

Report of the Social Scientific Study Group on Minamata Disease,
National Institute for Minamata Disease

In the Hope of Avoiding Repetition of the Tragedy of Minamata Disease

-What We Have Learned from the Experience-

2001

the Social Scientific Study Group
on Minamata Disease

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2001 National Institute for Minamata Disease

In the Compilation of a Research Report of the Social Scientific Study Group on Minamata Disease

On the occasion of submission of a research report on the Social Scientific Study Group on Minamata Disease to the National Institute for Minamata Disease, I feel deep emotion as the chairperson of the Study Group.

The objectives of the Study Group have been focused on the process of cause-effect investigation of Minamata disease and countermeasures against the disease, which would lead to the Government's announcement of its views on the disease. After the discovery of the strange disease, it took 12 years for the Government to decide on a unified policy toward the disease. Investigations of these circumstances, under which the delay of the policy decision had caused the spread of tragic consequences, including the second outbreak of Minamata disease in Niigata Prefecture, must have urged the Government's remorse, and induced severe controversy to every member of the Study Group as well, who has been involved in the Minamata disease affair from different standpoints.

The National Institute for Minamata Disease established the Study Group to undertake such a task. The Institute may meet with some criticisms that the start was too late, because 40 years or more have already passed since the official discovery of Minamata disease. Until September 1995, when the political solution presented by the Government to the problem of Minamata disease was accepted by patient groups and disputes about exploration of the responsibility of the Government were settled, we had not expected any national research institute to have discussed "learnings" among the investigators in quite different standpoints. Although the legal action to the Kansai district court, which did not yet accept the political solution to the problem, is pending in court, the matter is settled at present from a political standpoint. In Minamata "*moyai-naoshi* (restoration of mooring)" was advocated. Under these circumstances, matters were likely to develop socially toward the reconciliation.

In the first meeting of the Study Group, it was decided that I took charge of the chairpersonship. Even if the problem had been politically settled, I had entertained some apprehensions about the possibility of a definite conclusion being drawn among the members who had participated in from such various standpoints, when looking at lineup of the Study Group members. However, it became increasingly clear that the apprehensions were utterly unfounded.

The secretariat was asked to arrange those opinions offered from every member in each meeting, to make drafts of subject matters, which would be presented for further discussion, and to collect the reference data concerned. The secretariat prepared subject matters faithfully to the members' opinions, and did not set up any means of control for discussion. In the beginning, there were some requests that the research report be compiled within one year. In this matter as well, the long argument about the problem was prior to the quick compilation.

From respective standpoints, the affair was much debated on the basis of each member's own experiences, and occasionally the facts with which the persons dealt in the draft had unpleasant experience were also revealed.

Severe opinions against the governments and companies as well were offered.

When the issue gradually boiled down at each time of the meeting of the Study Group, however, common understandings came to be obtained among the members who appeared to have participated in the Study Group from different standpoints, and the work to induce “learnings” from these understandings progressed satisfactorily. Ultimately, the research report thus-compiled had few or no parts, in which both pros and cons of the issues were offered and personal views were included without any change.

I would like to pay my respects to all the members for their having participated in and cooperated with the progression of the difficult task from a broader perspective with the aim of avoiding the error of Minamata disease to be repeated. I also express my thanks to the secretariat, who have made exhaustive efforts, as the chairperson of the Study Group.

Michio Hashimoto
Chairperson
the Social Scientific Study Group on Minamata Disease
1999 Dec.

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The Meetings of the Social Scientific Study Group on Minamata Disease

1st meeting	July 5, 1997
2nd meeting	November 24, 1997
3rd meeting	February 22, 1998
4th meeting	April 18, 1998
5th meeting	May 8-9, 1998
6th meeting	July 19-20, 1998
7th meeting	October 31-November 1, 1998
8th meeting	March 21-22, 1999
9th meeting	June 26-27, 1999
10th meeting	September 5-6, 1999
11th meeting	December 4, 1999

On the Research Report of the Social Scientific Study Group on Minamata Disease

The Social Scientific Study Group on Minamata Disease was established as a research project of the National Institute for Minamata Disease (NIMD) in July 1997 on the basis of the purport of “a talk by the Prime Minister in the solution of the problem with Minamata disease”, which was decided upon by the Cabinet in case of the political settlement of Minamata disease in 1995.

Herein, the circumstances of the occurrence of a tragedy of Minamata disease, particularly of the spread of casualties of Minamata disease, are compiled and discussed from a social scientific viewpoint with reference mainly to approach of each party of the Government, companies, research institutions, victims, and so on. The research report was designed to deduce learnings, the most of which could be put to practical use for policy decisions by the Government not only of Japan but also of various foreign countries and for companies’ measures taken against environmental pollution.

The Social Scientific Study Group on Minamata Disease defined the period dealt with by the study group as that from May, 1956, when the Minamata disease was officially discovered, to September, 1968, when the Government’s unified views were lead. In April 1997, NIMD started selecting suitable persons for members of the Study Group from physicians and investigators, who had been involved with the treatment and studies in the early stage after the discovery of Minamata disease, investigators who had long studied the problem of Minamata disease, investigators of environmental problems in modern times, and so on.

Consents to the registration as the members were obtained from 10 persons. On July 5, 1997, the 1st meeting was held in Kumamoto City, and it was decided there that Mr. Michio Hashimoto would take charge of the Chairperson of the Study Group.

The Social Sciences Section of Department of International Affairs and Environmental Sciences of NIMD took charge of the Secretariat of the Study Group. The Secretariat started compiling with the aim at making research report under the guidance of the Chairperson Hashimoto. The work began with a clean slate; i.e., the selection of important circumstances and facts, establishment of points of discussion, and so on were conducted first.

The opinions offered from every member in each meeting were arranged to make drafts of subject matters, which would be presented for further discussion. The number of the items that should be assessed gradually increased, and the long argument over two days was adopted from the 5th meeting (May 8-9, 1998) onward.

Extraction of concrete learnings started from the 6th meeting (July 19-20, 1998). Thereafter, assessment of the details of expression was repeated for all sentences on at least 100 pages, while new facts and discussion were added. In this way, the research report was completed.

With regard to the courses and evaluation of the facts the documents kept and verbal evidence were confirmed to ensure the accuracy of these documents and evidence. However, it is thought that there are important facts, which are still interpreted erroneously or not yet be mentioned. Therefore, the matters written in the report does not show the final conclusion. They are waiting the verdict of a number of people.

In conclusion, I express my thanks to all the members as well as the Chairperson, who have long lavished much time and labor on debating at meetings and making the research report on the Study Group, though they

were very busy.

Yukio Takizawa
Director of the National Institute for Minamata Disease,
Environment Agency
1999 Dec.

Reference

*The Statement of Prime Minister on Solving the Problem with Minamata Disease
(tentative translation)*

Decided at the cabinet meeting on December 15, 1995

With regard to the problem with Minamata disease that should be regarded as the origin of environmental pollution, the parties concerned reached an agreement to settle the problem owing to the efforts of many people, and it could be solved 40 years after the first outbreak of the disease.

Apart from the compensation problem of patients certified under the Law Concerning Compensation and Prevention of Pollution-related Health Damage, which have already been solved, some problems still remain to be solved with the relief of the people who have not been able to be certified as the patient.

In order to solve the problem early, I have made efforts in all sincerity while closely communicating working with ruling coalition parties and local governments concerned. I would like to present my heartfelt admiration for the efforts of the people concerned including those who belong to each sufferers' group at reaching a difficult decision after the long and hard history.

In the solution of the problem, I express my feelings of profound mourning for the people who died with agony and resentment. When I think of incurable feelings of many people, who have long been forced to have agony that is beyond description, I do not know how to apologize to them.

The problem with Minamata disease not only induced serious damages to health but also destroyed ties among the local residents, having had huge and wide-ranging influence on the local communities.

I heartily hope that with the solution as a momentum the people of the districts concerned about Minamata disease will rebuild their local communities, where they will live together in mentally comfortable as early as possible.

Retrospectively considering the process from the outbreak up to the present time, the Government made efforts as much as possible at each time. However, we must reflect honestly that it eventually took long time to acknowledge the cause of Minamata disease and to take appropriate approaches to companies, and also that outbreak of the second Minamata Disease occurred in Niigata. I make a fresh determination that such a misery environmental pollution should not be repeated.

On solving this problem, the Government will promote countermeasures in cooperation with local governments concerning the medical program of Comprehensive Measures of Minamata Disease, financial support to Chisso Corporation, rehabilitation and advancement of the-affected regions, etc. We must modestly learn from the tragedy of Minamata disease. We determined to advance the environmental policy in Japan, and to make international contribution through cooperating actively with foreign countries over the world by putting our experiences and technologies to practical use.

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INTRODUCTION

Tragedy of Minamata Disease and Environmental Chemical Problems Today

1. Outline of Minamata disease

(1) Outbreak of Minamata disease and its casualties

Minamata disease is a poisoning disease of central nervous system developed among the inhabitants who routinely had large quantities of fishes and shellfishes in which methylmercury compound had been absorbed directly through the gills or through the intestinal tracts or been accumulated at high concentrations by food chains after discharge from chemical plant to the sea and rivers.

In the beginning of the outbreak, however, the disease occurred as a peculiar nervous disease of unknown cause in the districts along the shore of the Shiranui Sea (Yatsushiro Sea) centering on the areas around Minamata Bay in Kumamoto Prefecture. The outbreak was also confirmed later in the reaches of the Agano River in Niigata Prefecture.

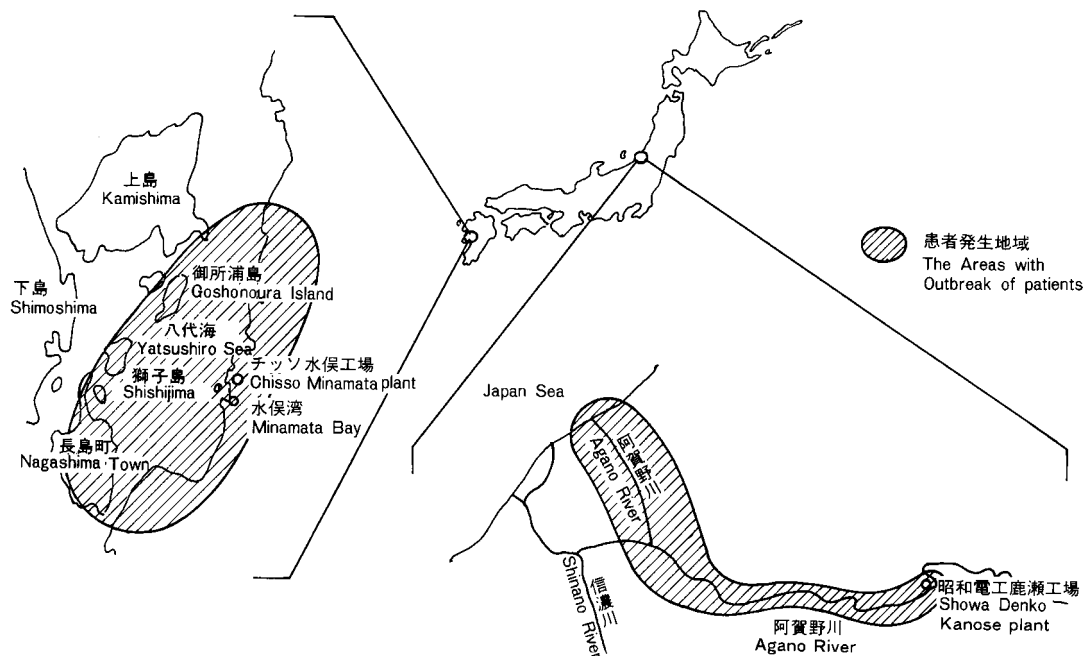


Figure 1. The areas with outbreak of Minamata disease (Cited from “Our Investigative Efforts to the Tragic History of Minamata Disease 1999” by Environmental Health Department, Environment Agency)

With regard to Minamata disease occurring in the areas around Minamata Bay in Kumamoto Prefecture, the patient was reported for the first time in May 1956, and it was confirmed at the end of the year that 54 patients had had the disease since December 1953 and that 17 of the patients already died. The disease became called “Minamata disease” from 1957 onward.

With regard to Minamata disease occurring in the reaches of the Agano River in Niigata Prefecture, the patient was reported for the first time in May 1965. In July 1965, it was confirmed that there were 26 patients and that 5 of the patients died.

Certification of a person to be a patient with Minamata disease in Kumamoto Prefecture is made by Governors of Kumamoto Prefecture and Kagoshima Prefecture on the basis of the law(*); 2,263 patients with Minamata disease have been certified by these Governors by the end of November 1999. Since the outbreak of Minamata disease was reported, at least 40 years have passed, and 895 patients were alive as of the end of November 1999.

(*)N.B.: (Old) Law Concerning the Relief of Pollution-Related Health Damage. At present Law Concerning Compensation and Prevention of Pollution-related Health Damage.

Certification of Minamata disease in Niigata Prefecture was made by Governor of Niigata Prefecture and the Mayor of Niigata. By the end of November 1999, 690 patients with Minamata disease have been certified by the Governor and the Mayor. As of the end of November 1999, 352 patients with Minamata disease are alive.

In addition to the people who have been certified to be Minamata disease patients on the basis of the law, the following people were decided to receive medical benefits from the Government and the prefecture, which would have expense to bear them, and to receive a single sum from Chisso Co., Ltd. or Showa Denko Co., Ltd.: the persons who have been exposed to the methylmercury compound at the concentrations higher than usual and certified to have sensory disturbance mainly in the peripheral portions of extremities by the Governor or the Mayor, among the people who were not certified to have Minamata disease by the law because of “the medically low probability of Minamata disease” as a measure of relief of the administrative structure by political measures to solve the problem of Minamata disease on the basis of mutual consent of the three Government parties (the Murayama Cabinet) [the Liberal Democratic Party, the Japanese Socialist Party (Social Democratic Party), and Shinto-Sakigake] in December 1995. In total, 11,152 people were the subjects (10,353 in Kumamoto and Kagoshima Prefectures and 799 in Niigata Prefecture).

Minamata disease caused not only serious casualties to lives and health of the patients but also serious damage, which are unable to be easily relieved, to natural environments, human relations, and economical activities in the districts, as well as the daily lives of the patients and family members.

(2) Tragedies of Minamata disease

Minamata City is located on the southern tip of Kumamoto Prefecture, and adjacent to Kagoshima Prefecture. Nature abounded on the city that was surrounded by the sea and mountains. The Shiranui Sea which Minamata City faces was a calm beautiful inland sea surrounded by the Kyushu mainland and the Amakusa Islands on the other side of the city. The sea area teemed with fish. Particularly, the areas around Minamata Bay were fishery spawning grounds, which were blessed with abundant natural rocky places under the water where fish tended to gather, and fishing grounds. The areas were dotted with small fishing villages, and the people led their self-sufficient lives with the blessed sea. On the days of large catches, anchovies, scabbard fishes, horse mackerels, etc. were netted in so large amounts that there were no spaces for drying grounds. The fishes and shellfishes caught in the Shiranui Sea were valuable protein sources for the inhabitants of the districts.

However, strange extraordinary events began to appear in the calm fishing villages in around 1953 at latest; cats went mad, ran around, and went into the sea, and crows and birds living along the shore of the sea fell to die. Thereafter, a disease of unknown cause stroke the inhabitants in sequence.

Among the inhabitants who had not ever entertained any apprehension about their health, some had numbness and trembling of extremities, narrowed visual field, and hearing disorder. Some people could not speak clearly, stumbled or staggered. Some could not walk in an ordinary way. Some people had convulsion or became bedridden. The persons with particularly serious ones of these symptoms lost consciousness, moved the extremities and the body terribly, cried by day and night, or scratched off the wall. Then, they died about 1 month after the onset.

Further tragedies occurred; some infants were born with physical and mental retardation and severe

difficulty of moving, and died in the early stage after birth.

The grief and troubles of the patients who suffered from the disease, whose cause and treatment were unknown, and of family members who cared for their blood relatives were serious, and the lives of the families that lost the supporters because of the disease were worked to the limit.

Fifty-four patients were confirmed by the end of 1956, and 17 of them died. However, that is not all grief or trouble Minamata disease has induced. The patients and family members were treated discriminately because of some apprehensions about the possibility of the disease being infectious, and they could not make purchases in the neighborhood. Thus, human relations between them and the surroundings were broken. If a patient appeared in a fishing village, the fishes taken by fishermen in the village would not be sold. For this reason, some persons were stopped to announce themselves as the patients. The inhabitants who had treated the patients discriminately also became patients, and some of them died. In 1959, patients and the family members moved to ask for compensations to the Chisso Minamata plant that had been strongly suspected as the causative company. Therefore, the patients and family members met with resistance from the citizens of Minamata City governed by the company. This was one of the main reasons by which the victims were confined to an obscure part in the local community.

Minamata disease that caused such tragedies is one of the most serious environmental pollutions humans experienced worldwide as well as in Japan. It occurred during the time period when Japan was going to revive from destruction of the economic base due to World War II, which ended in defeat of Japan, and to take the new course of economic growth, and when the Government, local governments, politicians, the mass media, and most of the nation, as well as companies, thought that economic development centering on heavy chemical industries is most important. The activities of companies, in which only the productivity took priority over others and which lacked consideration to environments, took many persons' lives, damaged many people mentally and physically, and further gave serious irrecoverable casualties to natural environments, economic activities, and human relations in the districts.

Despite the outbreak of such serious tragedies in the districts along the shore of the Shiranui Sea, any efficient measure to arrest the spread of the casualties was not taken by the Government, leading to the second outbreak of Minamata disease in the reaches of the Agano River in Niigata Prefecture in May 1965.

Drainage from the process of acetaldehyde production by Chisso, which was a causative factor for Minamata disease in Kumamoto Prefecture, completely stopped by the cessation of operation of production facilities in May 1968, i.e., 12 years after May 1956 when the outbreak of Minamata disease was reported for the first time to the administrative organs. Operation of the process of acetaldehyde production by Showa Denko, which was a causative factor for Minamata disease in Niigata Prefecture, was ceased in January 1965.

(3) Confirmation of the causes of Minamata disease by the Government

The methylmercury compound as a by-product of the process of production of acetaldehyde at the Minamata plant of Shin Nippon Chisso Fertilizer Co., Ltd. ("Nippon Nitrogen Fertilizer Co., Ltd." until January 1950; "Shin Nippon Chisso Fertilizer Co., Ltd." until January 1965; "Chisso Co., Ltd." at present; hereinafter referred to as "Chisso") and at the Kanose plant of Showa Denko Co., Ltd. (hereinafter referred to as "Showa Denko") as discharged with factory wastes. It contaminated Minamata Bay, the Shiranui Sea, and the Agano River, and accumulated in the fishes and shellfishes inhabiting there. The disease that occurred in the inhabitants of the districts, who continued to eat the fishes and shellfishes in large quantities, was Minamata disease.

With regard to the cause of Minamata disease occurring in the districts around Minamata Bay in Kumamoto Prefecture and in the reaches of the Agano River in Niigata Prefecture, the Government's unified views were announced on September 26, 1968; i.e., it was concluded that the causative agent for Minamata disease in Kumamoto Prefecture was the methylmercury compound formed as the by-product of the process

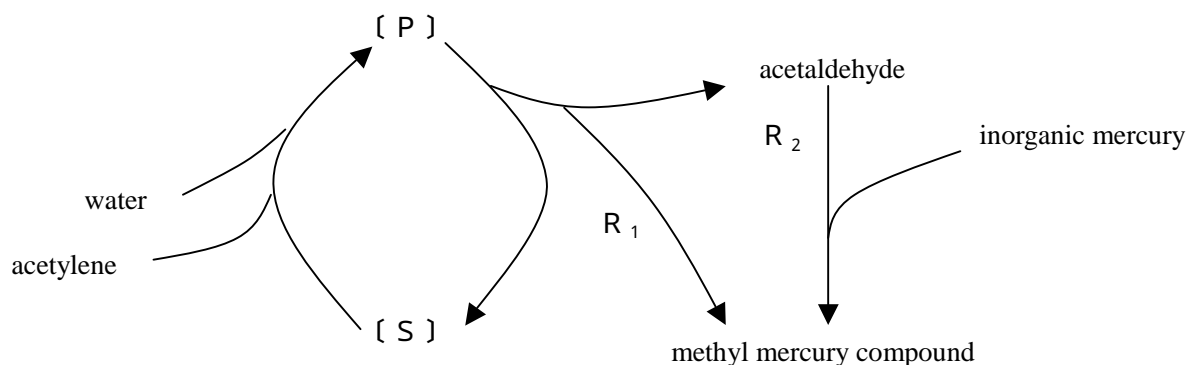
of acetaldehyde production in the Chisso Minamata plant”, and that “the development of poisoning in Niigata Prefecture was based on the drainage containing the methylmercury compound as the by-product of the process in the Showa Denko Kanose plant”. It was then concluded that the methylmercury compound discharged from these plants accumulated in fishes and shellfishes and Minamata disease was the disease of the central nervous system, which occurred in the inhabitants who continuously took these fishes and shellfishes in large quantities.

2. Mechanisms underlying the outbreak of Minamata disease and morbid conditions

(1) Mechanisms underlying the by-production of methylmercury and the outbreak of Minamata disease

A. The mechanism underlying the by-production of methylmercury

The methylmercury compound as the causative agent for Minamata disease is generated in the process of production of acetaldehyde by addition reaction with acetylene water, as follows: produced in a reactor as a side reaction of acetaldehyde generation, i.e., as one of the catalyst deterioration reactions; produced in response to reaction of generated acetaldehyde to inorganic mercury ion. The reaction shown as may occur not only in a reactor by addition reaction with acetylene water but also in other instruments in which acetaldehyde may come in contact with inorganic mercury. The whole relevant reactions are illustrated below.



With regard to the mechanisms underlying the generation of the methylmercury compound in the actual reactor, there is one hypothesis; i.e., the methylmercury compound is produced as an adverse reaction (R1) in the process of the degradation, while acetaldehyde is generated in the process of degradation of the intermediate product [P] developing through the reaction of acetylene to mercury.

Furthermore, *Hajime Nishimura, Prof. Emeritus of University of Tokyo (Chemical Industry) and his co-workers, who have recently investigated results of past experiments by various investigators by the analysis from the aspect of reaction kinetics, have indicated that it is important to generate the methylmercury compound via the R2 tract as the reaction in the process of the actual production of acetaldehyde and that the contribution of R1 to the generation is relatively slight.

B. Onset mechanisms of Minamata disease

The methylmercury compound may have been generated in acetaldehyde plants which had the process similar to that in the Chisso Minamata plant. The following possible reasons for the occurrence of a large number of patients in Minamata are considered to be that: the amount of acetaldehyde produced in the

Chisso Minamata plant was large; the amount of the secondarily generated methylmercury compound per unit production amount was extraordinarily large; in the case of the Chisso Minamata plant, since a large amount of chloride ion was contained in city water, the methylmercury compound generated changed to volatile methylmercury chloride, which may have been transferred to a rectifier in the process of evaporation and distillation of acetaldehyde in the mother liquor and excreted with the essential drain waste water; the excreted methylmercury compound did not diffuse adequately and accumulated at high concentrations in fishes and shellfishes, because Minamata Bay is the inland sea of the Shiranui Sea; and the fishing people who eat the fishes and shellfishes in large quantities existed there.

In the case of Minamata disease in Niigata Prefecture, the following possible reasons for the outbreak are considered to be that: The inhabitants who eat river fishes existed in the areas around the Agano River to which waste water from the Showa Denko Kanose plant was discharged; and a large quantity of factory wastes may have been thrown away as a consequence of the cessation of operation of the acetaldehyde process.

[Comments] According to the recent study by Hajime Nishimura ["Gendai Kagaku (Chemistry Today)", February, 1998], some possible reasons for the high frequency of the methylmercury compound generated in the Chisso Minamata plant are described below. From August 1951 onward, the procedural system was changed; manganese dioxide used conventionally as a promotor for maintaining the activity of mercury catalyst was changed to ferric sulfide, and ferrous ion reduced in the reaction mother liquor was oxidized with nitric acid. As a result, the amount of methylmercury generated in the process was rapidly increased, and since the factory water with which the sea water was mixed was used, the methylmercury compound was transmitted from the evaporator to the rectifier in the form of methylmercury chloride and discharged. Also, waste matter from a sulfuric acid plant, i.e., burned draff of ferrum sulfide ore, has been used as a promotor for 3 years since 1951, frequently leading to troubles; the reaction mother liquor containing the methylmercury compound has been thrown away.

(2) Morbid conditions of Minamata disease

When the fishes and shellfishes contaminated with the methylmercury compound are orally taken into the body, the compound is absorbed almost completely into the digestive tract, and distributed in organs of the whole body via blood circulation. The compound partly passes the blood-brain barrier to accumulate in the central nervous system and damages nerve cells to cause neuropsychic symptoms. The methylmercury compound is characterized by the fact that it passes the blood-brain barrier more easily than other mercury compounds. The compound is partly transmitted into hairs.

Minamata disease shows a variety of clinical symptoms as follows, and the patients have persistent subjective complaints: sensation of numbness, arthralgia and myalgia of extremities, disturbance of speech, disability to use fingers, disability to grasp objects, easy stumbling and unsteadiness, ageusia, anosmia, difficult hearing, cramp, headache, failure of memory, insomnia, etc. The major clinical pictures of nervous system in the typical patient include sensory disturbance mainly in the peripheral parts of extremities (which may be expressed as glove and stocking anesthesia in some cases), cerebellar ataxia, dysarthria, concentric constriction of visual field, central hearing impairment, central disturbance of ocular movement, central dysequilibrium, tremors, etc. Sensory disturbance, ataxia, constriction of visual field, and hearing impairment among these are called Hunter-Russell syndrome after the names of the physicians in England, who have reported for the first time details of the patients with methylmercury poisoning. These symptoms are regarded as typical clinical features of methylmercury poisoning.

Some severe cases of Minamata disease show restlessness, wild excitement, and consciousness disorder or the state called apallic syndrome, and occasionally show the fatal course. With regard to patients in the early stage of Minamata disease, 16, 4, and 1 patients died within 3 months, 6 months, and a year, respectively, after the onset. As of 1965, the fatality rate was 43.8% in the patients except fetal cases which

will be described later (“Minamata byo – Yuki-suigin chudoku ni kansuru kenkyu [Study on Minamata disease: an organic mercury poisoning]”).

[*Comments*] Including fetal cases, all patients of Minamata disease who had been confirmed by 1968 at latest, were serious cases. Since the disease is a methylmercury poisoning that occurred through fishes and shellfishes via environmental pollution, it is a matter of course that there are patients with the diseases of many various patterns of the severity in addition to these severe cases. Thereafter, some patients were actually confirmed to have had the disease as a consequence of chronic exposure to the methylmercury compound, and a number of patients were confirmed to have had mild incomplete-type Minamata disease. As the mild type of fetal Minamata disease as well, some patients were confirmed to have had high mercury levels in the umbilical cord and shown intellectual disorder as the main symptom.

Minamata disease is pathologically characterized by cortical damages of the cerebrum and the cerebellum. In other words, cell deficits are selectively observed in the calcarine areas (visual center), precentral gyrus (motor center), postcentral gyrus (sensory center), and the transverse temporal gyrus (auditory center) of the cerebrum. In the cerebellar cortex, Purkinje’s cells remain, and granular cells markedly fall off, showing an atrophy of granular cell type. The severe cases show spongiosis and the mild cases show slight nerve cell loss and glia cell proliferation. Thus, lesions of various degrees have been confirmed. It is characteristic that the lesions of the basal ganglion, brainstem, and the spinal cord are mild even in the severely affected cases. Damages mainly to sensory fibers including the sural nerve and the dorsal root of spinal nerves have been reported as peripheral neuropathy.

[*Comments*] With regard to the peripheral neuropathy, some reports have shown that biopsy and so on revealed the absence of damage mainly to the sensory fibers.

The methylmercury compound passes the blood-placenta barrier in a way similar to that for the blood-brain barrier. It is therefore clear that the methylmercury compound widely damages the fetal brain via the placenta from the mother who eats the fishes and shellfishes in which the compound accumulates. Consequently, cerebral palsy-like symptoms, which include (congenital) intellectual disturbance, developmental disorder, speech disorder, difficulty of moving of extremities, gait disturbance, abnormality in ocular movement, other paroxysmal symptoms, and abnormal posture deformation, occur. The condition showing these symptoms is called fetal Minamata disease, mainly because the disease is considered to be due to damage in the fetal stage (in late pregnancy).

<Column> “*Hunter-Russell syndrome*”

In 1940, three investigators: Hunter, Bomford, and Russell in England, reported an accident of poisoning in the workers who were engaged in production of the methylmercury compound at a plant of seed disinfectants production.

In the plant, 16 workers were exposed to the methylmercury compound (the route of invasion of the compound was the respiratory system, unlike Minamata disease), only 4 of them showed toxic symptoms. Twelve other workers showed no symptoms. From the symptoms observed in the 4 patients with manifestations, three symptoms of methylmercury poisoning were regarded as ataxia, speech disturbance, and constriction of visual field, and they are called three signs of Hunter and Russell syndrome. At present, however, sensory disturbance and hearing loss were added to these three signs (speech disturbance was included in ataxia in some cases), and under these circumstances of elucidation of Minamata disease these symptoms are called Hunter-Russell syndrome, which shows symptoms of typical Minamata disease.

<Column> “*Clinical features of Minamata disease patients*”

Details of symptoms in Minamata disease patients from the records by the physician (N.B.) in those days are shown below. “S.T. A girl aged 5 years and 11 months. She has had pyrexia for only a day in late March, 1956. Whenever she had meals thereafter, she was awkward at holding chopsticks and the foods dropped. She could not wear her shoes well. Since around April 14, it has been noted that she was unsteady on her feet. On April 17, she had twists in her tongue and she was choked with something to eat. At night, she became displeased and could not sleep. She became to increasingly show wild excitement. On April 21, she was examined at Shin Nippon Chisso Hospital (Chisso Hospital). The findings on examination showed a middle stature, undernutrition, and dementia-like facial expression. She always let out sudden cries. She showed slight pupillary dilatation, dry tongue, and no other abnormalities from the aspect of internal medicine. She was admitted to the hospital on April 23. Difficulty of moving of extremities was being increased. On April 26, the tendon reflex of the upper and lower extremities was increased, a pathological reflex was observed, insomnia continued, tonic convulsions were occasionally observed in the whole body, and she bit her tongue that bled. On May 2, systemic tonic convulsions frequently occurred with remarkable sweating and muscle stiffness of extremities. On May 28, the patient became blind, the frequency of systemic convulsions gradually increased, she had no response to any stimuli, and she had flexion and remarkable deformity of the extremities.” (Died on January 2, 1959)

“J.T. A girl aged 2 years and 11 months. On April 23, 1956, she was unsteady on her feet, she became unable to walk freely, and she had difficulty of moving of her hands. Simultaneously with these conditions, she was unable to speak distinctly, and she complained of pains in the right knee and hand fingers. On May 7, she could stand up, but was unable to walk. Her grasping power was also reduced. She did not chew any food. She had slight swallowing difficulty, enhanced dysphasia (she was unable to speak distinctly), and her neck became unsteady. On May 8, she was unable to eat any meals. She had insomnia. On May 10, she could not grasp any object. On May 14, difficulties of mastication and swallowing were considered to have been reduced, but alalia was present.”

“K.E. A girl aged 5 years and 4 months. Since April 28, 1956, she has been unsteady on her feet and shown unnatural gait. She has been increasingly unable to speak distinctly and to grasp objects. On May 8, she received initial examination, and showed ataxic gait. On May 9, she frequently spilled water when she drank water, and she choked over her water. On May 10, she was unable to stand. On May 16, she was unable to grasp any object. On May 17, she had aphagia and stiffness of extremities. On May 21, she had pneumonia and frequent convulsions. She had severe systemic convulsions, deformation, and loss of consciousness. On May 23, she died.”

Thus, symptoms of Minamata disease patients are philosophically and simply described, but the records written by the physicians in those days show how dreadful the disease is. It is surprising that these patients lived next door to each other. In the family of the patient reported last, a boy aged 11 years and 8 months had the disease on May 8. Their mother had the disease on May 16. Thereafter, his younger brother aged 8 years and 7 months had the disease on June 14.

Their father and other brothers, who had not been dealt with on that occasion have also shown a variety of complaints. In 1971, sensory disturbance, constriction of visual field, and incoordination were revealed by our survey, and all members of the family were revealed to have been influenced by the methylmercury compound. It is a matter of course that these results were observed, because they had eaten the same foods. However, this is fear of poisoning with environmental pollution.

[Cited from “Minamata disease” Masazumi Harada, Iwanami Shinsho (1972)]

(N.B.) “The physician in those days” indicates Hajime Hosokawa, Director of Chisso Hospital

3. Lessons of Minamata disease

The lives lost by Minamata disease and the mental and physical damages are irreparable.

Causative companies did not cooperate with other institutions' activities to clear up the cause of the disease and veiled even the achievements of internal research, leading to delays of elucidation of the cause and countermeasures and to the spread of the casualties.

Compensation for the casualties was decided to be paid by causative companies to the patients, who have been certified to have Minamata disease on trials on the basis of "Law of compensation for casualties of environmental pollution to health". The compensation paid accumulated, and at present, Chisso is obliged to pay the compensation (including the interest of borrowed money for the payment of compensation) to patients, which exceeds markedly the ordinary profit.

From the aspect of cost as well, there has been a trial balance showing that the expenses for countermeasures against the prevention of Minamata disease would have been much lower than the actual amount of compensation paid to the certified patients by the causative companies ("*Nippon no Kogai Keiken* [Experience of Environmental Pollution in Japan]" ed. by the Research Group for Global Environments and Economics, Godo Shuppan, 1991). This indicates that the prophylactic countermeasures eventually become profitable for the companies' management as well.

We Japanese, who experienced Minamata disease, should contribute actively not only in Japan but also to foreign countries on the basis of the experience as lessons, so that such a tragic environmental pollution will not be repeated on the earth.

For this purpose, the delay of the policy decision and the countermeasures by investigators, the inhabitants in the districts, and the causative companies on each occasion should be inspected with the investigation of the reasons for the outbreak of Minamata disease, the spread of tragic consequences, and for the fact that it took 12 years after the discovery of the disease for the official views to have been offered by the Government. By doing so, the lessons should be clarified from the experience of Minamata disease.

4. *The object of the present compilation*

The history of Minamata disease may be regarded as that of the following tragedy: Only the strict need for scientific elucidation of the cause has been done, and no responsible decision has been made by the Government; any necessary measure to counter the disease has not been considered for a long period; consequently, serious casualties were given to the inhabitants. In addition, the tragedy was repeated twice. Repetition of such a failure in the countermeasures against Minamata disease should not be allowed any more.

With regard to the problems about pollution with chemical substances, which all men currently face, there are two standpoints of the safety; i.e., from one standpoint, chemical substances, safety of which is not or will not be confirmed not only at present but also in the future, should not be discharged into environments, and from the other standpoint, a certain chemical substance may be discharged before the chemical substance is confirmed to be harmful.

Considering from viewpoints of preliminary prevention of environmental pollution and prevention of the spread, everybody should agree with the former principles of the priority of safety. However, when concrete measures to counter environmental pollution with chemical substances are considered, various objections against the measures are raised, as follows: "Any causative chemical substance has not been identified"; with regard to the chemical substances, harmfulness of which has not been demonstrated, "regulation of the chemical substances may damage considerably industrial activities." Thus, decision of important policy or social countermeasure is not necessarily made rapidly because of such dissenting voices.

Considering the seriousness at the time point when the current pollution with chemical substances, the

spread of the pollution, and the casualties were confirmed, it should be beyond medical aid to consider countermeasures after the scientific elucidation of harmfulness and the mechanisms. There are many things that can be learned from the failed experience of Minamata disease; e.g., the way how to rapidly decide the opinion as the Government under the state in which insecurity remains.

Minamata disease is a typical poisoning with chemical substances, which occurred as a result of the following process: the causative agent (methylmercury compound), a by-product of the process of production at chemical plants, was discharged with factory wastes to the natural world, and accumulated in fishes and shellfishes, and the people ate them in large quantities. This affair has the leading meaning in problems with chemical substances as the event as well, in which a chemical substance damaged seriously a fetus via the maternal placenta.

The subjects of the studies by the Study Group included the process of inspection of the cause, which indicated the most important period for considering countermeasures against Minamata disease, i.e., from the outbreak of the disease to September 26, 1968 when the Government's unified views were presented. Problems with Minamata disease have involved central ministries and offices, the Diet, Prefecture, prefectural assemblies, city, municipal assemblies, causative companies, trade groups, research institutions, the mass media, victims in the districts, inhabitants, fishing people, and so on. How have these social groups or the individuals belonging to them behave regarding the disease during the period? How have they recognized the period and judged the situation? What kind of results have been induced by the behavior under the recognition and circumferential judgment? These problems mainly with Minamata disease in Kumamoto Prefecture were discussed from a socioscientific viewpoint at meetings of the Study Group. The present research papers were designed to extract social factors, which make the common quick countermeasures against the current problems with chemical substances to be hard, from the process of inspection of the cause of the disease and to dispatch the lessons obtained from the factors to various foreign countries over the world as well as all countries in Japan.

Many valuable lessons, which will become useful on considering environmental problems in the future, particularly relief measures, may be induced from the history from 1968 onward as well as the period included in the subjects of the present study, i.e., the process of inspection of the cause before 1968. Therefore, it should be added that similar research is required for these lessons.

[Comments] The present research papers do not show any conclusion about the presence or absence of legal responsibility of the nation or prefecture. With regard to the presence/absence and the extent of legal responsibilities of the Government's and prefectural countermeasures in those days, the opinions may vary with individuals' standpoints. When the actual situation of the casualties of Minamata disease is exposed, however, nobody may be satisfied with the countermeasures made in those days, regardless of the standpoints. There is the common critical moment in which the Minamata disease affair is inspected in spite of the different standpoints.

It is easy to criticize the behavior of each group made in those days after the results of the affair have already been obtained. However, on reading the papers, suppose the case in which the readers are placed in the situation as the person concerned in those days. Imagine how the readers should have or should not have behaved under the situation. Read the papers as if the readers face the troubles. On reading the final chapter particularly, review the readers' current standpoints and ask again whether or not the readers are going to repeat the same serious mistake at present.

CHAPTER 1.

Movements during the Pperiod from the Times When the Signs Appeared to May 1956 when Minamata Dsease was Officially Dscovered

1. Background of the times, positioning of Chisso in industrial policy, position of Chisso in economic society of the district, and characteristics of the technological development by Chisso

(1) Situation of economy

Industrial reconstruction in Japan was proceeded relatively from 1945 onward, early after World War II.

Since around 1955, heavy chemical industrialization policy aiming at conversion of energy resources from coal to petroleum has been promoted, and the time when high economic growth of an annual rate of ca. 10% is achieved has arrived. The times of high economic growth lasted until 1973 when the primary oil shock occurred. In the times, Japan pushed on economic growth by the joint efforts of the Government and people with the national aim of increasing international economic competitive force.

(2) Position of Chisso in the local economic society

A. Location of Chisso in Minamata

Minamata situated on the west side of Kyushu faces the Shiranui Sea (Yatsushiro Sea), and the Amakusa Islands are on the opposite shore of the sea. Minamata is adjacent to Kagoshima Prefecture on the most southern tip of Kumamoto Prefecture. The plain at the mouth of the River Minamata running in the center of the city is narrow, and there is a mountain close to the sea. Because of these situations, general traffic means was a sea-based route.

In those days of 1898 before the invasion of Chisso, Minamata was a fishing and agrarian village of a total of 2,542 houses. The industry at Minamata was characterized by the salt-making industry, which was the only cash income for farmers. However, the industry was discontinued by the Government Monopoly in Salt Act (1910). Lumber and so on were carried from the port in Minamata, which was flourishing as “the window” through which coal was carried to the Ushio gold mine at Okuchi Village in Kagoshima Prefecture adjacent to Minamata.

[Comments] Many inhabitants of the Amakusa Islands on the opposite shore of the sea have come to the shore of Minamata for fishing. A part of them have been settled in Minamata and formed colonies of fishing people.

Minamata Bay is a double inlet surrounded by Myojinsaki in the Shiranui Sea and the off-lying island, Kojishima. It is always waveless. There are natural gathering-places for fish, such as beaches and sea shores inside and outside the Bay. In the shade of pine woods along the shore, a variety of fishes and shellfishes gathered naturally, providing best spawning grounds. Thus, Minamata Bay was one of the best fishing grounds in the Shiranui Sea.

The founder of Chisso, Sitagau Noguchi who was an electric engineer, established Sogi Electrics, K.K. in 1906. He constructed a hydroelectric power plant at the Sogi Falls in Okuchi Village in Kagoshima Prefecture and supplied electric power to the Ushio gold mine, etc. The essential purpose of the construction was to produce carbide that generates acetylene, which is a raw material of organic synthetic chemistry, by using surplus electric power and that from the second electric power plant constructed subsequently.

On constructing a carbide plant, Minamata was the best place from the aspect of the geographical features

as well, for the following reasons: the Amakusa Islands, from which lime-stone and good smokeless coal as the raw materials were abundantly produced, were situated on the other side of the Bay; there were good seaports for transportation of these raw materials and products; there was abundant water necessary for the development of electric power in the place backing against the city. People of the district have also eagerly invited a manufacturing company to set up its plant in the place. In March 1907, Noguchi started constructing a carbide production plant in Minamata Village, and in October of the year transmission of electricity from Sogi Electric, K.K. was started. In August 1908, Sogi Electric, K.K. was combined with a carbide production company, and the direct ancestor of the present company Chisso, i.e., Nippon Nitrogen Fertilizer Co., Ltd. was established.

B. Development of Chisso and the increase in the influence of the company on the districts of Minamata

Chisso succeeded in production of metamorphic ammonium sulfate and synthetic ammonium sulfate, and sequentially constructed electric power plants at various places in Kyushu. During the period, the scale was enlarged by constructing plants at Yatsushiro and Nobeoka. The amount of electric power produced was 880 kw in 1908, which reached ca. 40,000 kw in 1927 when ammonia synthesis by Casale's method was started at the Chisso Minamata plant.

In the 1930s Chisso took the lead in chemical industries in Japan in advance of the old interests of Mitsubishi, Sumitomo, and Mitsui as representatives of rising chemical industries with Mori, Nissou, and Riken. These rising industries were characterized by the following: the founder was a technologist or had a full understanding of technology; these rising industries aimed at electric chemistry in which cheap homemade hydroelectric power was used for production of the raw materials, while the interests used coal as the raw materials.

Since the Sogi Hydroelectric Power Plant was established in 1906, the persons who had driven carriages in order to carry coal, i.e., a power source of gold mines, from the Minamata Seaport, lost the job. In Minamata where the salt-making industry was also abolished, the way how to get cash income was replaced by employment to the Chisso Minamata plant. The bloc economy in Minamata was increasingly dependent on Chisso along with the development of Chisso. In those days, labor accidents such as explosion frequently occurred at the Minamata plant. Wages for the plant workers were also lower than daily wages for the people employed from the district to the plant, but they rose along with the development of the plant. A number of labors gathered the plant from the surrounding districts. It changed to the boast for the inhabitants of Minamata to become a factory worker of the plant. In general, there was much difference in pay treatment among classes of factory workers. At the Chisso Minamata plant as well, there was stern difference in employment conditions between employees of the company and the factory workers employed from the people of the district until the postwar period.

In April 1889 when Minamata Village was established according to the organization of cities, towns, and villages, the number of the inhabitants went on increasing along with the development of the Minamata plant: The village contained 2,400 houses with 12,040 inhabitants; the number of the inhabitants was 17,192 in December 1912 when the town organization was implemented; and the town contained 2,911 houses with 18,681 inhabitants in 1916. In 1949 when the municipal organization was implemented in Minamata after World War II, the city contained 8,584 houses with 42,137 inhabitants. In 1956 when Minamata disease was officially discovered, Kugino Village (with 3,258 inhabitants) was included in the city, and the number of the inhabitants peaked 50,461. In 1960, employees of Chisso and the subcontract companies accounted for 4,757 (ca. 24%) of the industrial population 15 years of age or over (19,819).

During this period, the specific gravity of the Chisso Minamata plant in the bloc economy in Minamata further increased. "Minamata Kojo Shinbun (Chisso Minamata Plant News)" of Chisso showed off the influence of Chisso by describing that the sum of the municipal property tax of the Minamata plant and the municipal tax of its employees exceeded 50% of the income of municipal rates in around 1955, and that

Chisso must be the first consideration for Minamata and Chisso is just a money-maker for Minamata City.

Thus, Minamata changed to so-called “the town supported by a company”, which is highly dependent on a single company and which is much influenced by the company. The inhabitants have also come to consider that only the development of the Minamata plant was prosperity of the town.

Under these circumstances backed by such consciousness of the inhabitants, the Minamata plant has been actively involved with the local government’s administration. In 1926, Jiro Sakane, an ex-employee of the Minamata plant, became the town manager, and the plant manager and the 7 persons interested in Chisso became members of the town assembly. In the same year, Minamata Station of the Japanese National Railways started practice in front of the Chisso Minamata plant. In 1950 after World War II, Hikoshichi Hashimoto, an ex-manager of the Minamata plant, who had developed technology of production of acetaldehyde, became the Mayor, and many employees of the plant became the members of the assembly. A plan of the opening of seaports in Minamata was established with the aim of sending in and out the raw

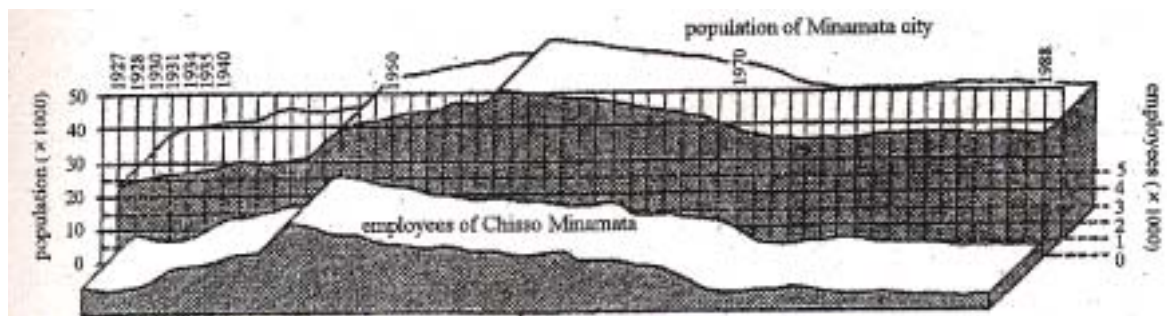


Figure 2. Changes in the number of employees of Chisso (from the exhibit of Minamata Disease Municipal Museum)

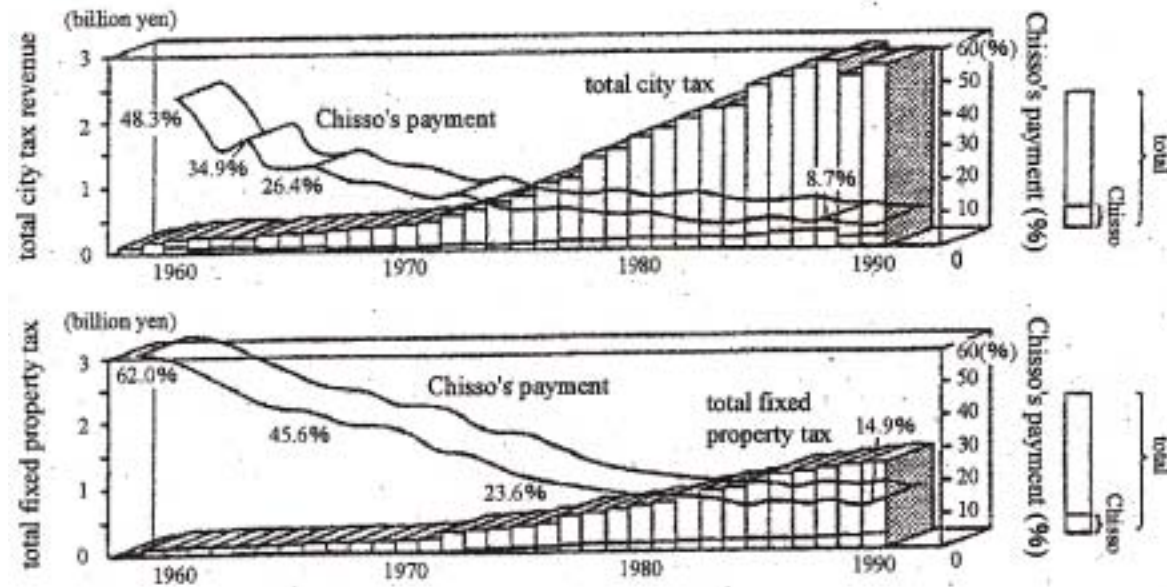


Figure 3. Proportion of the amount of taxes of Chisso in the city tax revenue (from the exhibit of Minamata Disease Municipal Museum)

materials and products at the plant. To promote the plan, many privileged measures were taken; bearing the public expenses for dredging of the harbor base buried in industrial waste in Minamata Bay, privileged measures against the municipal property tax of the Minamata plant, and the monopolistic use of water rights of the Minamata River. Thus, the Hyakken Seaport and the shoreline where the citizens had enjoyed sea bathing have changed to dumping grounds for the carbide residue.

(3) Positioning of the Chisso Minamata plant in the industrial policy in Japan

A. Postwar reconstruction of Chisso

The principles of the synthesis of acetaldehyde by using mercury as catalyst and using acetylene generated from carbide as the raw material has long been known. The process has already been industrialized in Germany, etc. Chisso developed its original method for the production. In 1932, Chisso started producing acetaldehyde earlier than other companies.

Thus, the ability of Chisso to investigate and develop was constantly at the top level, and Chisso has led technology of Japanese chemical industry before the war. With such technological knowledge, Chisso invaded Korea for developing the market, and established a large-scale hydroelectric power plant in Korea and the northeastern part of China. As Korea Nitrogen Fertilizer Co., Ltd. (Chosen Chisso Hiryo), Chisso created the most large-scale electrochemical kombinat, centering on the big Hungnan plant (including 45,000 employees), in the Eastern countries. It was situated in the important position as the munitions industry including fertilizers, oil and fats, gunpowder, etc.

On promoting postwar reconstruction, the Government paid special attention to production increases in fertilizers and coal, and promoted so-called the priority production system. The Chisso Minamata plant received big damage by bombings in 1945, and discontinued the production tentatively. After World War II, however, Chisso undertook restoration of the fertilizer division. Two months later, Chisso started producing fertilizers again in October 1945, next year the production of acetic acid was also started again. The production scale was mostly restored to that before the war in around 1950. Since all overseas fortunes (the Hungnan plant, etc.) of Chisso were requisitioned, many executives and engineers of the Korea Nitrogen Fertilizer Co., Ltd. came to Minamata and assumed leadership at the Minamata plant.

In 1950s, profits from organic synthesized products were gradually increased, while those from inorganic synthesized products such as fertilizers were decreased.

B. Chisso predominating over all others in the market of acetaldehyde

The amount of acetaldehyde and synthetic acetic acid produced, which are the raw materials of a plasticizer for plastics, was rapidly restored thereafter; in 1955 it reached 10,000 tons, and the postwar peak, 45,245 tons, in 1960. In those days, 8 plants of 7 companies, as shown in Table 1, have produced acetaldehyde, and Chisso has constantly occupied 1/3 to 1/4 of the amount of domestic production.

The production of acetaldehyde and acetic acid by using carbide as the raw material has been the main enterprise of organic synthetic chemical industry until the industry was contemplating branched out into the petrochemical industry in the postwar period of high growth of Japanese economy. Chisso moved into the lead of the domestic production and had influence on the market. During the 10-year period from 1950s, technological improvements and reforms have been sequentially made and technical installations have also expanded in the organic synthesis division of Chisso plant. In particular, Chisso succeeded in inducing and synthesizing octanol, which had been obtained only by import, from acetaldehyde in 1952. Chisso manufactured a plasticizer DOP, which is necessary for the molding of poly-vinyl chloride, and nearly occupied the domestic production. In 1959, the amount of octanol produced by Chisso occupied 85% of the domestic production.

Under these circumstances, Chisso continued to increase production of acetaldehyde the raw material of octanol in order to supply the demand of octanol during the period when other companies decreased operating rate for the process of acetaldehyde production. Thus, Chisso accumulated the capital as reserve capital for the conversion to the petrochemical industry.

Table 1. Plants of production of acetaldehyde by acetylene water addition reaction

Plant	Location	Operating period	Productivity (1963)	The results of production (1960)	The place where wasted water was discharged
Chisso Minamata plant	Minamata City, Kumamoto Pref.	March 1932 ~May 1968	48,000 t	45,245 t	Minamata Bay (tentatively at the mouth of the Minamata River) Siranui Sea
Dainippon Celluloid Arai plant	Arai City, Niigata Pref.	March 1937 ~March 1968	24,000	22,142	Shibue River , Seki River The Sea of Japan
Japan Synthetic Chemistry Kumamoto plant	Uto City, Kumamoto Pref.	January 1944 ~April 1965	18,000	15,969	Hamato River Ariake Sea
Japan Synthetic Chemistry Ohgaki plant	Ohgaki City, Gifu Pref.	February 1928 ~September 1964			Suimon River, Ibi River Ise Bay
Showa Denko Kanose plant	Kanosemachi, Higashiurahara gun, Niigata Pref.	January 1936 ~January 1965	12,000	11,800	Agano River The Sea of Japan
Denki Kagaku Aomi plant	Aomimachi, Niigata Pref.	April 1945 ~May 1968	12,000	10,890	Oumi River The Sea of Japan
Mitsubishi Gas Chemical Matsuhama plant	Niigata City, Niigata Pref.	July 1960 ~January 1964	10,000	4,244	Niigo River The Sea of Japan
Tekkosha Sakata plant	Sakata City, Yamagata Pref.	April 1939 ~December 1964	3,600	2,826	Sakata Seaport The Sea of Japan

(Prepared from “*Minamata-byo-20-nen no Kenkyu to Konnichi no Kadai-* (Minamata disease--Experience over the two decades and the present tasks confronting the disease)” edited by Sumio Arima)

The amount of octanol production was compared on the basis of the data stored in Chisso; 3,233 tons in Chisso vs 1,781 tons in other companies in 1955, 7,758 tons in Chisso vs 1,647 tons in other countries in 1958, and 13,147 tons in Chisso vs 1,378 tons in other companies in 1959. The data show that the amount of octanol produced by Chisso rapidly increased while that by other companies decreased.

The big task confronting the chemical industry of Japan and the Ministry of International Trade and Industry (MITI), which guides it, was that how the conventional electrochemical system could have been rapidly converted to the petrochemical system for the purpose of strengthening their competitive positions in world markets for freeing of trade of chemical products. MITI has prepared “Measures to foster petrochemical industry” in 1955, and carried forward the 1st-stage plan of the conversion from electrochemical to petrochemical system (E-P conversion plan), and the 2nd-stage E-P conversion plan. All companies have strived to become the first in participating in the Ministry’s policy aiming at promoting

Japanese economic independence and strengthening Japanese competitive position in world markets.

Chisso has also searched for oil companies, with which it could cooperate, and the place of location of industry, so that Chisso would have not missed the chance to participate in the 2nd-stage E-P conversion plan. In October 1959, Chisso cooperated with Maruzen Oil Co., Ltd., and made its decision to establish a new kombinat at Goi in Chiba Prefecture. MITI has regarded the Chiba kombinat as the efficient kombinat by reasonable investment in plant and facilities.

At the end of December 1959 when the E-P conversion plans were come out fully by various companies, the Ministry presented "Conduct policies of future plans to mass-produce the petrochemical industry", and showed the policy (scrap-and-build system) aiming at abolishing old technical installations simultaneously with conversion of chemical industry to petroleum industry. Eight plants of 7 companies including Chisso, which had produced acetaldehyde in those days, were to abolish the facilities for production sooner or later. In spite of such prospects, the new establishment of the 7th-stage technical installations for acetaldehyde was completed in the Chisso Minamata plant in November 1959, and the operation was initiated.

(4) Characteristics of the technological development in Chisso

A. Advanced development of technology in Chisso

The founder of Chisso was an engineer, a graduate of the Electrical Engineering Division of the Tokyo Teikoku University (the present University of Tokyo). During the period from 1955 to 1964 when Minamata disease have been discovered, Chisso has been evaluated highly as the company, which has been leading the fashion of chemical industry in Japan and in which much importance has been put on engineers, by students who have majored in applied chemistry. Under these circumstances, only the leading students have been employed to Chisso.

The history of Chisso shows with certainty that they have always developed new technologies by themselves. In 1932, Hikoshichi Hashimoto and his co-workers developed their original industrial technology for acetaldehyde (mother liquor circulation method), then succeeded in manufacturing products of butanol, acetic acid, ethyl acetate, anhydrous acetic acid, fibrin acetate, and vinyl acetate. In 1941, Chisso succeeded in synthesizing vinyl chloride from acetylene for the first time in Japan.

The Minamata plant was designed to develop organic synthetic chemistry of acetylene, and has taken the lead in developing technology in the pre-war Japanese chemical industrial circles. Chisso created the biggest electrochemical kombinat in the East centering on the Hungnam plant constructed in Hamgyongnomdo of Korea by using these technologies developed in the Minamata plant.

B. Absence of consideration to labor safety and environmental pollution

Organic chemical factories such as the Minamata plant are dangerous workshops in which instruments are likely to induce explosions. There are many hazardous chemical substances in the raw materials, and a variety of dangerous articles are included in waste products from factories. For this reason, particular consideration was required for the factories from the aspect of industrial hygiene as well. In Chisso in those days, however, consideration to labor safety of workers of the plant has been postponed by the company's pursuit of its profits. The Labor Safety and Health Rules in those days had no regulations regarding organic mercury.

In 1930, Zangger, an industrial health scientist of Switzerland, has reported a patient with suspected organic mercury poisoning, who has been a worker engaged in the process of acetaldehyde production. In 1937, Koelsch, an industrial health scientist of Germany, has cited the article of Zangger and described that attention must be paid to the process because the light volatile methylmercury compound is secondarily generated from mercury used as catalyst in the process. Some overseas reports have shown the possibility

Table 2. Acetaldehyde production and the situation of operation of the installations in the Minamata plant

Year	Acetaldehyde production (t)	Stage							N.B.								
		1st	2nd	3rd	4th	5th	late 5th	6th		7th							
1932	209.763	Started in May 1932	Started in April 1933	Started in October 1934	Started in September 1935	Started in September 1937	August 1945	February 1946	Destruction of the plant by bombings Initiation of restoration in February								
1933	1297.410																
1934	2583.180																
1935	3628.330																
1936	5133.750																
1937	6252.120																
1938	7386.130																
1939	9063.108																
1940	9159.187																
1941	8700.148																
1942	8480.195	Stopped	Stopped in September 1935	Succeeded in April 1949	Started in August 1953	Started in May 1956	Started in August 1953	February 1946	A co-catalyst MnO ₂ was replaced with FeO. Industrialization of octanol (for the first time in Japan)								
1943	7469.934																
1944	7295.541																
1945	2263.815																
1946	2252.830																
1947	2362.703																
1948	3326.256																
1949	4391.208																
1950	4484.016																
1951	6248.467																
1952	6147.777	Discovery of Minamata disease in May	Stopped in May 1967	Started in August 1953	Started in May 1956	Started in August 1953	Started in August 1953	February 1946	In February, a device for reaction mixture oxidation was completed. In September, the drainage channel for factory wastes was changed from the Hyakken Seaport to the mouth of the Minamata River.								
1953	6592.261																
1954	9059.140																
1955	10632.776																
1956	15919.042																
1957	18085.091																
1958	19191.351																
1959	31921.222									In August, the essential drain circulation system. The plant was improved, so that metal mercury could be used as catalyst.	Stopped in May 1967	Started in August 1953	Started in May 1956	Started in August 1953	Started in August 1953	February 1946	In August, the essential drain circulation system. The plant was improved, so that metal mercury could be used as catalyst.
1960	45244.790																
1961	42287.970																
1962	26500																
1963	38500																
1964	41029																
1965	26581																
1966	17960																
1967	16115																
1968	11961	In June, complete circulation system of waste water	Stopped in May 1967	Started in August 1953	Started in May 1956	Started in August 1953	Started in August 1953	February 1946	In June, complete circulation system of waste water								
1967	11961																
1968	783	In May the operation was ceased.	Stopped in May 1967	Started in August 1953	Started in May 1956	Started in August 1953	Started in August 1953	February 1946	In May the operation was ceased.								

Cited from "Minamatabyo -20-nen no Kenkyu to Konnichi no Kadai-(Minamata disease--Experience over the two decades and the present tasks confronting the disease)" edited by Sumio Arima

of organic mercury being secondarily generated simultaneously with acetaldehyde formation and the occurrence of new poisoning, which was different from inorganic mercury poisoning. However, the data from the reports have never been put to practical use in the process of inspection of the cause of Minamata disease. Transient by-production of organic mercury as an intermediate has been known by the engineers in Japan as well, but the organic mercury was not suspected to be a lower alkyl mercury with high toxicity. It has also been considered to have soon disappeared. Therefore, the by-production has not been reported to any physician or any person in charge of industrial health by any chemist. Chisso has made efforts to collect information on technical revolution, but they have not collected information on industrial health.

[Comments] The article by Zangger was presented as the evidence by the accuser of the legal action in Kyoto regarding Minamata disease in May 1987. Although the copy of this article has been obtained by the University of Tokyo School of Medicine in 1938, and a few universities have also obtained the copies of the article, nobody has mentioned this paper during the investigation of Minamata disease until 1987. The house documents of Chisso as of May 10, 1947 referred to the contents of "Chemistry of Acetylene" (1921) by Newland et al., describing as follows: "It is obvious that a white precipitate of organic mercury compound is obtained as an intermediate, but its chemical composition may not have been determined. According to the literature, trimercury-aldehyde is believed to be induced by the reaction ("Production of acetaldehyde" ed. by Shigeo Shinomiya)".

The factory wastes from the Minamata plant have included mainly inorganic materials such as calcium carbonate in the days when fertilizers have been mainly produced. When the synthesis of acetaldehyde and acetic acid has been initiated, large quantities of various chemical substances have come to be included in the factory wastes. These chemical substances have included not only the methylmercury compound, which was the cause of Minamata disease, but also a variety of harmful materials such as heavy metals. The risk of the factory wastes was markedly increased. However, the Minamata plant had no realization that there might be a risk of pollution of the environment outside the plant with the waste water. There were no facilities for waste water management, which aimed at preventing environmental pollution, in the plant.

Around the Minamata plant, there have been disputes between the inhabitants and the plant about floating dust and poisonous gas discharge from early on. In 1944, the farm products from the lower part of the plant died because of the Marushima Drainage channel, and the farm products from the hill at the back of the plant died because of particles of soot from the plant. In fact, the inhabitants of the Marushima district petitioned the municipal assembly for countermeasures against the damage from fallen soot in 1955.

2. Early signs before the official discovery of Minamata disease

(1) History of disputes about the fishing industry

The history of the Chisso Minamata plant is that of sea contamination by dumping of factory wastes and of the damage of fishery with the sea contamination. The history of the plant was that of conflicts between Chisso and the damaged fishing people.

The conflicts between fishing people and the Minamata plant about marine pollution have already started since the Taisho Era; the Minamata Fisheries Cooperative Association (MFCA) has proposed indemnification of damages to fishery with dregs stored in the waste water from the plant and by reclamation of the foreshore to Chisso for several years. In 1926, MFCA discontinued to require the compensation because of straitened circumstances, and instead received ¥1,500 from Chisso as a money present of the company's sympathy, provided that the Association would not make a claim permanently on the company.

In 1932 when Chisso started producing acetaldehyde, the severity of pollution with the waste water was increased. The MFCA often negotiated with the plant about indemnities. The MFCA, which was in the red figures, resigned a part of its fishery right to approve reclamation of the foreshore and received ¥150,000 as indemnities in the negotiations on indemnification of fishery damages in 1943. In 1951 as well, the MFCA obtained a loan of ¥500,000 from Chisso in exchange for reclamation of the foreshore.

In 1951-1952, the pollution of the area in the vicinity of the Hyakken Seaport, where there was the outfall for waste water from Chisso, became increasingly severe. Although it was unknown whether the phenomenon would be attributed to a toxic substance or strong-acid factory wastes, dead fishes had putrid smells, and the fishery was so decreased that the MFCA repeated to request of the Fisheries Section of Kumamoto Prefecture to conduct research on the actual condition. The Fisheries Section requested of the plant to report the waste water, and furthermore, Reiji Miyoshi, the Chief Clerk of the Section, went to the actual place in August 1952. He requested of the plant to explain the properties and the management of the waste water from the plant, but the plant was not cooperative, explaining that “the waste water is not so harmful”.

In the report (of mission) on the spot investigation by the Chief Clerk Miyoshi, it was concluded that the fishery has come to decrease because of the general waste water discharged from the Chisso Minamata plant to the Hyakken Seaport and the dregs accumulating in the Seaport, indicating that “the waste water needs to be analyzed and the compositions need to be clarified, as the occasion demands”. The report by Miyoshi was attached by a report by Chisso as well, “The situation of waste water management in the plant”, in which “mercury” was overtly described as the raw material in the process of acetic acid management. Thereafter, however, the waste water has not been investigated at the level of the Prefecture, and this report was kept from the public eye without its being put to practical use for the subsequent inspection of the cause or countermeasures against the waste water discharge.

(2) Abnormal phenomena in organisms and the occurrence of Minamata disease

Since around 1953, strange phenomena have become apparent in fishing villages and village communities around Minamata Bay; cats ran around to die [people of the district came to call the phenomena “neko odori-byo (dancing cat disease) or cat epilepsy], and crows and birds living along the seashore suddenly fell down while flying. Fish catches have decreased annually thereafter, and the damages have become widespread outside Minamata Bay.

In 1954, almost all of the 100 or more cats died mad in a fishing village (Modo) around Minamata Bay (the phenomena have been observed since about June, 1954), and correspondingly, the cats gotten from other districts died. Thereafter, rats rapidly increased, by which fishing nets were eaten away. Since the frequency of the damage increased, fishing people asked the Health Section of the City Government to get rid of rats. This matter appeared in an issue of Kumamoto Nichinichi Shimbun (The Kumamoto Daily News) on August 1, saying that “All cats were totally destroyed by feline epilepsy, and people are ready to cry for help against the remarkable increase in the number of rats”.

Retrospectively, the report was the first one showing unusual changes of organisms due to the methylmercury compound, but as the measures taken to counter the phenomena by the City Government, rat eliminators alone were delivered, but the City Government did not inspect the reason why the cats died mad.

The unusual situation eventually spread the inhabitants. At the end of 1953, there have been some patients with peculiar neuropsychic symptoms. In 1954, patients with diseases of the central nervous system, which were diagnosed with difficulty, have come to visit the Chisso Minamata Plant Hospital and practitioners of the district.

In 1955, two young people complained of numbness of the extremities and were examined at clinics of the district on an outpatient basis, but any diagnosis was not made on that occasion. They were admitted to the Kumamoto University Hospital for examination, and diagnosed as having had “polyneuritis of unknown

cause” on the examination.

水俣市 茂道部落

猫てんかんで全滅

ねずみの激増に悲鳴

三十一日水俣市茂道漁業石本賢重さん(37)は市衛生課を訪れ、ねずみが急増して漁村を荒し回り、手がつけられないと感嘆方を申し込んだ。

同部落は百二十戸の漁村だが、不思議なことに六月初めごろから急に猫が狂い死し始め(部落ではねづみかんと呼ぶ)と、遂に百餘匹いた猫がほとんど全滅してしまふ。反対にねずみが急増、大騒動で部落中を荒し回り、被害はますます増大する一方、あわてた人々は各方面から猫を買いつけたが、これまた気が狂ったようにギリギリ舞した。

なお同地区は水田はなく農薬の關係なども見られず、不思議がらるる気味もあるやうな衛生課でもねずみ被害ののり田(すいとう)はない。

“Cats were totally destroyed in Modo Village, and people are ready to cry for help against the remarkable increase in the number of rats.” (A morning paper of August 1, 1954, *Kumamoto Nichinichi Shimbun* (The Kumamoto Daily News))

On July 31, Torashige Ishimoto (aged 37 years), one of the fishing people at Modo, Minamata City, visited the Health Section of the City Government and asked to get rid of rats, because the number of rats rapidly increased, which did damage to the village, and nothing could be done about the phenomenon.

The village is a fishing village with 120 houses. From early in June onward, cats suddenly began to die mad (the phenomenon is called “feline epilepsy” in the village), and almost all (about 100) cats were totally destroyed. In contrast, rats rapidly increased and did damage to the village. While the damage is being increased, the people got cats from various places, but even the cats spun themselves round and round to die as if they became mad. Ultimately, the people implored the City Government for the phenomena. Since there are no paddy fields in the district, the relation to agricultural chemicals is not considered. The people greatly wonder about the phenomena and get nervous unease. The Health Section decided to exterminate rats.

Table 3. Abnormal conditions of fishes and shellfishes, birds, cats, etc.

Year	Fishes	Shellfishes	Seaweeds	Birds	Cats, pigs, etc.
1949 1950	In “Mategata”, <i>Karuwa</i> , octopuses, and sea basses came to the surface, and they could be caught by hands.	No oysters adhered to any ship made fast to the bank near the outfall for the wasted water from the plant in the Hyakken Seaport.	Seaweeds in Minamata Bay began to appear whitish, and gradually rose to the surface.		
1951 1952	In Minamata Bay particularly, black porgies, croakers, porgies, sea basses, scorpion fish, and <i>kusabi</i> rose to the surface.	The number of empty shells of short-necked clams, oysters, fresh-water mussels, snails, etc. markedly increased in Minamata Bay.	The color of sea lettuces, agar-agar, green laver, and <i>wakame</i> seaweed in Minamata Bay began to run, and the amount of seaweeds that drift on the tide was decreased to about one third of the previous amount.	At Yudo, Dezuki, and Tsukinoura, crows fell down, and it became possible to catch <i>amedori</i> by hitting them with a pole.	
1953 1954	The range, in which fishes were observed to rise to the surface, spread from Minamata Bay toward the south, i.e., “Tsubodan”, “Akahana”, “Shin’ajiro”, “Hadakaze”, and “Yudo Bay”. Striped mullets, porgies, scabbard fishes, cuttlefishes, croakers, etc. rose to the surface. In “Yudo Bay”, small horse mackerels ran around in mad.	Extirpation of shellfishes spread from Minamata Bay toward the Tsukinoura Seashore. In 1953, edible cockles grew after a dozen or so years throughout the area lying beyond the place, but those grown within 1,000 m from the shore were extirpated.	The frequency at which seaweeds drift on the tide increased, and the damage to them becomes remarkable.	In Kojishima, Dezuki, Yudo, and Modo, the number of birds, which showed abnormal conditions (falling-down), increased. Crowded crows went in the wrong direction and went into the sea or smashed into rocks.	Cats: One cat died mad at Dezuki in 1953. In 1954, the phenomenon occurred in succession at “Mategata” Myojin, Tsukinoura, and Dezuki, Yudo, etc. Pigs: The same phenomenon as that in the cats was observed at Dezuki and Tsukinoura.
1955 1957	The range, in which fishes rose to the surface, spread on the lower Minamata River, Ohsakigahana, and Nishiyunoko. Porgies, sea basses, black sea bream, striped mullets, etc. came to the surface.	Nasty smells of the extirpated shellfishes assailed their noses along the beach.	The edible seaweeds all over Minamata Bay were extirpated.	The number of the birds that showed abnormal conditions further increased.	The incidence of the same phenomena as those in the cats further increased in the same district. Both house cats and ownerless cats died mad, and there were also many missing cats.

Cited from “*Minamatabyo ni Taisuru Kigyō no Sekinin* (Responsibility of Companies for Minamata Disease)” by the Study Group for Minamata Disease

3. Legislation regarding countermeasures against pollution

(1) Prewar legislation

The Ashio copper mine pollution is mentioned specially as a prewar affair in which environmental pollution became a big social problem and damaged inhabitants of the district. Since about 1885, waste water from the Ashio copper mine in Tochigi Prefecture has flown out into the Watarase River and damaged the agriculture and forestry. The damages of air pollution have also been added, leading to large-scale protest movements by the inhabitants.

The victims of mine pollution have struggled over the long period including the Taisho and Showa Eras. As a result, habitual practices of indemnification (of damages) were increasingly established mainly for pollution caused by the coal mining. In 1941, however, the Mines Act was amended for the purpose of increasing the coal production aiming at prosecution of the war, and the system of no-fault liability for compensation was introduced.

(2) Legislation in the beginning of the postwar period

The postwar administration of environmental pollution started with establishment of “Factory Pollution Control Ordinance” by Tokyo Metropolis in 1949. Since then, a plurality of local governments have regulated pollution control ordinance. In Japan, many complaints have been presented by the inhabitants before the Government took measures against environmental pollution. Under the necessity of legislation, local governments have established ordinance, i.e., legislation by the local governments. Thus, the initiative in the development of environmental administration was taken by local governments in Japan.

At the level of national administration, in 1951, the Commission of Resources Investigation in the Economic Stabilization Board had only few attempts to recommend the Government to establish the Water Pollution Prevention Act and the National Research Institute for the Water Quality from a viewpoint mainly of qualitative preservation of water resources. However, such an attempt was not put to practical use.

[Comments] In those days, the Ministry of Health and Welfare and the Ministry of Agriculture and Forestry appeared to have made efforts to prepare the main principle in the administrative inside on the advice of the Commission, but the movement did not develop into the preparation of a bill under the situation in those days. Then the Ministry of Agriculture and Forestry established “Fishery Resources Conservation Act”, which was regarded as having considered the need for countermeasures against water pollution. Ultimately, the Act functioned only for the purpose of preventing fisheries.

In 1954, “(Old) Cleaning Act” was established, and in 1955, the Ministry of Health and Welfare prepared the main principle of the standard bill of living environmental pollution prevention, and presented it to negotiate with the various fields interested. However, the main principle was opposed by industrial circles and public opinion, as well as the various ministries interested, because it was regarded as being still premature to use. Therefore, the Ministry of Health and Welfare added some corrections to the main principle and presented the resultant main principle in 1957. However, since MITI also presented a bill from an independent standpoint, adjustment was performed between the aforementioned main principle and the bill presented by MITI. No consensus has yet been reached on in the Government, and eventually this bill was not presented to the National Diet.

At the time of outbreak of Minamata disease, the concept of “environmental pollution” or the recognition of “pollution-triggered diseases” (the diseases that are derived from environmental pollution or that may be influenced by environmental pollution), which had been taken up by the press as a problem with environmental pollution in Yokkaichi, has not yet come to stay in general. Any company may also have intended not to invest money in or commit the personnel to countermeasures against environmental pollution,

which have been considered unrelated to production efficiency.

(3) Legislation of environmental pollution and “harmony with industries”

In 1958 after the outbreak of Minamata disease in Kumamoto Prefecture, approximately 700 fishing people of the Urayasu Fishermen’s Cooperative Association broke into the Edogawa plant of Honshu Paper Co., Ltd. located in the suburbs of Tokyo concerning fishery damages from the factory wastes. Because of the confused fight between the Fishermen’s Cooperative Association and the plant, Tokyo Metropolitan Government ordered the plant to stop operating tentatively.

Taking the opportunity of this event, (Old) Two Acts of Water Quality were established; i.e., “(Old) The law concerning preservation of the quality of the waters for public use” and “(Old) The law concerning regulations for factory wastes, etc.”. They were epoch-making in the sense that they aimed for the first time at regulating water discharge from plants and factories into the waters for public use. In the former law, “the theory of harmony with industries” was distinctly described as the objective; i.e., “With the aim of promoting preservation of the quality of the waters for public use and of conducting to solve the troubles concerning water pollution, the fundamental items necessary for the aim are established to contribute to industrial mutual harmony and improvement of public health”.

In these laws, the areas or the waters, where a problem with water pollution occurred or may occur, were assigned as “designated waters”, and water quality standards and the maximum permissible limit of draining to the waters were regulated for the purpose of regulating plants, etc. In general, it took about 2.5 to 3.0 years after the occurrence of trouble for examinations of water quality to be conducted in assigning the waters. In the case in which the cause of pollution or the maximum permissible limit of draining could not be distinctly determined, like pollution of Minamata Bay, it took further time for the examination to be conducted. The number of the waters, which could be examined, was limited by restrictions of staff, etc., and these laws could not cope with the situation under which water pollution was rapidly spreading and progressing nationwide. The persons interested in industries and fisheries and representatives of ministries and offices interested participated in the inquiry commissions for the maximum permissible limit, but the direct victims did not attend to them. Since the maximum permissible limit could not be decided without agreement by the ministries that have interests, information, and authority, even the most generous standards were decided after the long time of inquiries.

[Comments] The limit was overcome after the “designated waters” system was abandoned and environmental standards and regulation standards came to be applied to nationwide waters for public use according to “the Water Pollution Prevention Act” replaced by (Old) Two Acts of Water Quality at the 64th Diet, so-called the Environmental Pollution Diet, in 1970. On that occasion, the relationship between law and ordinance was arranged in the law, and it was written to the effect that local public bodies can carry out more strict regulation than that established by the nation according to ordinances.

The Industrial Pollution Room was established in MITI in 1963, and the Environmental Pollution Room was established in the Ministry of Health and Welfare in 1964. There have been no places of duty, which have dealt with environmental pollution, in any central ministry or office.

In 1964, a plan of the development of the Mishima-Numadzu industrial kombinat decided upon by the Cabinet was ceased by movements against the plan. Taking this opportunity, the Industrial Pollution Countermeasures Committee was established in the Lower House and the Upper House of the Diet in 1965. The committee was the first one which suggested countermeasures against environmental pollution as the theme of politics.

In 1967, “The (Old) Environmental Pollution Countermeasures Basic Act” was established. It was a legal framework aiming at comprehensively promoting countermeasures against environmental pollution at the level of the nation. All of the laws, which have been established in the past, were based on the principles

of harmony with economy, but in the Basic Law established in 1967, the following principle was clearly described for the first time: “health comes before everything”. With regard to “Preservation of people’s living environment”, it was described that “harmony of people’s living environment with the healthy development of economy should be promoted”. After the manner of this, (old) Two Acts of Water Quality was amended. It was also suggested for the first time by the Environmental Pollution Countermeasures Basic Act that the Government copes in the mass with the countermeasures against environmental pollution.

Furthermore, at “the Pollution Diet” in 1970, the provision about harmony of preservation of people’s living environment with the healthy development of economy was deleted from the laws concerning environmental pollution, which included the Environmental Pollution Countermeasures Basic Act, for the purpose of clearing away suspicion that economy may take priority over other factors in the attitude to countermeasures against environmental pollution.

<Column> “What is” *kogai* (environmental pollution)?”

A word, “environmental pollution”, appeared for the first time as a legal term for the administration in the River Act. On this occasion, the word meant “injurious public welfare”. In this sense, Shozo Tanaka also called the damage from the Ashio copper mine “environmental pollution”.

After World War II, the word, “environmental pollution”, came to be used for air pollution and noise as well. According to the concept of environmental pollution, environmental pollution indicates the damage to health and property of a number of people and deeds to interfere with the common rights of the public.

At present, an environmental organic law defines “environmental pollution” as follows: “Damages involving human health or living environment (including the property closely related to human life, animals and plants closely related to human life, and the environment of the development and growth) are induced by air pollution, water pollution, soil pollution, noise, vibrations, land subsidence, and bad smells, all of which occur accompanying business activities and others’ activities, among the troubles about environmental preservation.”

Chapter 2.

The Process of Investigation of the Cause of Minamata Disease and of Decision of the Pollution Source

(Part 1)--Circumstances during the period from May 1956 when Minamata disease was officially discovered to July 1959 when the Study Group of Kumamoto University School of Medicine, (Kumamoto University Research Group) presented the organic mercury hypothesis--

1. Construction of the quick investigation system for the cause immediately after the official discovery of Minamata disease

(1) The day of official discovery of Minamata disease

In late April 1956, a 5-year-old girl with peculiar nervous symptoms, who lived at Tsukinoura, was brought to Chisso Hospital, which was a medical institution with the most arranged facilities in Minamata City in those days. Then, her sister aged 2 years was also admitted to the hospital with the clinical features similar to those in the elder sister. According to their mother, there were some patients with similar disease in her neighborhood.

Kaneki Noda, a pediatrician-in-charge, suspected the patients to have had infectious diseases, and consulted with Hajime Hosokawa, the Director of the Hospital. In fact, Director Hosokawa has also examined 2 patients with clinical manifestation similar to those in these sisters in the previous year, but they died in 2-3 months after examination without decision of the cause. In the situation, Noda knew that Hikoji Misumi of the Department of Internal Medicine of the Hospital also examined adult inpatients with symptoms similar to those in the pediatric patients.

Hosokawa, the Director of the Hospital, paid specific attention to the situation, and visited Minamata Public Health Center with Noda on May 1. They reported that a disease of unknown cause, which showed cerebral symptoms, occurred in Tsukinoura District and 4 patients have been admitted to the hospital. The day will be described later, "the day of official discovery of Minamata disease".

(2) Construction of the quick countermeasure system composed of physicians, universities or colleges, and local government

Hasuo Ito, the Director of Minamata Public Health Center, who knew the situation, went to the actual locale immediately. He was surprised at the pitiable conditions of the patients, and presented a report entitled "A strange disease of child occurring in the vicinity of aza-Tsukinoura, Minamata City" to the Director of Department of Health, Kumamoto Prefectural Government on May 4. The report included other phenomena as follows: In addition to the two sisters, there were several more patients with similar symptoms; cats of the patients' houses and those in the neighborhood had spasms or ran around to die. Ito asked the Prefectural Institute of Health to examine well water in the vicinity of these houses. These movements were reported for the first time in the issue as of May 8 of The Nishinippon, which reported the disease as "a strange infectious disease in Minamata, induced the dead and mad persons".

The measure to counter "the strange disease (kibyō)" of unknown cause was initiated on a full scale from the establishment of Minamata Strange Disease Countermeasures Commission of Minamata City consisting primarily of the Public Health Center on May 28. Other organizations involved with the Commission were the Medical Association, the Municipal Hospital, Chisso Hospital, and Public Health Section of Minamata City. Research on the actual condition of the occurrence of the patients and review of charts for the dead and the patients, which had been kept at the practitioners, were performed mainly by Ito, the Head of the Public Health Center, and Hosokawa, the Director of the Hospital. As a result, 30 patients, who had been diagnosed as having had alcoholism, cerebral syphilis, stroke, and Japanese encephalitis, etc., were

confirmed to have been diagnosed from the symptoms similar to those in the sisters described above. It was ascertained that the occurrence of the disease could be retrospectively assessed until December 1953 by the research and review. It was also revealed that the patients have been observed mainly in the district of fishing villages and many patients have been observed in one same family. These facts were compiled by Hosokawa, and reported to the Prefectural Government on August 29, 1956.

As of the end of 1956, 54 patients were confirmed to be present, and 17 of them were already dead.

Major clinical features, the time of the onset, and the outline of the regional spread were clarified by the early epidemiological survey performed actively by Minamata Strange Disease Countermeasures Commission, which was established by consolidation of the institutions interested in the district. The achievements were supportive and valuable for the subsequent studies by the Kumamoto University Research Group. The clinical epidemiological survey in this period is evaluated highly, because it shows the attitude of practitioners in the district, who reviewed the charts of their patients and corrected their diagnoses, and devoted survey on visiting patients by physicians including Hosokawa, the Director of Chisso Hospital.

(3) In about 6 months, the Kumamoto University Research Group narrowed down the cause of the disease to consumption of the fishes and shellfishes, which were contaminated by chemical substances.

A. Establishment of the Kumamoto University Research Group

On August 13, 1956, at the request of Minamata Municipal Hospital, Prof. Shibanosuke Katsuki and Asst. Prof. Haruhiko Tokuomi of the First Department of Internal Medicine, Kumamoto University School of Medicine, visited Minamata, and examined the patients for the first time. Minamata Strange Disease Countermeasures Commission of Minamata City also asked the Kumamoto University School of Medicine, to investigate the cause on August 14. On August 24, Prof. Shibanosuke Katsuki, Prof. Tadao Takeuchi (2nd Dept. of Pathology), Prof. Sukenori Nagano (Dept. Pediatrics), Prof. Tokichi Rokutanda (Dept. Microbiology), and so on conducted a field survey in Minamata, and held a joint conference with the Commission to discuss future studies. On the same day, the Study Group of Kumamoto University School of Medicine for the Strange Disease in Minamata (hereinafter referred to as "the Kumamoto University Research Group") was established, including each department (Internal Medicine, Pediatrics, Pathology, Microbiology, Public Health, etc.) of Kumamoto University School of Medicine. Soon thereafter, Dept. of Hygiene also participated in the Research Group. The members of the Research Group visited Minamata immediately, and proceeded to narrow down the cause in cooperation with the Minamata Strange Disease Countermeasures Commission.

B. The 1st meeting of the Kumamoto University Research Group

The Kumamoto University Research Group held the 1st research meeting on November 3, 1956. There were no clinical findings of inflammation, and the results of the bacteriological and virological tests were also negative. At this time, possibility of the disease would be an infectious disease has almost disappeared. From the patients' symptoms, Prof. Shoji Kitamura (Dept. of Public Health) doubted whether the disease was poisoning with heavy metals (particularly manganese). With regard to the route of invasion to humans, Prof. Katsurou Irukayama (Dept. Hygiene) consider that fishes and shellfishes might be involved with the outbreak of the disease from the situation in which many of the patients were fishing people. He paid special attention to waste water from the Chisso Minamata plant as the cause of the pollution.

Since the presentation at the 1st meeting suggested the ingestion of large quantities of fishes and shellfishes as the cause of the disease, the consumption of fishes and shellfishes by the inhabitants decreased. There have been no reports on any new patient until August 1958.

Prof. Kitamura has considered the following factors as the possible causes of seawater contamination in the vicinity of the districts in which the patients were observed: Waste fluid from a slaughter house in the Tsukinoura District, spring water in the sea in the Yudo District, disposal of explosive compounds accompanying the termination of the war at the ex-navy ammunition storage house in the Modo District, and so on. However, there was no fact of abandonment of ammunition in the sea, and none of these factors was related to the cause of the disease of unknown etiology.

The Kumamoto University Research Group obtained the data on the measurements of the waste water at the Hyakken Seaport drainage channel in Minamata Bay in October 1956 by the Technology Division of the Chisso Minamata plant. The data included the values of analyses of copper, lead, arsenic, manganese, etc., but mercury was not included. Prof. Irukayama also analyzed the factory wastes at the Hyakken drainage channel by the sewerage test in October and December, 1956, but manganese, lead, etc. were only detected as harmful metals.

C. Report by the Public Welfare Science Research Group Sponsored by the Ministry of Health and Welfare

The 1st research meeting was held by the Public Welfare Science Research Group Sponsored by the Ministry of Health and Welfare (Public Welfare Science Research Group), in the Institute of Public Health on January 25-26, 1957. The Group consisted of the Institute of Public Health, the Kumamoto University Research Group, the Director of Minamata Public Health Center, and so on. At the meeting, the hypothesis for the fishes and shellfishes being regarded as carriers of the disease was evaluated as most plausible.

On March 30, 1957, the Public Welfare Science Research Group presented a report entitled, "A strange disease (kibyō) occurring in the Minamata District, Kumamoto Prefecture", to the Ministry of Health and Welfare. It describes the following: "The strange disease is most suspected of poisoning by ingestion of the fishes and shellfishes caught in the seaports of Minamata Bay, as revealed from the results of epidemiological surveys. The toxic substances that may have contaminated the fishes and shellfishes still remain unknown, but they are estimated to be a certain type of chemical substances or metals." As the research policy in the future, epidemiological, pathological, and toxicological inspection is most important. According to the report, "the etiology of the disease should be clarified by adequate research on the actual condition of the Chisso Minamata plant and by specification of components in the factory wastes and abandoned mine and the situation of pollution of harbors with the components".

D. Endeavors to analyze chemical substances in drainage from the Chisso plant

At the meeting of the Japanese Society for Hygiene in July 1957, the Director of the Epidemiology Division of the Institute of Public Health, Shinichi Matsuda, in the Public Welfare Science Research Group, Prof. Kitamura and his co-workers reported that the strange disease in Minamata is caused by the ingestion of large quantities of fishes and shellfishes taken in Minamata Bay, and that chemical substances in the factory wastes are suspected of being causative materials.

Waste water has been released without treatment into Minamata Bay from the Chisso Minamata plant over a long term of years, and sludge has accumulated considerably in the vicinity of the outfall.

The investigators of Kumamoto University could not collect any sample from the plant because they could not obtain the cooperation from the Chisso plant. Therefore, they conducted energetic inspection of the sludge as well as the seawaters and fishes and shellfishes. In the beginning, 64 types of heavy metal compounds were enumerated in the list.

Prof. Kitamura described the following in the article entitled, "Minamata disease--A study of organic mercury poisoning--" (published in March 1966): "Mercury came to be excluded from the subjects of screening, partly because that expensive mercury should not have been drained in large quantities into the factory wastes." In addition, mercury was so volatilized by heating in the way the samples are analyzed

(by wet calcification) that it has not been detected at all. Thus, mercury was not enumerated in the subjects of the assessment.

Apart from this report, an article by Prof. Kansuke Sera (Dept. Forensic Medicine) et al. was published in Kumamoto Igakukai Zasshi (Journal of the Kumamoto Medical Society) (vol. 31, Supplement No. 2). The results of the qualitative determination of mercury are described in the table of results of the determination of various samples. In the results, mercury was not detected, and no comments were given to this result.

In actuality, at least 10 kinds of harmful substances were detected in the sludge and fishes/shellfishes. To estimate a causative agent for the disease, the departments participating in the Kumamoto University Research Group vied with each other in having repeated animal experiments. The steady research for investigation of the causative agent was continued for about 2 years thereafter.

Although It has spent much time for searching the causative agent among the chemicals other than mercury, it was correct that the Kumamoto University Research Group narrowed down the Chisso Minamata plant as the source of pollution on the basis of the concept that Minamata disease is a poisoning with heavy metal.

On the other hand, however, it has not been sufficiently understood what kind of substances were used, generated, and abandoned in the Chisso Minamata plant, because no investigator in the industrial field was not added to the Research Group at the time of the establishment. Under these circumstances, mercury was not included in the subjects of the analysis in the beginning. Even after special attention was paid to mercury thereafter, much attention was paid to the process mainly of vinyl chloride producing process rather than acetaldehyde as the causative source. Thus, there was no conception that the causative agent was narrowed down from the aspect of the production process. In the Kumamoto University Research Group as well, no importance was placed on sharing information or partial charge of research. Each department carried forward research by its own way.

(4) Initial countermeasures by the Government

Department of Health of Kumamoto Prefecture has already reported the outbreak of Minamata disease to the Epidemic Prevention Section of the Public Health Bureau, Ministry of Health and Welfare on August 3, 1956.

The Ministry of Health and Welfare established the Public Welfare Science Research Group for Minamata disease in November, and sent Shinichi Matsuda, the Director of the Epidemiology Division of the Institute of Public Health, and others to the actual locate, and performed an epidemiological survey in Minamata City and Akasaki, Tsunagi-machi adjacent to the city on the north side of the city, which served as the control. The results were reported at the research meeting in January 1957. In the Fukuro District of Minamata, there were overtly many children, who had mild intellectual disturbance with difficulty of moving. As shown by this phenomenon as well, the results were consistent with the following opinion of the Kumamoto University Research Group: everything other than factory drainage was hardly regarded as the cause of Minamata disease.

In the Prefectural Government, the department in charge of the relevant problem was placed under the authority of the Public Health Section from the Prevention Section that deals with infectious diseases, and the Countermeasures Commission was established in the Health Department in January 1957. In February of the year, a petition, which complained of straitened circumstances of the fishing people, was presented to the Governor from the MFCA. At the meeting of the Welfare Committee of the Prefectural Assembly as well, an opinion was presented to the Prefectural Government to ask for early consideration of the measures taken for the relief of the people in the district by establishing the countermeasures commission.

Therefore, the Prefectural Government established Liaison Committee of Countermeasures against the Minamata Strange Disease. The committee consisted mainly of the Health Department, and included Public Welfare, Engineering Works, and Economics Sections, and at the 1st meeting on March 4, 1957, the

policy including the following items was decided: (1) Promotion of the investigation of the cause at the prefectural expense; (2) treatment of inpatients; (3) guidance for self-control of consumption of the fishes and shellfishes; (4) guidance for self-control of fishery and for change in fisheries; (5) investigation of the prefectural countermeasures against the Hamamatsu short-necked clams affair in Shizuoka Prefecture; and (6) the Minamata disease is dealt with by taking the position that the causal relationship between the disease and Chisso is unknown for the time being.

After the Ministry of Health and Welfare accepted the report of research from the Public Welfare Science Research Group on March 30, 1957, the administrative Vice Minister, Chujiro Kimura, of the Ministry of Health and Welfare invited directors of the relevant ministries to ask for their cooperation in investigating the cause of the disease.

[*Comments*] In the districts around Lake Hamana there were 334 patients with short-necked clam poisoning and 114 deaths associated with the poisoning in 1942. In 1949 there were 93 patients, and 7 died of the poisoning. Shizuoka Prefecture immediately prohibited the collection, selling, and transfer of shellfishes in the districts.

In 1950 as well, there were 12 patients with the poisoning. The cause remained unknown, but the Prefectural Government showed the articles of the Food Sanitation Act and prohibited selling shellfishes (oysters and short-necked clams) in the relevant districts around Lake Hamana.

(5) *Experiments on cats*

The Kumamoto University Research Group has collected the fishes and shellfishes caught in Minamata Bay, which were suspected of having caused the disease, since around November 1956. The Group intended to induce the disease to cats with the fishes and shellfishes, but the typical onset was not acquired.

[*Comments*] According to the report by Prof. Kitamura et al. [Kumamoto Igakukai Zasshi (Journal of the Kumamoto Medical Society), vol. 31, Supplement No. 2, 299, 1957], they have performed the experiment on 3 cats, to which the fishes and shellfishes sent directly from the actual locate are given, since November 19, 1956. One of the cats had paralysis of the hind limbs and died on December 23. The pathological findings extremely resembled the findings on the cats that had the disease in the actual locate. This experiment is considered the first experiment of the onset, but the onset could not be confirmed in the other 2 cats.

Furthermore, Haruhiko Tokuomi, Assit Prof. of Kumamoto University School of Medicine, said: “It was soon after the commencement of the research when inflammation was clinically ruled out and poisoning became considered because of the onset after ingestion of fishes. To demonstrate the possibility, the disease must be induced to cats by giving the fishes caught in Minamata Bay. Every department started the experiment all at once.” (“Minamatabyo – 20-nen no Kenkyu to Konniti no Kadai [Minamata disease - Experience over the two decades and the present tasks confronting the disease]” edited by Sumio Arima, p. 275) “On November 17, 1956, the Health Section of the City Government sent the fishes and shellfishes to the 1st Dept. of Internal Medicine, Kumamoto University School of Medicine, and since then the fishes and shellfishes have been sent to each Dept. of Kumamoto University School of Medicine as specimens and samples.” [A chronological table, *ibid.*]

Ito, the Director of Minamata Public Health Center, who initiated experiment for the disease at the request of Prof. Takeuchi, succeeded in the experiment of the onset in cats for the first time. Ito, who has been a research student of the Second Dept. of Pathology, Kumamoto University School of Medicine in those days, maintained 7 cats in a room of Minamata Public Health Center by the request of Prof. Takeuchi. He has given the fishes and shellfishes caught in Minamata Bay to the cats since March 1957. As a result, the same symptoms as those in the cats with spontaneously developing Minamata disease appeared after a week

at earliest and after about 40 days at latest of the experiment. The Director Ito recorded the dyskinesia of the cats on 8 mm cinefilms, and performed pathologic autopsy and histological examination in cooperation with Kumamoto University School of Medicine. He reported to the Health Department of the Prefectural Government that the condition observed in the cats is the same as Minamata disease in human. The experiment has the deep significance, because it scientifically demonstrated that the fishes and shellfishes caught in Minamata Bay are responsible for the outbreak of Minamata disease.

On the other hand, Prof. Sera has also investigated the toxicity of the fishes and shellfishes, which have been given to the cats in this district, by sending healthy cats to fishermen's houses at Modo and Yudo in Minamata City and making them to maintain these cats. All 8 cats sent to them developed the disease after 33-65 days of the experiment. The experiment also demonstrated that the fishes and shellfishes are responsible for the development of Minamata disease.

At the Kumamoto Prefectural Assembly on February 8, 1957, some questions were presented about the cause investigation and the prefectural countermeasures against reliefs of patients and fishing people. In July of the year, the results of the experiments on cats by the Director Ito and Prof. Sera were also presented, showing the need for taking urgent measures to avoid consumption of the fishes and shellfishes in Minamata Bay.

2. A reply from the Ministry of Health and Welfare in September 1957 regarding the application of the Food Sanitation Act and movements in response to the report of research by the Public Welfare Science Research Group in June 1958

(1) A reply from the Ministry of Health and Welfare regarding the application of the Food Sanitation Act

Since Minamata disease has become increasingly suspected of being caused by consumption of the fishes and shellfishes in Minamata Bay, the Kumamoto Prefectural Government has discussed a ban of consumption of the fishes and shellfishes of Minamata.

The Prefectural Government referred to Shizuoka Prefecture for reference about the Shizuoka Prefectural Government's countermeasures against the Hamamatsu short-necked clams affair, which were included in the policy established by Liaison Committee of Countermeasures against the Minamata Strange Disease in March 1957. The causative agent for the short-necked clams affair was yet to be confirmed, as in Minamata disease. In spite of the similarity to these affairs, there was no information used for the decision of the types of dangerous fishes and of the range of restriction of fisheries in the case of Minamata disease in Kumamoto Prefecture. Therefore, it was concluded in Kumamoto Prefecture that the case in Kumamoto Prefecture could not follow the case in Shizuoka Prefecture.

In July 1957, the members of the Public Welfare Science Research Group, i.e., Ito (the Director of Minamata Public Health Center), Hosokawa (the Director of Chisso Hospital), Shigeo Arita (Director of the Health Dept. of the Prefectural Government), Noriaki Morizumi (the Chief of the Public Health Section of the Prefectural Government), etc., reported the following as the results of epidemiological and clinical studies: "The present disease was regarded as a sort of poisoning due to consumption of the fishes and shellfishes caught in Minamata Bay, judging from the epidemiological and clinical evidence, (an ellipsis).....since the department (the 2nd Dept. of Pathology, Kumamoto University School of Medicine) succeeded in the experiment as well, in which the disease was experimentally induced to cats by giving the fishes and shellfishes caught in Minamata Bay to them, the disease was revealed to have been caused by the fishes and shellfishes in Minamata Bay".

The Health Dept. of the Prefectural Government evaluated the situation as that following the regulations described in Paragraph 2, Article 4 of the Food Sanitation Act, and decided a policy to officially announce under the name of the Prefectural Governor that the capture and consumption of the fishes and shellfishes

were prohibited. On August 16, 1957, the Medical Dept. referred to the Ministry of Health and Welfare regarding the propriety of applying the Food Sanitation Act to the situation.

On September 11, 1957, however, the Governor received the following reply from the Director of the Public Health Bureau of the Ministry of Health and Welfare: "Since consumption of the fishes and shellfishes caught in the specific areas of Minamata Bay may induce central nervous diseases of unknown cause, the people must be guided to avoid consumption of the fishes and shellfishes caught in Minamata Bay in the future as well. However, there has been no distinct evidence showing that all the fishes and shellfishes in the specific areas of Minamata Bay are toxified. Therefore, it appears to be impossible for Paragraph 2, Article 4 of the Food Sanitation Act to be applied to all the fishes and shellfishes caught in the relevant specific areas."

(2) Narrowing down of chemical substances by the Public Welfare Science Research Group Sponsored by the Ministry of Health and Welfare

In October 1957, the Public Welfare Science Research Group reported, at the meeting of the Japanese Society of Public Health, that "attention is paid to selenium, manganese, and thallium" as the causative agent narrowed down by the studies.

Thereafter, these three kinds of heavy metals of high concentrations were detected from the dregs in the Chisso plant and the mud at the drainage channel, and in February 1958, the Kumamoto University Research Group suggested the needs for elucidation of the intermediate routes of the three agents discharged from the Chisso plant and for the experimental reproduction of the symptoms by using these agents as future tasks. Although these three agents have neurotoxicity, it was impossible to experimentally make a reproduction of the symptoms specific to Minamata disease by the single use of them.

In the Diet session (Committee on Social and Labour Affairs, the Upper House) on June 24, 1958, Moriyoshi Morinaka, a Dietman, gave an inquiry, and Takehisa Omura, the Director of the Environmental Hygiene Dept. of the Ministry of Health and Welfare, replied to the inquiry by citing a report by the Kumamoto University Research Group, as follows: "The causative agent is a sort of metal, i.e., any of thallium, selenium, and manganese, or a complex of some of them. These three heavy metals were used in the chemical plant located adjacent to Minamata Bay, and future tasks confronting investigation of the causative agent include the determination of roles of the fishes and shellfishes as media and the pathogenic influence".

On July 7, 1958, the Ministry of Health and Welfare notified the ministries and offices interested and municipalities of the research achievements of the Public Welfare Science Research Group and the countermeasures to Minamata disease on the basis of the report from the group. In response to this, Chisso brought forth a counterargument, explaining that there is no problem with manganese, selenium, or thallium, because their levels in waste water are under the standards for indications for harmfulness. These agents were replaced by organic mercury when the organic mercury hypothesis was suggested later, and thus, they were ruled out from the candidates for the causative agent for Minamata disease.

On August 7, 1958, the Ministry of Health and Welfare established the Liaison Council of Countermeasures against Minamata Strange Disease with the aim at realizing the intensive studies and countering the disease from the administrative aspect. It was comprised mainly of the Ministry of Health and Welfare and of the ministries and offices interested including MITI, the Ministry of Agriculture, Forestry, and Fisheries, the Ministry of Education, and the Ministry of Transport. On the other hand, the Ministry of Health and Welfare decided to establish a liaison council of general research on the strange disease in Minamata (which is comprised of branch offices of the ministries and offices interested, Kumamoto Prefecture, Kumamoto University, and Kyushu University) in Kumamoto Prefecture with the aim at generally investigating the disease. However, this plan was left off, and on January 16, 1959, a Special Task Group on Minamata Food Poisoning was established in the Food and Sanitation Investigation

Committee, the Ministry of Health and Welfare.

3. Movements in response to the change of the drainage channel in the process of acetaldehyde production in September 1958

(1) Change of the drainage channel in the process of acetaldehyde production by Chisso

The pollution in Minamata Bay persisted, and the occurrence of a patient with the disease was reported in August 1958, i.e., after an interval of about 1.5 years. The mass media of the district also reported the occurrence simultaneously. The Director of the Department of Economics of the Prefectural Government notified the guidance of absolute prohibition of operation in the sea areas of Minamata Bay for the unions interested to the Kumamoto Prefectural Alliance of Fishing Cooperatives and to the Fishermen's Cooperative Association interested. In response to this, MFCA decided to request indemnification of damages to fishing people from the prohibition of operation in the sea areas, which were estimated to be dangerous and quick elucidation of the cause of Minamata disease.

Chisso, which went on increased production of acetaldehyde, intended a dilution of the waste water with the Shiranui Sea by discharging the waste water from the mouth of the Minamata River as a measure to tentatively cease the pollution in the vicinity of Hyakken Seaport. Hajime Hosokawa, who had stayed at Chisso Hospital even after the retirement age continued experiments on cats, suggested Chisso to cease the operation because the appearance of a patient in the vicinity of the mouth of the Minamata River would demonstrate that the drainage from the plant is responsible for the disease.

[*Comments*] Hajime Hosokawa reached the age limit in September 1956, but served as the Director of the hospital until September 1957 when a new director came. Thereafter, he has assisted medical examination as a part-time employee and continued the experiments on cats.

However, in September 1958, Chisso changed the drainage in the process of acetaldehyde production to the Hyakken Seaport in Minamata Bay; i.e., the drainage was changed to the release of the supernatant stored tentatively in a reservoir, "Hachiman Pool", into the mouth of the Minamata River. The "Hachiman Pool" was originally produced by reclamation of the foreshore as the dump of carbide residues. It was not a facility for waste water management; the substances dissolved in water percolate downward the "Hachiman Pool" through the sea. The person who was the Chief of the plant in those days gave testimony in the court, which will be held later, that they had known the solid materials to be purified but the substances dissolved in the "pool" to be excreted unchanged.

(2) Broadening of the contaminated area and the new patient of Minamata disease, which were due to changes of the drainage channels for the waste water

In March 1959, the anxiety of Hajime Hosokawa became reality. The occurrence of Minamata disease was reported from the fishing people in the vicinity of the mouth of the Minamata River, and thereafter as well, new patients were successively reported among the people by the mouth of the river. The observation of the disease in many cats has become reported at Tsunagi-machi and Yunoura-machi on the north side and even in the Amakusa Islands on the opposite shore of the Shiranui Sea. The influence of the changes of the drainage channels, which can be regarded as an experiment on human bodies, led to the serious results, i.e., the new occurrence of the patient and broadening of the contaminated areas.

The changes of the drainage channels, an increase in the number of the patients, and the broadening of damages strongly suggested that drainage from the process of acetaldehyde production must be the cause of Minamata disease in Kumamoto Prefecture, regardless of the causative agent.

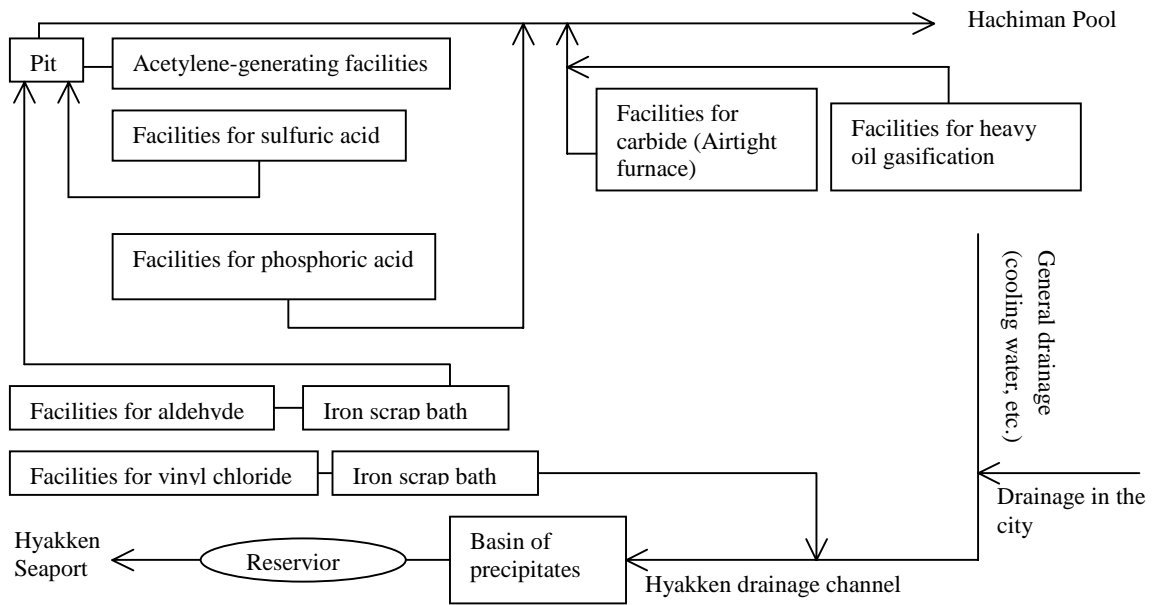


Figure a. Diagram of wasted water management (in Sep. 1958)

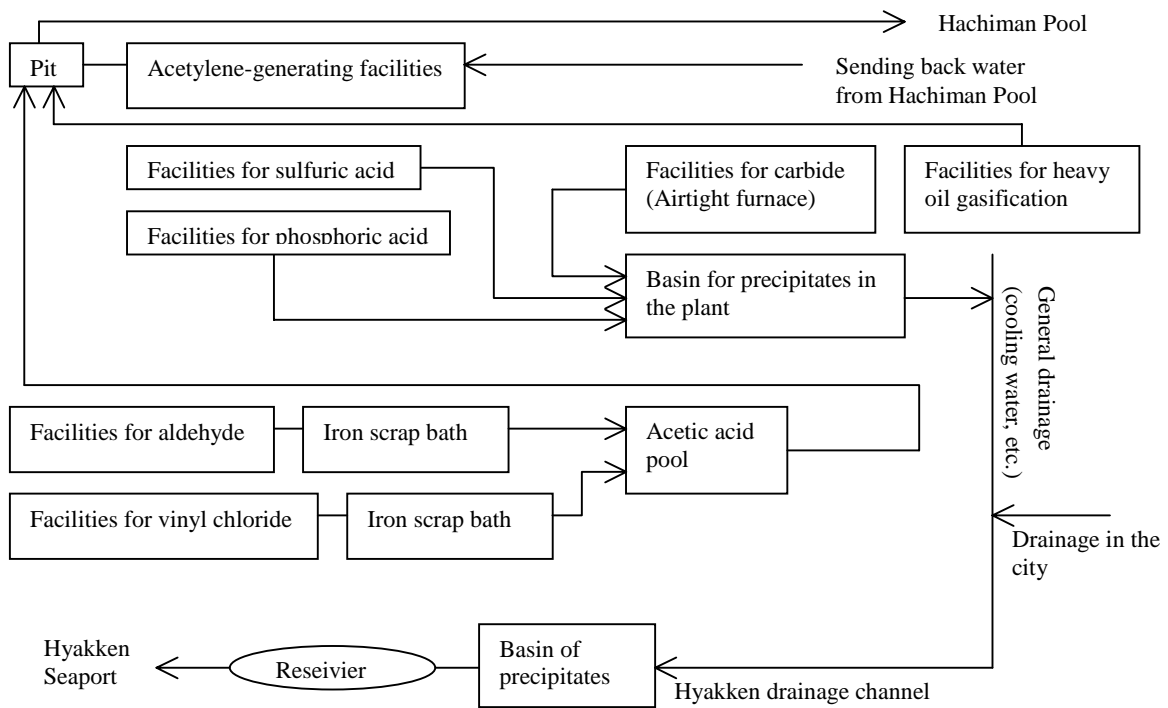


Figure b. Diagram of wasted water management (in October 1959)

Cited from "Minamatabyo Mondai no 15-nen sono jitsuzo wo otte (Minamata disease, over the 15-year period--In pursuit of the real facts--)" edited by Chisso

Figure 4. The drainage system of Chisso Minamata plant (in September 1958 and October 1959)

The changes of the drainage channels were not reported to any man on the outside of Chisso. In June 1959, however, an engineer of Kumamoto Fisheries Experiment Station, who went to check the information on the sweetfishes having floated in the mouth of the Minamata River, reported the following to his superior officer in a report of mission: "Waste water appears to have been currently drained into the Minamata River". Since the president and others of the Minamata Municipal Assembly, who petitioned the Ministry of Health and Welfare, explained to the effect that "Chisso appears to have recently drained waste water into the Minamata River" in June 1959, the staff members of the Government and the Prefectural Government also started to notice the changes of the drainage channels.

Nine of the 10 patients, who were newly reported by Asst. Prof. Tokuomi and his co-workers during the period from February to October, 1959, were revealed to be the inhabitants in the mouth of the Minamata River or in the area north of the mouth. From these findings, they indicated that the polluted area broadened to the north, suggesting that this phenomenon had a causal relationship to the changes of drainage channels of the plant (according to the investigation by the Kumamoto Prefectural Government). Prof. Kitamura and his co-workers also reported a list of changes of the drainage channels, which was obtained from Chisso, paying much attention to the correspondence between the places of the incidence and the changes of the channels of the process of acetaldehyde production [Kumamoto Igakkai Zasshi (Journal of the Kumamoto Medical Society) vol. 34, Suppl (3), March 1960]. However, the important epidemiological fact was not led to any concrete approach to the changes.

It is not clear when MITI knew the changes in the drainage channels of Chisso, but in October 1959 the Ministry verbally gave Chisso instructions to abolish the drainage channels, through which the waste water was directly discharged into the Shiranui Sea, to hasten construction of facilities for waste water management, and to complete the construction within the year or by January of next year. In November 1959, the Ministry notified by writing Chisso of the following: "You may be thinking of various countermeasures including abolition of a part of the drainage channels, but on this occasion you must prepare fully facilities for waste water management as early as possible, and make efforts to solve the anxiety of the people of the district by inspecting the cause as fast as possible in much cooperation with the organizations interested".

Chisso has ceased to release the discharge in the process of acetaldehyde production into the mouth of the Minamata River since November 1959, and the drainage channel was replaced to the Hyakken Seaport. Chisso adopted the method of reusing the supernatant fluid, which was drawn up from the Hachiman Pool and sent to the acetylene generator in the plant.

[*Comments*] In the trials in which the President of Chisso and the manager of the Minamata plant were called to account penal responsibilities for the outbreak of Kumamoto Minamata disease later, the appearance of the new patients due to the changes in the drainage channels provided the important material for judgment of "guilty".

[*Comments*] Even after Chisso started to draw up the supernatant fluid from the Hachiman Pool, the outflow of mercury from the pool continued, mainly because (1) that the sending back was inadequate, (2) that the structure of the pool led to the outflow of the waste water containing mercury from the bottom, and (3) that the overflow due to heavy rain could not be suppressed.

4. The situation of the patients

(1) Measures taken under suspicion of an infectious disease

Minamata Strange Disease Countermeasures Commission of Minamata City devised measures to make the Health Section of the Minamata City Government to spray disinfectants and insecticides in the districts of the outbreak of the disease, taking into consideration the possibility of an infectious disease, because a

number of patients were detected in specific districts during the limited period as a result of the research on the actual condition in 1956.

Many families of the patients have led their lives by making their own supplies; they practiced fishery and ate fresh fishes and shellfishes abundantly at each meal. Since the people's cash incomes were poor at all, however, their lives fell to the bottom when patients appeared in families. Under the situation, they could not pay the expenses for admission of the patients to hospitals. Therefore, even though some physicians, like Hosokawa, have long considered it difficult to regard the disease as an infectious one, the Minamata City Government admitted patients to municipal isolated wards for infectious diseases as an immediate measure in July 1956. In this case, hospital charges would be borne at public expense as "suspected cases of Japanese encephalitis". Approximately a month later, most of the patients were transported to the Kumamoto University Hospital, but on this occasion, there was no system, with which hospital charges were borne at public expense. For this reason, these patients were admitted to the hospital as those for teaching and education, and they were relieved from bearing the medical expense and hospital charges.

Some of the fishery patients family let the patients eat the fishes, expensive prawns, etc. They caught these fishes by themselves in order to have the sick family members take nutrition of good quality even in the small amount. On the contrary, this behavior got all the worse for the symptoms. None of them noticed that.

(2) Poverty of the patients' families that were not improved despite the denial of the possibility of infectious disease

In those days when the disease was officially discovered in May 1956, Minamata disease was reported as "a rare infectious disease", and the patients have been dealt with as patients with an infectious disease. In November of the year, a suspicion of excessive eating of the fishes and shellfishes contaminated with some heavy metals as the cause of Minamata disease was increased. Next year (in 1957), the department in charge of the disease was placed under the authority of the Public Health Section from the Prevention Section. Thus, from the aspect of administration as well, the suspicion of infectious disease was dispelled. Thereafter, researches by the Kumamoto University Research Group and the Public Welfare Science Research Group progressed, and none of the physicians or investigators have suspected infectious disease as the cause.

In spite of the circumstances, patients with the disease have still been treated discriminately through the misunderstanding about infectious disease in the districts of the outbreak of the disease. The concept of discrimination created from the misunderstanding in the beginning has been succeeded thereafter as well. As the name of Minamata disease has become known throughout Japan, the whole district of Minamata has been misunderstood to be the district contaminated with endemic diseases, thereby having received various adverse influences. The situation, in which the patients are treated discriminately for only the reason that they have Minamata disease, persisted.

In fishing villages, moreover, the families of patients were boycotted by the villagers, because the fishes caught in the village where patients appeared would not be sold, leading to lives of extreme poverty not only in the patients' families but also in all fishing people of the villages. Even the new patients could not announce themselves to the public as patients with the disease under the situation. There have been some examples of the situation: A fisherman patient, who was just admitted to hospital by the family, was taken back from the hospital to home by a leader of the fishermen's cooperative association; despite the fact that a patient with typical symptoms of Minamata disease was bedridden at home, the patient could not announce him-/herself to the public as a patient with the disease, because the patient was told by his/her child(ren), "I will disown you as a child, if you announced yourself to the public as a patient with the disease".

If the cause of Minamata disease had early been revealed to be poisoning with the fishes and shellfishes

contaminated with the factory wastes and if the system of compensation for patients and the MFCA by causative companies had been established, the patients would not have later been suppressed to speak in the local community or discriminated strictly by other people in the district.

In actuality, however, Chisso has not admitted in the beginning their responsibility for the outbreak of the disease. Furthermore, there was another situation; Chisso has had strong influence economically and politically in the local community, and the citizens have hesitated in speaking out about the cause of Minamata disease, out of regard to feelings of Chisso, since many citizens have participated in some “benefits” of Chisso.

<Column> *A story based on experience of Tsuginori Hamamoto*, a patient certified to have Minamata disease by the Government*

I was born and brought up in Minamata, and have already gone fishing in the sea when I began to take notice. After graduation from a school in 1951, I have led my very common natural life by going fishing in the sea with my parents.

The sea became dirty during the period from 1952 to 1953. Large fishes have also been floated up in dead. Since this period, I have frequently had falls and poor physical condition. Therefore, I started being examined on an outpatient basis at a hospital. Since I was suspected of having poisoning with acetylene used as a light in fishing on examination, I quit fishing, and changed the job.

In 1956, similar symptoms started being observed simultaneously in patients. The condition was dealt with as “a strange disease (kibyō)” at hospitals and as “an infectious disease” in the district. I have long kept it to myself, because it was not clear that my condition was Minamata disease. My parents had the disease successively. My father’s condition deteriorated rapidly after admission, and soon he died of fulminant Minamata disease.

In response to the presentation of the hypothesis of organic mercury poisoning, We requested Chisso to stop the discharge in 1959, but it was not realized. In those days, we patients have been placed in fixes for physical, mental, and economic points. Therefore, we were obliged to make an agreement with Chisso about a gift of money in token of their sympathy on December 30 of the year. With this opportunity, Minamata disease died from the memory of the public medically and socially, and in the district the disease remained recognized as being infectious. Because of this misunderstanding, it still remains difficult for the patients to marry. When the people who were born and brought up in Minamata are asked about the birth place, some of them hesitate to say, “I am from Minamata”. We would like to become an example of the person who can say his/her birth place without apology.

*Tsuginori Hamamoto was born in 1935. At present, he talks his own experiences as a family of professional reciters at exhibits of Minamata Disease Municipal Museum with the hope that Minamata disease will be understood by many people.

5. The name of the disease, Minamata disease

Since the cause of Minamata disease was unknown in those days when it was discovered, the disease was called “kibyō (strange disease)” among the people of the district. Therefore, the Minamata City Government also tentatively used the name, “the Minamata Strange Disease Countermeasures Commission”, and so on, and the Prefectural Government and the Government called the disease officially “central nervous disease of unknown cause developing in the Minamata District” or “so-called kibyō (strange disease)”. In the mass media, the term, “Minamata kibyō”, was generally used in the beginning of the outbreak.

In the Kumamoto University Research Group as well, Prof. Katsuki suggested to call the disease “Minamata disease” because it was too nonmedical to call the disease “kibyō (strange disease)” for any

length of time. These institutions including the governments reached an agreement on this point that “Minamata disease” would be most appropriate.

The term, “Minamata disease”, was used for the first time by Prof. Takeuchi in an article submitted to a scientific journal, which was entitled “A pathological study of Minamata disease (central nervous disease of unknown cause in the Minamata District) (2nd Report)” [Kumamoto Igakkai Zasshi (Journal of the Kumamoto Medical Society) vol. 31, Supplement No. 1, June, 1957]. In the article, the name, “Minamata disease” was used after giving notice that “the disease will be called Minamata disease tentatively by the time when a toxic factor is confirmed.

In newspapers, all newspaper publishing companies have come to call the disease “Minamata disease” since August 1958 when new incidence was reported after the silence of about 1.5 years.

In 1959 the organic mercury hypothesis was reported by the Kumamoto University Research Group, but the causative agent for Minamata disease was not officially confirmed until 1968 when the Government’s unified views were led. During the period, Minamata disease was widely reported not only in overseas literature on medical sciences but also abroad as the affair of environmental pollution. Thus, the name, “Minamata disease”, became widely used.

[Comments] The research on commission, which involved environmental pollution, etc., sponsored by the Ministry of Health and Welfare was conducted in March 1970 for the purpose of enforcing the (old) Law Concerning the Relief of Pollution-Related Health Damage. In the research article “A study of the range and so on of diseases under the influence of environmental pollution”, the name, Minamata disease, was concluded “to be valid for being adopted as the name of disease included in the Cabinet order”, on the basis of the fact that the name has already been widely used internationally. In the research, Minamata disease was defined as “a disease of the nervous system resulting from the oral intake of organic mercury accumulated in fishes and shellfishes”; the disease is not merely induced by the aerial, oral, or percutaneous intake of organic mercury, but “includes a factor for environmental pollution in the process of the accumulation in fishes and shellfishes and the ingestion of them”.

As for the entity of Minamata disease, which became known on a nationwide scale, the people still erroneously understood; the disease was regarded as endemic, infectious, or hereditary. The citizens of Minamata considered that the name, “Minamata disease”, hurted the city image to lead not only to damages to the products and tourist development in Minamata but also to discrimination in marriage and employment opportunities. In 1973, the Municipal Office as well as the Chamber of Commerce and Industry and the Tourist Association carried on a drive to change the name of the disease.

<Column> *What is Minamata disease?*

“Minamata disease” is methylmercury poisoning that developed as a result of the oral ingestion of the fishes and shellfishes contaminated with methylmercury compound, which was discharged into environments through industrial activities and accumulated in fishes and shellfishes via the mechanism of biological concentration.

Since the source of the generation of the causative agent and the route of invasion into human body are very specific, research groups on commission, which included environmental pollution investigation, etc., sponsored by the Ministry of Health and Welfare have used this term in a special sense, unlike merely methylmercury poisoning, on the basis of the concept that “the disease includes a factor for environmental pollution in the process of the accumulation in fishes and shellfishes and ingestion of them”. The cases due to direct exposure to causative agents, such as vocational diseases in agricultural chemical plants using the methylmercury compound, and the case in Republic of Iraq, in which a number of people ate seed wheat plants disinfected with organic mercurial agricultural chemicals and died, are included in the category of methylmercury poisoning but not called “Minamata disease”. In gold refining, on the other hand, metal

mercury is mixed with gold dust to produce amalgam, and the mercury is evaporated by heating. This method poisoning due to exposure of workers to mercurial vapor becomes a big issue. This matter is quite different from Minamata disease. However, inorganic mercury is discharged into rivers and contaminated the soil and rivers by scattering the air. After methylation in the environment, the compounds are accumulated in fishes and shellfishes and then increase the mercury level in human hairs. Such facts are being confirmed in various countries all over the world. In the Amazonian area particularly, the hair mercury level (approximately 90% of the level is methylmercury) exceeded 50 ppm, and some people complained of nervous symptoms. If such nervous symptoms were confirmed to have been induced by methylmercury poisoning, these people may manifest symptoms medically similar to those of Minamata disease, though the condition of the area is different from that for the outbreak of Minamata disease, in which the methylmercury compound was directly discharged into the environment.

<Column> *Factors related the hypothesis of methylmercury*

With regard to methylmercury poisoning that observed in 4 workers of a seed disinfection plant in England, D. Hunter, R. Bomford, and D. Russell made a detailed clinical report in 1940 (Quart. J. Med., vol. 9). One of them (Case No. 4) died 15 years after the onset, and examined by autopsy. The Kumamoto University Research Group noticed that the symptoms of Minamata disease closely resemble those of organic mercury poisoning, owing to description of details of the pathological findings in an article by Hunter and Russell (J. Neurol. Neurosurg. Psychiat., vol. 17, 1954).

Prof. Takeuchi obtained "A Compendium of Pathological Anatomy" [vol. 13 (2), edited by F. Henke and O. Lubarsch] published in 1958, and found that the pathological findings on the brain of a patient with methylmercury poisoning, which were observed by Hunter et al. and described by A. Pentschew in the item of mercury poisoning, were extremely similar to those in Minamata disease patients. Prof. Takeuchi was convinced that Minamata disease is methylmercury poisoning, asked the Dept. of Public Health to analyze mercury in the fishes and shellfishes caught in Minamata Bay.

Asst. Prof. Tokuomi noticed that alkyl mercury was given, as a toxic substance inducing concentric constriction of visual field and ataxia, at the beginning of a book by Von Oettingen, "Poisoning" (published in 1954), which Tokuomi obtained in April 1957. He obtained two pieces of literature by Hunter et al., which were cited in the book, and assessed them. In those days there were many severe cases and the symptoms were so serious that these conditions were not necessarily consistent with the description by Hunter et al. The possibility of expensive mercury being abandoned in large quantities was also considered low. Therefore, these phenomena did not reach the hypothesis of alkyl mercury. Thereafter, however, Tokuomi encountered at least 34 patients, and found that the main symptoms and signs are consistent with those reported by Hunter et al. Thus, he confirmed that Minamata disease is organic mercury poisoning.

The relationship between Minamata disease and organic mercury was first described in an academic journal by McAlpine, a neurologist in England, and Shukuro Araki (Dept. of Internal Medicine, Kyushu University School of Medicine). McAlpine has come to Prof. Kuheita Miyagawa of Kumamoto University School of Medicine (Dept. Neuropsychiatry) in order to investigate multiple sclerosis. In February 1958, McAlpine visited Minamata with Araki to examine Minamata disease patients, and introduced Minamata disease in Lancet (published in September, 1958). On this occasion, introducing a thallium hypothesis, which was advocated by Prof. Miyagawa as a study in Japan in those days, he suggested for the first time the possibility of organic mercury being a causative agent for the disease from the clinical features.

In September 1958, Kurland, the Director of the Epidemiology Division of National Institutes of Health (NIH) in the U.S., and his co-workers visited Minamata in order to investigate the cause of Minamata disease, and examined patients. They brought back the fishes/shellfishes Bay, the mud, and the seawater of Minamata for analysis. He detected a large amount of mercury in the samples which he brought back from Minamata. As a result, he strongly supported the hypothesis postrated by the Kumamoto University

Research Group in 1959. The support from such an overseas authoritative investigator has encouraged the Kumamoto University Research Group, which has been exposed to various counterarguments in those days. Furthermore, NIH came to support thereafter the research by Kumamoto University School of Medicine from the aspect of research funds as well.

Chapter 3.

The Process of Investigation of the Cause of Minamata Disease and of Decision of the Pollution Source (Part 2)

--Circumstances during the period from July 1959 when the organic mercury hypothesis reported by the Kumamoto University Research Group to May 1965 when Minamata disease in Niigata Prefecture was officially reported via the agreement with the present of money in token of the company's sympathy --

1. Presentation of the organic mercury hypothesis by the Kumamoto University Research Group and responses of Chisso to the presentation

(1) Presentation of the organic mercury hypothesis by the Kumamoto University Research Group

There were some factors involved with the attention paid to organic mercury by the Kumamoto University Research Group. Prof. Takeuchi and Asst. Prof. Tokuomi paid special attention to the consistency of their results with clinical symptoms and pathological findings of organic mercury poisoning, which were reported by Hunter and Russell, and started conducting the research narrowing down organic mercury from the fall of 1958 onward. In Japan as well, there have been some findings of agricultural chemicals concerning lower alkyl mercury poisoning in those days, but the poisoning has not been assessed in relation to Minamata disease.

A variety of heavy metals have ever been postulated as a candidate for the causative agent, but mercury was not detected because it had been volatilized by heating during pretreatment. After organic mercury was suspected as a causative agent, mercury levels were began to determine. Dithizone colorimetry, which allows the determination of concentrations with a detection limit of as low as 0.1 ppm, has been established to some extent as the method of quantifying the total mercury level in those days.. However, it took much time for the acquirement of pretreatment skills for specimens; it required ca. 3 months for Prof. Shoji Kitamura and his co-workers to become proficient in the method of analyzing the total mercury. There has been no technique for analysis which allows the precise quantification of organic mercury in those days. The efforts to reproduce symptoms and pathological findings of Minamata disease have been continued with animal experiments by administration of alkyl mercury.

The organic mercury hypothesis was not approved soon within the Kumamoto University Research Group, because the hypothesis of selenium, thallium, and manganese was advocated as members of the Public Welfare Science Research Group in July 1958.

At the meeting of the Kumamoto University Research Group on July 14, 1959, Prof. Takeuchi and Asst. Prof. Tokuomi reported the organic mercury hypothesis from the pathological and clinical standpoints. Prof. Kitamura also reported that mercury was discharged from Chisso, showing the data on the following tendency: the contamination level with mercury in the sediment of Minamata Bay decreased as the site of the determination became more distant from the outfall, with the peak, 2,000 ppm (wet weight), at the mud of the Hyakken outfall.

From the standpoint of the Kumamoto University Research Group, it was concluded that "Minamata disease is a disease of the nervous system induced by ingestion of the fishes and shellfishes caught in the district, and special attention has become paid to mercury as the toxic substance contaminated fishes and shellfishes". In July 22 of the year, the following item confirmed by the Research Group was officially presented: "it has become common to think that the causative agent for Minamata disease is the mercurial compound, particularly organic mercury". However, at this time, further study is needed as to what kind of mercurial compound is the causative agent. It has also been concluded that there was no direct relationship between the causative agent and mercuric chloride, which was used in the process of vinyl chloride production in Chisso. In the Research Group, Prof. Kuheita Miyagawa has still insisted the thallium

hypothesis.

(2) Fishing people's demands for compensations

When the organic mercury hypothesis was announced officially on July 22, 1959, the patients and fishing people, who had suspected the factory wastes as the cause of the disease from the beginning of the outbreak, confirmed that Chisso was the source of the causative agent of Minamata disease because there were no places other than Chisso, which discharged mercury. The fishing people urged first Chisso to pay indemnifications.

In August 6 of the year, fish dealers held a demonstration with the MFCA to the Chisso Minamata plant, and demanded payment of one hundred million yen for compensation to fishery, complete removal of sludge, and establishment of drainage disposal facilities. At the negotiation on August 12, the fishing people, who got angry at the unsatisfactorily progressing negotiations, broke into the place of the negotiation. On August 17 as well, the fishing people broke into the place of the negotiation, and at last the police were called out. Eventually, the dispute was brought to an end under the payment of ¥35,000,000 for compensation to fishery on the 29th day of the month through the intermediary of the Mayor and the Prefectural Assembly.

On August 19 of the year, the following proposal by the Shin Nippon Chisso Labor Union(SNCLU) was carried at the general meeting of representatives, since the company's workers (laborers) and fishing people are based on the fundamental attitude to the problem with fishing people as the same workers: the workers support struggles of fishing people as a rule.

However, from September 1959 onward immediately after the decision, there were patients of the disease among the fishing people at the mouth of the Minamata River and at Tsunagi on the northern side. The disease in cats were also confirmed in Izumi City and Shishi-jima Island on the southern side. Since these events suggested the wide-ranging contamination of the Shiranui Sea, the demand of the fishing people on the seashore of the Shiranui Sea for cessation of waste water drainage has been accelerated. On October 17 of the year, the Kumamoto Prefectural Alliance of Fishing Cooperatives held an indignation meeting, and demanded the Government the establishment of the Water Pollution Prevention Act, the specification of the Shiranui Sea as a designated sea area, and the investigation of the cause of Minamata disease. the Kumamoto Prefectural Alliance of Fishing Cooperatives demanded cessation of the operation before the completion of drainage disposal facilities, as well as compensation for fishery and payment of money in token of the plant's sympathy. However, since Chisso rejected all negotiations for these demands, 1,500 fishing people thronged to the plant, and stocks were thrown at the place. The police were called out.

At the end of October of the year, when movements of fishing people showed a tense situation at the same time with the field survey by the investigation team sponsored by the Diet (the Diet Investigation Team), the Governor of Kumamoto Prefecture, Kosaku Teramoto, visited Minamata for the first time after 1956 when Minamata disease was officially discovered.

On November 2, 1959, the Diet Investigation Team conducted the field survey of Minamata for the first time. The team, whose leader was Tetsuzo Matsuda, was composed of 8 Dietmen (Lower House Committee on Agriculture, Forestry and Fisheries, Committee on Social and Labour Affairs, and Committee on Commerce and Industry). At the same time, ca. 2,000 fishing people gathered at Minamata and appealed to the Diet Investigation Team. Thereafter, the fishing people held an indignation meeting and proposed a collective bargaining to the plant. Since the proposal was rejected, they broke into the plant, and the trouble developed into the affair in which at least 100 persons were injured.

In response to the affairs by the fishing people, SNCLU held an urgent representative conference on November 4. On the 6th of November, SNCLU demanded the Prefectural Government absolute opposition to cessation of the operation of the plant, early investigation of the cause of the disease, and countermeasures against patients and fishery. The union demanded the company the early completion of drainage disposal

facilities, cooperation for the investigation of the cause, and modest correspondence to the Kumamoto Prefectural Alliance of Fishing Cooperatives. Furthermore, the union carried the following resolution with one consent: the Kumamoto Prefectural Alliance of Fishing Cooperatives was requested to reflect the acts of violence.

(3) A petition of opposition to the cessation of drainage was presented to the Prefectural Governor by the Minamata City Government and various groups of the district

In response to the affairs by the fishing people on November 2, 1959, the Minamata City Assembly carried a resolution of the early investigation of the cause of Minamata disease, negation of acts of violence, measures to relieve patients and fishing people, and the early completion of drainage disposal facilities by Chisso. In the resolution, the Assembly requested to avoid cessation of the operation of Chisso, because very serious results will be induced if the operation was ceased.

On the 7th of the month, representatives of the Mayor, the City Assembly, the Chamber of Commerce and Industry, Agricultural Cooperative Association, and the Labor Union appealed to the Governor with the resolution.

The Family Association of Suikosha, which was founded as consumers' cooperative of the Minamata plant of Shin Nippon Chisso Fertilizer Co. Ltd. proposed a written petition to the Governor and the Chairman of the Kumamoto Prefectural Alliance of Fishing Cooperatives as of November 9, 1959. The content was as follows: Solution by acts of violence would be absolutely neglected; countermeasures against factory wastes should be established by the plant as early as possible; generous consideration by the prefectural authorities is strongly needed for discharge of factory wastes not to be ceased.

Intention of Chisso, which has much influence on Minamata City from the aspects of finance and man-power, appears to have been reflected in these movements, but the consciousness of a community bound together by common fate with Chisso, which has long percolated among the citizens of Minamata, may have facilitated these movements.

(4) Approach of the Government

On October 21, 1959, MITI guided Chisso to return the drainage for the waste water drained from the process of acetaldehyde production, i.e., the mouth of the Minamata River via the Hachiman Pool, back to the Hyakken Seaport and to complete the establishment of drainage disposal facilities within the year or by January of next year.

In response to the petition to the Diet from the Kumamoto Prefectural Assembly and the PFF, the problem with Minamata disease was dealt with at the meeting of the Committee on Agriculture, Forestry and Fisheries of the Lower House on October 22, 1959. The Committee decided there to conduct the field survey as early as possible.

The Diet Investigation Team visited Kumamoto on November 1, 1959 to hear the opinions of the Prefectural Assembly and the Kumamoto University Research Group. On the following day, the 2nd, they visited Minamata for the field survey; they heard demands from Minamata Disease Patient's Families Mutual Aid Society and the Kumamoto Prefectural Alliance of Fishing Cooperatives, and made on-site inspections of Minamata Bay and the Chisso plant.

MITI guided Chisso to complete facilities for waste water management as early as possible and to investigate the cause of the disease in cooperation with the organizations interested on November 10, 1959. Furthermore, MITI indicated to plants of acetaldehyde and vinyl chloride production all over the country to investigate waste water (particularly, the mercury content in the waste water). However, "secrecy was presented as to this investigation in view of the present situation in which the problem with Minamata disease was developing into a political issue".

On “the liaison conference of ministries concerning food poisoning in Minamata” on the following day, the 11th, Takeo Akiyama, the Chief of Light Industries Bureau, MITI, attended, and launched a counterattack to the organic mercury hypothesis by delivering copies of a report made by Prof. Raisaku Kiyoura, (Applied Chemistry) Tokyo Institute of Technology, to the effect that “There is no marked difference in the mercury level between Minamata Bay and the seawater of bays along the cities of other districts or factory areas, and evidence of the organic mercury hypothesis is not valid”.

On the following day, the 12th, circumstances, under which the organic mercury hypothesis was developed, were explained and the opposite opinion of Chisso to the hypothesis was introduced as the report on the investigation by the Diet Investigation Team at the meeting of the Committee on Agriculture, Forestry and Fisheries and the Committee on Social and Labour Affairs. The Diet Investigation Team suggested the ministries and offices interested to conduct survey and studies for investigation of the cause, to establish the sea areas investigated, to dredge and reclaim Minamata Bay, to increase study expenses for sectional meetings for food poisoning in Minamata, and to complete countermeasures against medical care and welfare for patients.

In January 1959, a Special Task Group on Minamata Food Poisoning was established in the Food and Sanitation Investigation Committee, the Ministry of Health and Welfare. The committee was composed mainly of the Kumamoto University Research Group, Institute of Public Health, and National Institute of Health Sciences. Kenshi Wanibuchi, the President of Kumamoto University, was the representative on the committee. A joint committee of these groups, which was held under the name of the Food and Sanitation Investigation Committee on November 12, submitted a report showing that “the major cause of Minamata disease was a sort of organic mercury compound”, but the source of generation was not described. The window, at which the investigation of the cause of Minamata disease was dealt with, was changed to the Economic Planning Agency, because the investigation by the Ministry of Health and Welfare alone would be difficult in the future. It was decided for many-sided studies to be conducted by the ministries and offices interested, and the special sectional committee of food poisoning in Minamata was suddenly dissolved. The disorganization was not informed in advance even to Kenshi Wanibuchi, the representative on the committee.

In November 1959, the Fisheries Agency demanded the Chisso Minamata plant to cease drainage of factory wastes and to approve on-the-spot-inspections for the purpose of collecting samples from the factory wastes, but Chisso rejected the demand on inquiry to MITI.

<Column> *Ex-president of Kumamoto University, Kenshi Wanibuchi, who was enraged by the approach of government officials*

Kenshi Wanibuchi, who was the representative on the special sectional committee of food poisoning in Minamata of the Food and Sanitation Investigation Committee, Ministry of Health and Welfare, Ex-president of Kumamoto University, attended on the liaison conference of ministries concerning Minamata disease at Matsumotoro on November 11, 1959. Asst. Prof. Haruhiko Tokuomi, who accompanied him on that occasion, has written the state of the conference in his diary. The following is cited from “Minamatabyo Nikki (the day book of Minamata disease)” by Tokuomi.

“November 11, 1959. Fine, Slightly cold. Attended on the liaison conference of ministries concerning Minamata disease at Matsumotoro in Hibiya from 1:30 PM. MITI did explaining of the plant’s conduct in vindication from beginning to end, and all ministries recriminated against each other. The Minamata City Government also vindicated the plant’s conduct. Everyone moved for his/her own benefit. Wanibuchi withdrew from the place in indignation. Matsumotorou is an elegant building in the Meiji era style before it was burnt, and was located in the grove of Hibiya Park. Since the conference was held as the liaison conference of ministries under the auspices of Management and Coordination Agency, clerks in charge of the ministries related to Minamata disease, i.e., Ministry of Health and Welfare, Ministry of Home Affairs, and

MITI appeared to have attended on the conference. I comprehensively explained the achievements of past studies, showing that organic mercury poisoning due to factory wastes was considered as the cause of the disease. Then, a person in charge of chemical industries, who is the Director of Light Metal Industries Bureau of MITI, rattled on, saying that “There are many chemical factories of this kind in and outside Japan. If Chisso was the prime mover, similar diseases should have occurred to date. You say organic mercury poisoning, but inorganic mercury is used as a catalyst in the process of industry. The process in which inorganic mercury becomes organic is not clear. Therefore, your explanation is unconvincing.” Wanibuchi, who listened to the opinion tongue-tied, suddenly stood up, and said, “Research groups have long demonstrated this real situation after years of hard application. You have not intended to help them. What are you doing to deny sweepingly the explanation?” He was infuriated and threw away an ashtray in front of him. He left the room indignantly. I was very frightened, and gathering up his baggage and my documents, I left the room to follow him immediately. I gave thought again to Wanibuchi, a gentle and calm person, who showed his nerve as a person of the *Meiji* era.”

<Column> *Attitude of MITI toward protection of Chisso*

Part of the attitude of MITI in those days has been described in the words of an assistant manager, who proceeded to the Economic Planning Agency from MITI. [Cited from Chapter 6: The truth kept from the public eye, “the water discharge did not stop” in vol. 3 “Declarations by the engineers of the Chisso Minamata plant”: “What occurred in Japan 50 years after the war?” (NHK Data Collection Group) Nippon Hoso Kyokai Publishers, 1995].

In those days, Takuzo Kumita proceeded to the Water Maintenance Section of the Economic Planning Agency as an assistant manager from MITI, and prepared a draft of countermeasures. The Water Maintenance Section has just been established. There were only few careers of the Economic Planning Agency; it consisted mainly of employees of MITI, Ministry of Health and Welfare, Ministry of Construction, and Ministry of Agriculture, Forestry and Fisheries, who were sent on loan. There was a great deal of argument about the countermeasures every night.

Kumita has also regarded factory wastes as the cause of Minamata disease, saying as follows. “There were really a number of patients. Frankly speaking, the causal relationship was already overt. I thought so, personally. Really, the factory wastes generated mercury. The mechanism underlying the change from inorganic mercury to organic mercury may not yet have been traced academically, but it cannot be said that there was no causal relationship.”

The employees of the Ministry of Agriculture and Forestry including Fishery Agency, who were sent on loan, have insisted to arrest the water drainage, but Kumita was called almost every week by the T-I Minister’s Secretariat and was eagerly indicated as follows.

“‘Hold out!’ he says. ‘Resist the anti-Chisso!’ When I said that the drainage had better be ceased, I was severely persuaded, saying, ‘What are you saying? If the operation of Chisso was ceased now, or if the industry of such a scale was arrested, high growth of Japan may be impossible. You should manage to avoid the cessation of the Chisso plant’s operation.’”

Eventually, the Economic Planning Agency and MITI took no measure to regulate water quality or cease the water drainage concerning mercury, and the waste water from the Chisso plant continued to be flown out. Water quality regulation was conducted on the seashore of Minamata in 1969 after the acetaldehyde plant was scrapped by the Chisso plant.

(5) *Mediation for compensations by the Kumamoto Prefectural Governor*

At urging of such a tense situation, the Governor Teramoto established a committee on Mediation for Fishery Disputes in the Shiranui Sea on November 24, 1959, and started mediating the disputes. On the

following day, the 25th, Minamata Disease Patient's Families Mutual Aid Society also demanded Chisso to pay ¥230,000,000 as compensation to 78 victims, on the basis of the following conclusion: "It is the social fact that the outbreak of Minamata disease was responsible for the waste water from your plant". Chisso took a firm attitude toward the demand, explaining, "We cannot pay any money as compensation to any patient because it has not been confirmed whether Minamata disease was caused by the factory wastes". Therefore, the Benefit Society started staging a sit-down demonstration in front of the main gate of the Minamata plant on November 28. The Society presented a petition to the Kumamoto Prefectural Governor, which demanded mediation the Committee on Mediation for Fishery Disputes in the Shiranui Sea. On December 12, the Committee including the Prefectural Governor and the Minamata Mayor launched out for mediation.

Chisso insisted the Governor the following as the conditions of the mediation: The payment is not intended for compensation but a present of money in token of their sympathy because the cause of the disease has not been determined; the payment of the present of money will be discontinued when it is confirmed that Chisso is not responsible for the cause of the disease; even if it is revealed that Chisso is responsible for the outbreak of the disease, Chisso will not pay any additional money. The Governor believed that the outbreak of the disease will stop if the facilities for waste water management were completed. He thought that on this occasion, it would be wiser to obtain the amount of payment as compensation according to workmen's accident compensation insurance, and so on. Thus, the Governor agreed to Chisso under these conditions.

The patients considerably resisted to the amount of payment based on the draft of mediation; they thought that the amount was too small. However, Chisso did not agree to the demand from patients, insisting that the cause of the disease remained unknown.

Chisso conducted the ceremony for the completion of the facilities for condensation and deposition management of waste water on December 24. On the following day, the 25th, Chisso inked an agreement with the Kumamoto Prefectural Alliance of Fishing Cooperatives on the mediation draft including the payment of ¥35,000,000 as compensation and financing of ¥65,000,000. On December 30, Minamata Disease Patient's Families Mutual Aid Society, which has taken into consideration the poverty of daily living of the patients' families, also signed a contract with Chisso on the present of money in token of their sympathy, which included payment of an annuity of ¥100,000 to each adult patient and payment of ¥30,000 to each minor-aged patient.

On this occasion, the subjects of the payment of the present of money in token of the company's sympathy were certified at "the Screening Council for Minamata Disease Patients". On December 25, i.e., immediately before the contract with the Benefit Society was signed, the Ministry of Health and Welfare temporarily held the Conference.

In Article 5 of the contract, the following item was included: "Even when the outbreak of the Minamata disease was determined later to have been derived from the factory wastes, new payment as compensation will not be required".

(6) Counterarguments of Chisso and Japan Chemical Industry Association against the organic mercury hypothesis offered by the Kumamoto University Research Group

A. Counterarguments of Chisso and Japan Chemical Industry Association against the organic mercury hypothesis

When the organic mercury hypothesis was presented by the Kumamoto University Research Group in July 1959, Chisso prepared "An opinion of the plant about the so-called organic mercury hypothesis" without delay, and presented it to the Special Committee of Countermeasures Against Minamata Disease in the Kumamoto Prefectural Assembly on August 5, 1959.

In this opinion, Chisso offered a counterargument as follows: Acetaldehyde and acetic acid have been

produced with mercury used as a catalytic agent since 1932, and vinyl chloride has been produced with mercury used as a catalytic agent since 1949. Therefore, the mercury has been partly discharged and accumulated in Minamata Bay. However, it is inorganic mercury. In addition, there have been no reports discussing the possibility of organic mercury being generated in the mid-course of the production process. Agricultural chemicals of organic mercury are rather problematic. The organic mercury hypothesis is problematic from the aspect of common sense of chemistry, and is merely inference.”

Moreover, on September 28, 1959, Chisso reported “The points (Summary) to which Chisso could not consent about the organic mercury hypothesis” in order to offer a counterargument against the hypothesis by listing the following reasons: The mechanism underlying the change from inorganic mercury to organic mercury remains unsolved regarding the hypothesis; there are the same kinds of plants using mercury over the world, but why does the disease occur only in Minamata? The military stores of all kinds (explosive compounds) abandoned and committed at the termination of the war are strongly suspected of being the reason for the sudden outbreak from 1954 on; there is much variation in the level of mercury in the liver, and there is almost no difference in the range of concentration between the cats with manifestation of Minamata disease and those without the manifestation; the theory is unreliable, because the research group has shown that clinicopathological findings closely resembling those of Minamata disease were obtained even from manganese, selenium, and thallium.

On August 24, 1959, Prof. Kiyoura of Tokyo Institute of Technology visited Minamata and investigated the seawater of Minamata Bay. On the 29th of the month, he had an interview at a press conference in Minamata City, reporting, “the contamination of the seawater of Minamata Bay with mercury is not so serious, and the mercury hypothesis should be carefully announced”.

On September 9, the Director of the Japan Chemical Industry Association, Takeharu Oshima, visited Minamata, and reported that the explosive compounds of the ex-navy, which had been abandoned in the Bay at the termination of the war, were responsible for the disease on the 28th day of September when Chisso offered the counterargument. With regard to the explosive compounds, the Kumamoto University Research Group has already referred to the persons interested in those days and confirmed that such fact did not exist on February 1957. Chisso has also asked them the circumstances in early September, 1959. In spite of that, Chisso advertised extensively the explosive hypothesis. They actually conducted investigation of the sea bottom, but obtained no results supporting the theory.

Since the mass media extensively dealt with the counterarguments against the organic mercury hypothesis, which involved scholars who were believed to be central authorities, the representatives of the patients and families, who had negotiations for compensation on the basis of the organic mercury hypothesis established by Kumamoto University, lost self-confidence. They told, “Our anxiety that the cause might remain unclear let us have made an agreement with Chisso about the payment a present of money in token of the company’s sympathy.”

B. The experiment on No. 400 cat by Hosokawa and the response of Chisso to the data

Chisso has also started experiment on cats since May 1957; the Technology Division cooperated with Chisso Hospital under a guidance of Hosokawa, the Director of the hospital. Hosokawa, who knew the organic mercury hypothesis, started conducting the experiment on cats, in which waste water from the processes using mercury, i.e., the process of acetaldehyde production and the process of vinyl chloride, was directly sprayed on the foods given to the cats, in July 1959.

The experiment was a determinant, which would demonstrate that the factory wastes are the direct cause of Minamata disease if it occurred. Therefore, Hosokawa initiated the experiment on his own responsibility without consultation to other physicians or the Technology Division, and only “the waste water concerned” was described on the labels of the cat experiment.

On October 6, 1959, the onset was observed in the “No. 400” cat maintained with foods on which the

waste water from the process of acetaldehyde production was directly sprayed. Hosokawa reported this fact to the managing staff of the Technology Division of the plant, but official presentation was avoided by mutual consent.

On November 30, Hosokawa was reported by the plant to discontinue all new studies in the company because the company decided that they would cooperate with the research groups of Kumamoto University and so on in the future. The continuation of the cat experiment was also prohibited. However, there was no cooperation of the company with the studies by the Kumamoto University.

Chisso arranged the counterarguments, which had been offered against the organic mercury hypothesis, with the detailed internal data, and prepared "A view against the organic mercury hypothesis as the causative agent for Minamata disease". On November 2, the copies of the view were delivered to the Lower House Investigation Team and so on. In this view, the onset in the No. 400 cat was not described, and the following conclusion was drawn: "In the case in which the factory wastes were directly administered to animals (cats), the failure in inducing Minamata disease indicates the absence of toxic substances themselves in the waste water.....".

The methylmercury compound as the causative agent for Minamata disease will be clarified later to be secondarily generated in the process of acetaldehyde production and to flow out into sea areas with the waste water. In those days, however, the Kumamoto University Research Group was urged by Chisso to demonstrate the change from inorganic mercury to organic mercury in the natural world without recognition of the results of the cat experiment in the Chisso plant or the possibility of the methylmercury compound being secondarily generated. The Group was further urged to do more difficult experiments and studies.

(7) Movements of the establishment of "Cyclator (Circulation and sedimentation flow system) "

A. Establishment of "Cyclator"

After the Kumamoto University Research Group declared the organic mercury hypothesis in July 1959, Minamata disease became a social problem, and fishing people strongly required the establishment of complete sanitation facilities for the waste water. MITI also guided Chisso in the completion of facilities for waste water management as early as possible in October of the year. As a measure to counter these movements, Chisso ordered a system of management of condensation and deposition (Trade name, "Cyclator") from a manufacturer specialized in the management of waste water at a cost of ca. a hundred million yen.

B. Social influence of the establishment of "Cyclator"

Akiyama, the Chief of Light Industries Bureau, MITI, notified Chisso of the early establishment of facilities for waste water management and cooperation in the investigation of the cause of the disease on November 10 of the year. The "Cyclator", which was scheduled to be completed in March next year, was completed after only 3 months of construction work, i.e., on December 19, 1959.

A ceremony for the completion of the system was conducted on a large scale on December 24 of the year, i.e., immediately before the contract for a present of money in token of the company's sympathy was signed. Fukuoka, the Director of Trade and Industry Bureau, and the Kumamoto Prefectural Governor were invited to the ceremony. The President of Chisso, Kiichi Yoshioka, drank the so-called "post-management water" at the ceremony. Even with the performance, Chisso declared openly that the waste water management became completed by accomplishment of "Cyclator".

However, early in 1960, the new incidence of Minamata disease in Yudo was reported, and the efficacy of "Cyclator" was doubted in some newspapers. In response to this, Chisso brought to Prof. Katsuro Irukayama samples from pre-management waste water and those from the waste water managed by

“Cyclator” (Chisso distinguished the former and latter groups of samples in writing), and asked to determine mercury levels. Prof. Irukayama reported without confirmation of the samples that the sample groups showed mercury levels of 20 ppm and 0 ppm, respectively. Thereafter, he repeatedly described the effect of “Cyclator” to remove mercury in his subsequent articles, believing in the removal effect of “Cyclator”.

As revealed by testimonies in the legal action (at the first trial) in the Kansai district in 1985, the main function of “Cyclator” was to clear turbid waste water so that it would be nice to look at, and the function to remove mercury was not needed to “Cyclator”, according to Tetsuo Ide, a designer for the system of the manufacturer specialized in the management of waste water. To begin with, the way of design of the system requested by Chisso was as follows: the system will treat waste water in the four facilities for airtight furnaces of phosphoric acid, sulfuric acid, heavy oil gasification, and carbide, and will ensure turbidity of 50 degrees or lower, color of 50 degrees or lower, and pH 8-9. The system was not designed to treat waste water in the processes of acetaldehyde or vinyl chloride, which uses mercury. As a consequence, part of the mercury adsorbed to the suspension material could be removed, but the system was not designed to remove the methylmercury compound dissolved in water.

A designer for the system heard the performance of the President of Chisso at the ceremony, i.e., drinking of “the post-management water”, and thought that the performance would produce illusions in people’s minds as if the System produced drinking water. He was disgusted with the performance.

When the waste water, in which mercury was dissolved, was actually flown into the “Cyclator” during test working, Chisso knew the absence of the removal effect of the system, and the waste water in the process of acetaldehyde production was sent to the “Hachiman Pool”, not “Cyclator”.

However, the propagation by Chisso, which showed that waste water became safe by the completion of “Cyclator”, had much influence on investigators and the mass media, as well as the citizens; the propagation induced them to believe that the outbreak of Minamata disease terminated. The Prefectural Governor, Kosaku Teramoto, also spoke reflectively in memoranda as follows: “When Cyclator started operating, I thought that the disease would not develop any more.Some years later, I knew, for the first time, that Cyclator was useless for removal of organic mercury. I cannot help saying that the efficacy of the system is unknown.”

Kurland, who visited Minamata again for investigation of Minamata disease on February 16 and 17, 1960, declared openly that the results of the additional tests conducted by NIH supported the organic mercury hypothesis established by the Kumamoto University Research Group. He described the Chisso’s sanitation facilities as well, and indicated that toxic substances were not removed by “Cyclator”.

[Comments] The waste water in the processes of production of acetaldehyde and acetic acid was discharged to the Hyakken Seaport through an iron scrap tank. In December 1959, construction of “cyclator” and “Sedifloater” (system for management of minute particles such as soot) was completed, but assessment of the procedure, with which mercury was subjected to the circulation use within the building site, was initiated, because mercury could not completely be removed by “cyclator”. As a tentative measure, mud discharge has been collected in the Hachiman Pool for mud discharge via the acetic acid pool and the mud discharge pit of “cyclator” since January 1960. From August 1960 onward, drainage of acetaldehyde and vinyl chloride was separated from the draining system in the internal circulation system. However, the residue drainage and cleaning drainage were flown into the Hachiman Pool for mud discharge.

<Column> *Advisory opinions of Kurland about Minamata disease*

Kurland and his co-workers reported Minamata disease in *World Neurology* in November 1960 (vol.1 370) as followings:.

We believe that sufficient information is now available to present some constructive recommendations regarding the Minamata Bay and other areas in which similar conditions may prevail.

1. There is evidence that fish and shellfish from Minamata Bay are still toxic at the present time, and the ban on fishing in that area should continue to be enforced until, by appropriate animal experiments, the seafood is found to be safe.
2. The disturbing disclosure that several recent cases have occurred some distance from Minamata Bay among fishermen and their families (Fig.8), which presumably resulted from ingestion of free-swimming fish that migrated from the bay area, dictates the urgent need for a study to insure accurate diagnosis and laboratory confirmation of newly developing cases in the area.
3. A detailed study should be made of the ecology of the shellfish and free-swimming fish in Minamata Bay.
4. Tests should be undertaken to determine the precise chemical from in which the toxic agent exists in seafood, and the mechanism by which it is incorporated into this from.
5. A means of removing mercury-containing silt from the bottom of Minamata Bay, particularly near the effluent drainage canal where most of the mercury appears to be concentrated, seems indicated. This might require dredging the upper layers of silt in the vicinity of the old effluent channel and removing these to a safe inland storage area.
6. The possibility of employing distillation rather than washing to purify vinyl chloride should be explored. Since mercury may also be a serious contaminant of air, safeguards to insure that safe levels in the air are not exceeded after distillation will also be required. If it is economically feasible, local health authorities should encourage plants not already doing so to reclaim mercury from all spent catalyst. An alternative chemical process use of mercury in this manufacturing procedure.
7. Further case-finding studies, epidemiologic investigations, and chemical determinations for mercury and other possible toxic agents in fish and bottom specimens are necessary in the Galveston Bay area, as well as in the vicinity of other vinyl plants in Japan and other countries.
8. The experimental study of the use of chelating agents in the earliest stages of acute intoxication in animals may provide data which would be useful in early treatment if further human cases occur.

[Comments] With regard to "vinyl plants" described in Item 7, Kurland recognized it mistakenly; the terms should have been plants of acetic acid or acetaldehyde.

<Column> *Kurland's hypothesis suggesting that the cause of the disease is in the process of vinyl chloride*

In 1958, Leonard T. Kurland, the Director of the Epidemiology, Division of National Institutes of Health (NIH) in the U.S., heard outbreaks of a strange nervous disease in the Minamata district from Shukuro Araki of Kyushu University School of Medicine (Emeritus Prof. at present), who was in the U.S. for study. Kurland went to Minamata in September of the year. He analyzed the samples collected from Minamata, and next year he reported to suspect alkyl mercury as the cause of Minamata disease from the results of the analysis.

When the organic mercury hypothesis was reported in July 1959, Chisso admitted the use and discharge of mercury. However, Chisso insisted that the mercury is inorganic and organic mercury has not been flown out. If organic mercury as the causative agent was not discharged from the plant, it must be obliged to think that the inorganic mercury flown out in the sea became organic for some reason. This is the problem with so-called "conversion to organic mercury", which became the biggest heart of the problem thereafter. However, the possibility of such a way to comprehend the problem having been induced by Chisso is not ruled out.

Kurland visited Japan again in 1960, and obtained information and samples from Prof. Tadao Takeuchi of Kumamoto University School of Medicine. He analyzed the samples and those sent subsequently through Araki, and declared openly his opinion supporting the organic mercury hypothesis in the journal, "World Neurology" (November Issue, 1960). In this article, he showed some countermeasures against the cause of

Minamata disease on the assumption that the cause of Minamata disease exists in the process of vinyl chloride production at the Chisso Minamata plant. In the process of vinyl chloride production, inorganic mercury is used as a catalyst, but there is no possibility of methylmercury being secondarily generated in the process. From this point, Kurland presumed that inorganic mercury converts into methylmercury in the seawater. At that time, the investigators of Kumamoto University have considered in a similar way.

As for the problem with the source of generation of the substance, Prof. Irukayama and his co-workers eventually ascertained, during the period from 1961 to 1962, that methylmercury was generated in the process of acetaldehyde production at the Minamata plant and was flown out.

Even though the problem with organic change of mercury remained unsolved, it was sufficiently meaningful for narrowing down the problem to indicate that the Chisso plant, in which the largest amount of mercury is used, is the plant of acetaldehyde. However, such indication was not offered from the Kumamoto University Research Group. Conversely, Prof. Takeuchi and Kurland paid attention only to the process of vinyl chloride production. They did not change the recognition even after Chisso reported to the Kumamoto Prefectural Assembly the amount of mercury used in the process of acetaldehyde production in 1959. The fact is that precise knowledge of the process of production in the plant did not prevade among the medical investigators in those days, and information disclosed by the plant did not reach them.

Methylation of inorganic mercury in the natural world started from the mistaken speculation by Kurland. Jernelov in Sweden, who has continued to study in order to demonstrate the methylation, discovered by using mud of an aquarium that inorganic mercurial ion was actually methylated. He reported the discovery at the 1st Toxicity Conference in Rochester in 1968.

The methylation phenomenon in the natural world was confirmed in experiments on bacteria by Magos (1964) and Prof. Kitamura (1969). Environmental pollution due to methylation of inorganic mercury becomes an issue all over the world at present.

2. Breakup of the special sectional committee of food poisoning in Minamata in the Food and Sanitation Investigation Committee after the report in November 1959 and movements of the Tamiya Committee of the Japan Chemical Industry Association and Minamata Disease General Investigation and Research Liaison Council established in January 1960

(1) Breakup of the special sectional committee of food poisoning in Minamata in the Food and Sanitation Investigation Committee, Ministry of Health and Welfare

At a joint committee of the investigation groups, which was held under the name of the Food and Sanitation Investigation Committee on October 6, 1959, Wanibuchi, the representative on the special sectional committee of food poisoning in Minamata, reported the hypothesis of organic mercury intoxication as an interim report according to the contents reported by the Kumamoto University Research Group in July 1959.

On November 12 of the same year, the Standing Committee (Chairman: Prof. Katsuma Abe of Keio University) of the Food and Sanitation Investigation Committee reported to the Health and Welfare Minister that "Minamata disease, which is a toxic disease mainly showing disturbances in the central nervous system, is caused by massive consumption of fishes and shellfishes in Minamata Bay and in the surrounding areas, and the main cause of the disease is the organic mercury compound of a certain type", enumerating 8 points as reasons. Thus, the special sectional committee of food poisoning in Minamata was disorganized. The Chairman Abe talked, "factory wastes are highly suspected of having caused the disease, but the unsolved problem should be entrusted to the ministries and offices interested because the investigation is limited at the Board of Investigation". The special sectional committee was unexpectedly disorganized, and the representative on the committee, Wanibuchi, spoke reflectively, "The report is an interim at all, ...I have

thought that the final report should be offered after at most the source of generation of the substance is clarified. I was very surprised at the breakup which was ordered after the report". From this onward, investigation of the cause has been left to the new council comprised of various ministries and offices interested.

The Health and Welfare Minister, Yoshio Watanabe, presented the report offered at the Food and Sanitation Investigation Committee to the Cabinet meeting on the following day, the 13th, but no consent was obtained at the Cabinet meeting, because the T-I Minister, Hayato Ikeda, offered a counterargument, saying, "It would be premature to draw a conclusion that organic mercury was flown out from the plant".

[Comments] In the report, the Investigation Committee concluded that the cause of Minamata disease is the organic mercury compound for the following 8 reasons, which were reported at the special sectional committee of food poisoning in Minamata (Representative: Kenshi Wanibuchi, the Ex-president of Kumamoto University):

1. As the main symptoms of the disease, patients are disabled, and have the narrowing visual field and dull senses. These symptoms closely resemble clinical pictures of intoxication with the organic mercury compound.
2. On autopsy of the victims of the disease, the cerebellum and the visual center were revealed to have been damaged. These findings are observed in autopsy cases of organic mercury compound intoxication.
3. The urinary concentration of mercury in the patient affected with the disease is higher than that in the healthy people.
4. According to the results of chemical analysis in the victims of the disease, mercury levels in the brain, liver, and kidney are higher than those in the dead cases associated with other diseases.
5. The mercury concentration in the mud of the sea bottom of Minamata Bay is much higher than that for other places.
6. A large amount of mercury was detected in the body of *hibarigaimodoki* (a kind of black shell) collected in the district. When the shells were given to cats, they showed the same clinical pictures as those of Minamata disease.
7. The mercury concentrations in organs, particularly the brain, of the cats that died as a result of experiments and the cats affected with Minamata disease were higher than those for other cats.
8. When the organic mercury compound, e.g., the dimethyl mercurial compound or mercury ethylphosphate, was given to animals, they showed the same clinical pictures as those of Minamata disease.

(2) Minamata Disease General Investigation and Research Liaison Council of the Government

After the breakup of the special sectional committee of food poisoning in Minamata in the Food and Sanitation Investigation Committee, Minamata Disease General Investigation and Research Liaison Council (The Supervision of the Economic Planning Agency, MITI, Ministry of Health and Welfare, and the Fisheries Agency) was established. The first conference on the liaison council was held on February 26, 1960.

Two from Kumamoto University, i.e., Prof. Makio Uchida (Dpt. Biochemistry) and Prof. Kitamura, were involved with the council. Prof. Kiyoura of Tokyo Institute of Technology offered a counterargument against the report by Prof. Uchida, saying that mercury is not necessarily the cause of the disease.

At the second conference on April 12 of the year, Prof. Kiyoura presented "the hypothesis of noxious amine". In response to the hypothesis, the Kumamoto University Research Group offered a counterargument against the hypothesis on the 16th day of the month.

At that time, the council started in the expectation that the conference would be held 6 or 7 times. No conclusion was drawn, and the conference has not been held since the 4th conference was held on March 6, 1961. The inspection of the cause of Minamata disease by the Government was not conducted. After all, the council resulted in playing only the role to obscure the organic mercury hypothesis.

(3) *The Tamiya Committee of Japan Chemical Industry Association*

At the end of 1959 the dispute about the contract for a present of money in token of the company's sympathy was settled. From the 35th year of Showa (1960) on, Chisso did not oppose openly the organic mercury hypothesis, as guided by MITI. Instead of Chisso, Japan Chemical Industry Association took upon itself the responsibility of offering counterarguments and raising objections against the organic mercury hypothesis. As the place where the Association plays the role, the Association prepared "the Tamiya Committee".

Instead of Chisso, the industry groups started moving in on the problem with Minamata disease, probably because they were apprehensive about the possibility that the influence of the organic mercury hypothesis, i.e., the theory showing that the plant is the cause, spreads not only Chisso but also other domestic plants of the same kind.

In September 1959, Oshima, the Director of the Japan Chemical Industry Association, has already insisted the explosive hypothesis. The Association established in December of the year the special committee on vinyl chloride and acetic acid in the Industrial Wastes Countermeasures Commission for the purpose of countering waste water related to the problem with Minamata disease.

On April 8, 1960, the Association established "Minamata Disease Research Consultation Group" as an affiliated organization of the special committee on acetic acid; the chairman of the meeting was Takeo Tamiya, the President of the Japanese Association of Medical Sciences, and prominent members were collected for the meeting. The meeting was named "Tamiya Committee" after the name of the chairman. The Association emphasized that the establishment is the means by which the Association measures itself against Minamata disease from neutral and scientific viewpoints.

[*Comments*] The main members of the committee were Emeritus Prof. Yoshito Kobayashi of The University of Tokyo (Pharmacology) and Prof. Shigeo Okinaka of The University of Tokyo School of Medicine (Internal Medicine) as advisers, Prof. Haruo Katsunuma of The University of Tokyo School of Medicine (Public Health) as Vice Secretary General, and Prof. Tadashi Yamamoto of Institute of Infectious Diseases, The University of Tokyo, Asst. Prof. Mamoru Saito of The University of Tokyo School of Medicine (Pathology), and Prof. Yoshihiko Ohyagi of Tokyo University of Education (Analytical Chemistry) as committee men. Prof. Raisaku Kiyoura and Prof. Kikuji Tokita of Toho University (Pharmacology), who reported "the organic amine hypothesis" at the 2nd conference of Minamata Disease General Investigation and Research Liaison Council held on the 12th day of April, also participated in the committee. Kumamoto University School of Medicine was also requested to attend to the committee, but Dean Kansuke Sera of (Forensic Medicine) rejected it, and they did not participate in the committee until 1961 when the Dean changed to Prof. Masachika Kutsuna (Anatomy).

From April 1961 onward, the Ministry of Health and Welfare arrested a subsidy for aiding researches and continued a subsidy for aiding only the outgoings related to medical expenses. Therefore, the research funds for the Kumamoto University Research Group have contained a Government (Ministry of Education) subsidy for aiding scientific researches limited for only one year and the research funds by Public Health Service (PHS) through the good offices of Kurland of NIH.

Prof. Sera, who has been Dean of Kumamoto University School of Medicine and the Leader of the Kumamoto University Research Group, has rejected to participate in the Tamiya Committee, but in April 1961 when the Dean changed to Prof. Kutsuna, some attempts were made to improve the antagonism of the research group against Chisso; the group decided to accept aids from Chisso. From September 1961 onward, the Kumamoto University Research Group also participated in the Tamiya Committee.

In 1962 Prof. Irukayama and his co-workers of Kumamoto University reported an article entitled "Organic mercury in the residues of mercury used at the Minamata plant of acetic acid", demonstrating that the methylmercury compound has been secondarily generated at the Chisso plant. It describes to the effect that the research funds are partly derived from NIH and the Tamiya Committee.

The Tamiya Committee had much social influence because the investigators, who were taking the initiative in the medical world, started investigating the cause of the disease. Under these circumstances, Prof. Kiyoura and Prof. Tokita reported the hypothesis of toxic amine as the hypothesis different from the organic mercury hypothesis. These investigators insisted that there are various theories on the cause of the disease and no definite hypothesis on the cause has been established. Their opinion was reported in the mass media as it was, and made the organic mercury hypothesis to become a relative concept. Eventually, the establishment of the toxic amine hypothesis gave an impression that the cause of the disease remains unsolved. In this regard, the Tamiya Committee of the Japan Chemical Industry Association had much influence on regression of investigation of the cause of Minamata disease, and the committee provided a reason for having allowed the outbreak of second Minamata disease in Niigata.

3. Social function of the contract of the victims with Chisso about a present of money in token of the company's sympathy

(1) Contract of the victims with Chisso about a present of money in token of the company's sympathy

On December 30, 1959, a mediation draft on compensations for patients (the so-called contract about a present of money in token of Chisso's sympathy) was agreed to and signed between the representative of Minamata Disease Patient's Families Mutual Aid Society and Chisso.

In the contract about the present of money in token of the company's sympathy, Article 4 and Article 5 were combined; i.e., Article 4, "The former (Chisso) can cease delivery of presents of money in token of the company's sympathy at the month when Minamata disease is determined not to be derived from the factory wastes from the former in the future," and Article 5, "The latter (patients) will not request new payment of indignifications even after it would be determined in the future that Minamata disease is derived from the factory wastes from the former". Usually, items of relinquishing the victims' claim for presents of money in token of Chisso's sympathy are included in those of compromise, but an explanatory note as follows will not be included: "even after it will be determined that the disease is derived from the factory wastes". The "presents of money in token of Chisso's sympathy" by Chisso was very small from the current viewpoint; at that time as well, "the amount was extremely low, as compared to wages of laborers, the amount consumed and expanded at home, the amount calculated by assessment of the amount compensated for damages in cases of fatal and physical invasion by traffic accidents, and the amount in other cases of accident compensation" (A judgment paper on the primary action in Kumamoto Prefecture).

The announcement of the organic mercury hypothesis in 1959 was followed by counterarguments by Chisso, presentation of the hypothesis different from the organic mercury hypothesis by authoritative academical persons, breakup of the special sectional committee of food poisoning in Minamata in the Food and Sanitation Investigation Committee, establishment of Minamata Disease General Investigation and Research Liaison Council, completion of "Cyclator", settlement of compensations for fishery, and a contract with Chisso about a present of money in token of the company's sympathy. Such a series of movements indicate the structure of "termination of the problem with Minamata disease" at this period, which aimed at being realized within the year. Despite the fact that the problem essentially needed the elucidation of the basic cause, the affair was regarded as having been solved by the payment of the money in token of the company's sympathy. The concern of the mass media to the problem with Minamata disease also came to an end, and the problem was socially kept from the public as the cause was left unconfirmed.

Since the problem with Minamata disease in Kumamoto was ended as it remained obscure, no remarkable countermeasures have been considered thereafter, and there was the outbreak of the secondary Minamata disease in Niigata 6 years later.

[Comments] The efficiency of the contract about the present of money in token of the company's sympathy was contested at law thereafter. In 1973, the plaintiff gained the case on the judgment of the primary action in Kumamoto, which indicated that the contract about the present of money in token of Chisso's sympathy was ineffective because of contravention to the public order and morals on the basis of the state that the extremely small amount of the money in token was paid to patients and, instead, the company induced the patients to have disclaimed all reparations payment, taking advantage of patients' ignorance and economical poverty.

(2) The beginning of the Minamata disease certification system for the people affected

At the Screening Council for Minamata Disease Patients, which was organized with the opportunity of the contract about the present of money in token of the company's sympathy, the subjects of the receipt of the present of money in token of the company's sympathy, which should be essentially decided between the parties concerned, are assessed and decided by the specialists asked by the Government.

According to the judgment by private medical care institutions, it was taken into consideration that any consent would not be obtained from Chisso. Therefore, "the Screening Council for Minamata Disease Patients" was extraordinarily established for the first time in the Public Health Bureau, Ministry of Health and Welfare in December 1959, and scientific research funds sponsored by the Ministry of Health and Welfare were paid for medical expenses. In September 1961, the council was reorganized, and "the Screening Committee for Minamata Disease Patients" (the Supervision, the Health Dept. of the Kumamoto Prefectural Government) was inaugurated in Kumamoto Prefecture. In March 1964, "the Screening and Certification Committee for Minamata Disease Patients" was established according to the Kumamoto prefectural ordinances.

Regulations were prepared at the 1st meeting of the Screening Council for Minamata Disease Patients in February 1960. According to the regulations, the Minamata disease patients, who demand presents of money in token of the company's sympathy, or the family members were to offer the presents with written opinions of physicians-in-charge, and the decision was to be made unanimously by all members of the Conference.

(3) Certification of Minamata disease patients after the contract about the present of money in token of the company's sympathy

According to the Minamata disease certification system for the affected people, which was regulated in the contract about the present of money in token of the company's sympathy, 79 people, who had been discovered before establishment of the system, were certified to be Minamata disease patients. In 1960 and 1961, 8 and 1 patients were respectively certified to have had Minamata disease. Since then, however, only an infant has been certified in 1964, with the exception of certification of patients with fetal Minamata disease. There have been no reports by medical care institutions of the district, which have discussed the incidence of suspected Minamata disease, during the approximately 5-year period from 1965 to 1969, and no meeting of the Board has been held during the period.

During the period as well (1965-1969), waste water containing the methylmercury compound was continuously flown out from the Chisso plant, but the advertisement for the waste water, which showed that it is safe with the "cyclator" set, has exercised precaution to lower the citizens' guard.

Under the situation of the Medical Examination Society for Minamata Disease Patients in 1960, any case other than the cases that have all typical symptoms of Minamata disease was not certified to have Minamata disease. Furthermore, the thinking on termination of the affair of Minamata disease has spread the local community, and there have been discriminations in the local community. Therefore, it is not socially easy to newly apply the certification for the disease. Eventually, the certification itself was suppressed. Thus, there were patients in the wide-ranging areas, who had potentially symptoms as the influence of the

methylmercury compound, but these patients were dealt with as if they had not existed.

Table 4. The changes in screening for the certification of Minamata disease

Name	The Screening Council for Minamata Disease Patients	The Screening Committee for Minamata Disease Patients	The Screening and Certification Committee for Minamata Disease Patients	The Pollution – Related Health Damage Certification Council
Organization	December 25, 1959 (Tentatively)	September 14, 1961 (Tentatively)	March 31, 1964 (Institutionalization, Establishment of ordinances)	December 27, 1969 (Based on Law Concerning the Relief of Pollution – Related Health Damage)
Supervisory office	The Public Health Bureau, Ministry of Health and Welfare	Health Dept. of the Kumamoto Prefectural Government	Kumamoto Prefectural Governor (Health Dept.)	Asked to the Prefectural Government (Health Dept.) by the Health and Welfare Ministry
Objective	Evaluation of patients with true Minamata disease and necessary investigation Examination for the appropriateness of admission to and discharge from the Minamata disease wards (substantial institution for the certification)	do. (However, not held until November 29, 1962)	Evaluation of true Minamata disease patients, and accompanying investigation (the change to absolute institution for the certification)	The special measures for the relief of damages to health, which urgently require to be relieved, are adopted.
Procedure	The supervisory Director of the Prefectural Medical Dept. asks evaluation. In actuality, only the applicants by the patients themselves or their family members, which accompany written opinions of physicians-in-charge, are received (Based on the decision made at the Conference for Medical Examination of Minamata Disease Patients on February 3, 1960).	The Head of the Minamata Public Health Center asks the evaluation. do.	Reply to the questions requested on the evaluation by the Governor	After the patient's application
Committee member	Seven members	10 members (3 members were added because of the examination of fetal Minamata disease patients) Haruhiko Tokuomi, MD (Asst. Prof. of the First Dept. of Internal Medicine, Kumamoto University School of medicine) Tadao Takeuchi, MD (Prof. of the Second Dept. of Pathology, Kumamoto University School of medicine) Takeo Takada, MD (Prof. of the Dept. of Pediatrics, Kumamoto University School of medicine) Yoshitaka Harada, MD (Asst. Prof. of Pediatrics, Kumamoto University School of medicine) Noboru Ohashi (Director of Minamata Municipal Hospital) Isaoshi Mishima (Sub-Director of Minamata Municipal Hospital) Masamoto Ukiike (President of the Medical Association in Ashikita-gun, Minamata City) Iwao Ogawa (Director of the Chisso Minamata Plant Hospital) Naoya Hamazaki, MD (the Director Health Department of the Kumamoto Prefectural Government) Hasuo Ito (Head of the Minamata Public Health Center)	10 members	

Prepared from “*Nintei-Seido eno Chosen (the Challenge to the Certification System)*” edited by Minamata Disease Study Group

(4) Detection of patients with fetal Minamata disease

The abnormally high incidence of symptoms resembling those of cerebral palsy in children has been revealed since the first half of the period from 1955 to 1964 in the districts where many patients had been observed in Minamata. The relation of the high incidence to Minamata disease has been suspected. In March 1959, Prof. Kitamura and his co-workers reported 9 patients, describing, "There are relatively many children with abnormal findings, who show symptoms like those of cerebral palsy, among the infants who were born from 1955 onward in the areas surrounding Minamata Bay". This is the first report on fetal Minamata disease. Next year, Prof. Kitamura added 5 patients, clarifying that the frequency was abnormally high, 7.5 to 11.9%.

Prof. Sukenori Nagano and his co-workers of the Dept. of Pediatrics, Kumamoto University School of Medicine, also conducted precise examinations on 15 patients, indicating that "The cause of the disease lies in the fetal stage, which is closely related to Minamata disease from an epidemiological viewpoint, and the mercury level in hairs of affected child is high". However, it was postponed for the conclusion to be drawn, since there were no findings that were definitely different from those on general cases of cerebral palsy.

In March 1961, one of the patients, a 2.5-year-old girl, died. On the autopsy by Prof. Takeuchi and his co-workers, it was concluded that the condition was Minamata disease developing in the fetus. The condition was certified to be fetal Minamata disease in August. In the same year, Asst. Prof. Tokuomi and his co-workers also conducted precise examinations on the 7 patients, describing, "The sites of encephalopathy, which are assumed from these symptoms, are extremely wide-ranging; it includes most parts of the central nervous system, i.e., cerebral cortex, basal ganglia, brainstem, and the cerebellum. This finding closely resembles that on the sites of lesions observed on autopsy of pediatric patients with Minamata disease". They described about the one autopsied case as well, describing, "the possibility of congenital Minamata disease having occurred was confirmed from the epidemiological and clinical findings on child patients with so-called cerebral palsy that occurred frequently in the districts where the incidence of Minamata disease was high, and from the findings on the autopsied case".

From 1961 onward, the Dept. of Neuropsychiatry also participated in the investigation including the analysis of clinical manifestations and comparison with those of cerebral palsy of other causes. As a result of the investigation, it was concluded that the 16 patients found in Minamata "had the same disease of the same cause". These patients were diagnosed as having Minamata disease via the placenta from the following findings: the incidence rate is extraordinarily high; the sites and period of the occurrences are consistent with those of Minamata disease; the mothers of the patients have eaten fishes and shellfishes in large quantities during pregnancy; their mothers have had mild nervous symptoms including sensory disturbance; many of their family members have had Minamata disease.

In September 1962, a girl aged 6 years and 4 months also died, and Prof. Takeuchi conducted again autopsy of the patient. From pathological findings, this case was also diagnosed as Minamata disease developed in the fetal stage (in October). For this reason, 16 patients, whose diagnoses have been reserved by this time, were certified to have had fetal Minamata disease by the Screening Committee for Minamata Disease Patients on November 29, 1962.

It has been revealed that the frequency of abortion and stillbirth was high in the former half of the period from 1955 to 1964, when the pollution was serious. The male to female ratio of the babies born during the period also changed. These phenomena suggest that exposure to the causative agent in the embryonal stage has resulted in abortion and stillbirth.

In Niigata, the Prefectural Government guided earlier the women of childbearing age in the conception control on the basis of the outbreak of fetal Minamata disease in Kumamoto Prefecture. Only one case of fetal Minamata disease has been reported in Niigata Prefecture.

[Comments] In the primary action concerning Minamata disease in Niigata Prefecture, 6 of the women

with Minamata disease, who were guided in the conception control have requested to receive the amount compensated for damages. The 6 women included a woman who had undergone sterilization and two who had undergone termination of pregnancy. In the decision, ¥500,000 and ¥300,000 were approved to be paid as the amounts compensated for sterilization and others, respectively.

<Column> *Fetal Minamata disease*

With regard to the discovery of intoxication occurring via the placenta, Minamata disease is the first one of the whole world. The discovery of fetal Minamata disease was a new type of chemical toxicity. This was the affair from which the future of mankind would be foreseen. Thereafter, fetal Minamata disease or fetal methylmercury poisoning occurred in Niigata, the U.S., and Iraq.

Prof. Takeuchi defined the disease as fetal Minamata disease because it was the poisoning, which developed in the fetus. Clinically, however, it may be called congenital Minamata disease, because fetal infection and poisoning are also regarded as being “congenital”.

There have been no data that show definitely the number of the patients with the fetal case among Minamata disease patients. According to Masazumi Harada, 64 patients with fetal Minamata disease have been confirmed and 13 of them died.

It was confirmed in animal experiments as well that methylmercury passes through the placenta, and it was also clarified that methylmercury induces encephalopathy to the offspring via the breast milk.

The methylmercury level in the preserved umbilical cord of patient who was considered to have fetal Minamata disease was as high as at least 1.0 ppm, but some cases including pediatric patients with Minamata disease and children with intellectual disturbance and healthy children in the districts of outbreaks of Minamata disease showed the levels higher than those in the controls. Strictly, it is difficult to differentiate pediatric Minamata disease from fetal one in many cases, because the pollution of fishes and shellfishes continued even after the birth.

(5) Medical countermeasures against Minamata disease patients

In December 1958, the ward used tentatively for Minamata disease patients was constructed in the Minamata Municipal Hospital, and in July 1959 the construction of the ward for exclusive use was completed. On January 20, 1964, the construction of the Yunoko Hospital (200 beds), affiliated with Minamata Municipal Hospital was begun as the rehabilitation center for Minamata disease patients by using reduction financing of reserves for kosei nenkin plan (government-managed pension plan for corporate employees) under the initiative of the Ministry of Health and Welfare. The hospital was opened on March 7, 1965. This hospital was the first public special hospital for rehabilitation in Japan.

(6) Labor dispute of Chisso-- the stabilized wage disputes

To facilitate the self-renewal of Chisso to petrochemical industries, Chisso proposed the “steady wages” system to the trade union in April 1962.

Since the trade union rejected the proposal, a keen labor-management dispute has started and developed a great disturbance, which would divide the city in two parts by the union’s division; the union was divided, and it became an issue regarding the point as to which party the shops and citizens would support. The dispute terminated in January 1963, but thereafter a deep-rooted feeling of confrontation remained among the citizens as well as the workers of Chisso. During this period, Minamata disease did not draw concern of citizens and was over shadowed.

<Column> *Labor-management dispute in Chisso, which divided Minamata City in two parts*

The peak of acetaldehyde production was over in the Chisso Minamata plant, and Chisso, which was behind other companies in the management because of the transformation to petrochemical industries, proposed “steady wages” as a part of the measures to promote rationalization of the management to the trade union (of Chisso) in April 1962. According to the proposal, the improvement of wage level by the degree equivalent to that for other companies in the same field was preliminarily promised, and instead, the union had to resign its right of labor dispute and to cooperate with Chisso in the draft of rationalization. The negotiations between the union and the company were broken off, and the trade union rejected the proposal and came out on a strike (called “Fight for steady wages”). In response to this, the company locked out the workers as members of the union, and at the same time, undermined the solidarity of the member workers of the union to establish the second union, The Chisso labor union (2nd union).

Supporters of the General Council of Trade Unions of Japan gathered the first union (old union) under the control of (Japanese Federation of Synthetic Chemistry Workers Unions) Unions from all over the country. On the other hand, the new union forced the workers to work and started undermining the solidarity of the old union. Thus, the antagonism became intensified. At that time, a number of citizens, who included the Chisso’s employees, the family members and relatives, companies related to Chisso, and customer shops, supported individual movements by clarifying their own positions between these parties. Therefore, feelings of confrontation, such as exclusion, hatred, etc., developed among the citizens based on different positions, as well as between the unions. The antagonism developed the dispute by which the local community was divided in two parts.

After all, the dispute was controlled through the conciliation of the Regional Labor Committee in Kumamoto in January 1963. The production at the Chisso plant was normalized after the 9-month disordered period, but feelings of confrontation, which were reflected by division of the trade union and the subsequent discriminative treatments of the old union by Chisso, persisted. Without healing of the antagonism among the citizens, which was left in the district, there is no end to the antagonism among some people.

On the other hand, Minamata disease died from the memory of the public as a matter of citizens’ concern during the period of the fight for steady wages.

4. Survey of mercury level in hairs in Kumamoto Prefecture during the 3-year period after 1960

On October 1960, the Kumamoto Prefectural Institute of Public Health started conducting the survey of mercury level in hairs of the inhabitants along the shore of the Shiranui Sea, in response to the findings observed by Prof. Kitamura of the Dept. of Public Health of Kumamoto University School of Medicine, which showed that mercury level in hairs provides an effective indicator of the development of Minamata disease. This survey was continued for 3 years; the survey in each year included ca. 1,000 inhabitants. The survey was extremely valuable as that on the inhabitants of the polluted district.

The survey was designed to know the risk of the development of Minamata disease at both individual and regional levels by determining the rise and fall in mercury level in hairs and to prevent the new patient.

The results of the survey were reported every year in an annual report of the Health Institute, and the distribution according to mercury level in hairs and mean levels were declared openly. At present, the results of the survey on individuals are reported to the inhabitants themselves. At that time, however, the results were not used for application to the certification, because the results of the analysis of mercury level in hairs of each inhabitant, who offered the sample and was eagerly to know the results of the analysis, were not reported to the inhabitant.

In the Goshonoura island across the Shiranui Sea from Minamata, there have been no applications to the certification, but the survey conducted in 1960 revealed that the mercury level in hairs was abnormally high, exceeding 200 ppm, in 4 inhabitants.

Thereafter, the First Dept. of Internal Medicine, Kumamoto University School of Medicine, delivered questionnaire surveys to the inhabitants of the Goshonoura district, who showed 80 ppm or higher, on the basis of the results of the survey by the Health Institute, and investigated subjective symptoms. As a result, some “occasionally” complained of “numbness”, and even the inhabitants with high mercury levels in hairs showed almost no symptoms. However, the inhabitants who showed the highest mean level of 920 ppm (430 ppm at the root and 1,855 ppm at the tip), complained of the stiff hands and so on [they could not fasten buttons; their *zoris* (Japanese sandals) easily slipped off; etc.]. They were suspected of having had nervous symptoms, but no confirmation was made because the Goshonoura island was far from Kumamoto City and hard of access.

At this time, the public’s interest on Minamata disease in Kumamoto has languished, and the survey on mercury level in hairs was brought to an end 3 years after the initiation.

[*Comments*] At that time, Minamata was far from Kumamoto City, and the investigators of Kumamoto University thought that the place was hard of access. Furthermore, the sea route was needed to the approach to the Goshonoura island.

The Kumamoto Prefectural Government and the Kagoshima Prefectural Government initiated health screening of inhabitants from 1971 at the patients’ urging to request investigation against appeals of dissatisfaction with the Government. No extensive health screening has been conducted by either Prefectural Government before the year.

<Column> *An excellent indicator of exposure to mercury: mercury level in hairs*

The determination of mercury level in hairs is an important testing method, which was revealed to be useful by its wide-ranging use in Japan including Niigata prefecture, taking advantage of the opportunity presented by Minamata disease. The method is widely used all over the world.

With regard to methylmercury poisoning, it has not been known first that investigation of methylmercury in hairs is very useful. However, Prof. Kitamura of the Dept. of Public Health, Kumamoto University School of Medicine, took a hint from the accidental transfer of arsenic to hairs in arsenic intoxication, and determined mercury level in hairs. It was revealed that the mercury level in hairs is very useful as an indicator of exposure to the causative agent for Minamata disease.

In Canada and Sweden, there have been data on blood level of mercury in those days, but nobody has considered about the determination of mercury level in hairs.

No pain is induced by collection of hair samples, and it is also easy for hair samples to be stored for a long time. If the level was determined precisely by dividing the hair into some parts from the root, the situation of the time-course exposure to mercury will also be revealed.

In some studies based on the similar conception, the mercury levels in the past have also been determined by using feathers of the birds kept at museums in Sweden, since about 1966.

The presence or absence of environmental pollution may be debated from the data of the determination of levels in the seawater and rivers water, but even if any toxic substance was not detected at a certain time point, it would not be concluded that there has been no pollution in the past time. When the toxicity of a substance is cumulative, it is effective to determine in birds’ feathers and hairs of mankind and animals, as well as to determine the levels in living things of high orders of food chains. The considerably high ability to analyze is necessary for the determination of environmental changes, but the distribution of pollution in the past time will be determined if an indicator reflecting the pollution of the site was exactly obtained.

5. *The statement by Prof. Irukayama and his co-workers about the extraction of organic mercury from factory wastes in the process of acetaldehyde production*

(1) *Confirmation of the methylmercury compound in the factory wastes by the Technology Division of the Chisso Minamata plant*

Shunichi Ishihara of the Technology Division of the Chisso Minamata plant confirmed by paper chromatography in July 1961 that the alkyl mercury compound is contained in the factory wastes in the process of acetaldehyde production, and ascertained in December of the year that the extracted crystal was the methylmercury compound. However, the result was not reported to outsiders of Chisso.

(2) *Extraction of organic mercury by Prof. Irukayama and his co-workers of the Kumamoto University Research Group*

In November 1961, Prof. Uchida and his co-workers of the Kumamoto University Research Group reported at the meeting of the Japanese Biochemical Society for that methyl sulfide methylmercury ($\text{CH}_3\text{HgSCH}_3$) was extracted from *Hibarigaimodoki* in Minamata Bay.

In about 1962, Prof. Irukayama and his co-workers, who had followed up the source of generation of organic mercury, noticed that they had looked over organic mercury in the stage of preparation of samples, and started analyzing the mercury sediment untreated, which had been obtained from the Chisso plant.

Chisso has brought forth a counterargument to say that they have never discharged organic mercury, but Prof. Irukayama and his co-workers reported the article (submitted to *Nisshin Igaku*) entitled, "Organic mercury in the mercury sediment from the Minamata acetic acid plant", showing that methylmercury chloride (CH_3HgCl), which was considered the causative agent, was extracted from the mercury sediment from the (acetaldehyde) acetic acid plant and from the short-necked clams in Minamata Bay. Thus, organic mercury as the causative agent was extracted at last.

At a briefing session of the Kumamoto University Research Group, which was held with research funds from PHS on February 16, 1963, Prof. Irukayama reported that organic mercury salt was detected from the mercury sediment produced in the process of acetaldehyde production in the Minamata plant.

(3) *Approach of the Government and so on to the report on extraction of organic mercury*

Kumamoto *Nichinichi Shimbun* (The Kumamoto Daily News) scooped this report as the news, showing, "The Kumamoto University Research Group reported in connection with the cause of Minamata disease. Bound to organic compound in the process of production. Prof. Irukayama detected a toxic substance." Since the news were scooped, the public's attention has been unanimously paid to the substance. On this occasion, Kumamoto *Nichinichi Shimbun* (The Kumamoto Daily News) got the following comment of the Chief Public Prosecutor Teiji Ikeda of the Kumamoto Direct Public Prosecutor's Office regarding the penal responsibility of Chisso: "We have not touched about this problem, but we must be much concerned about it if some conclusion was drawn." This was the only case in which the prosecution gave comment, but thereafter there have been no movements of the prosecution.

On the basis of these news items, a Dietman, Fujitarou Fujita, made an inquiry concerning measures to cease discharge of organic mercury from the plant to the sea at a meeting of the Committee on Social and Labour Affairs, the Upper House on February 19, 1963. The Director Yoshiaki Igarashi of the Environmental Health Bureau of the Ministry of Health and Welfare, replied to the effect that "the circumstances of the district must be adequately investigated, and necessary countermeasures will be assessed because new opinions were reported", but the Government did not behave concretely to consider the countermeasures. The Minamata Disease General Investigation and Research Liaison Council was in a

resting stage from the 4th meeting held in March 1961 onward, and nobody requested to open the meeting again. The answer to the inquiry was also made by the Ministry of Health and Welfare, not the Economic Planning Agency which was the sponsor of the liaison council.

On February 20, 1961, the Kumamoto University Research Group declared about the cause of Minamata disease openly that the future tasks for confronting the group include the following point: the toxic substance is the methylmercury compound, but the substance extracted from the shellfishes in Minamata Bay is slightly different from that extracted from the mercury sediment from the acetic acid plant in terms of the structural formula.

In January 1964, Prof. Hirotsugu Shiraki of The University of Tokyo (Neuropathology) reported a summary of the research of Minamata disease, which was entitled, "Minamata disease--With special reference to the hypothesis of the origin of organic mercury--", to a scientific journal, "Kagaku (Science)". It summarized the circumstances of the period from the outbreak of Minamata disease to the detection of the methylmercury compound in the mercury sediment from the acetic acid plant by Prof. Irukayama, with references to the literature. The summary drew a conclusion that Minamata disease in Kumamoto was clearly caused by the methylmercury compound discharged from the Chisso plant.

In 1964 the Chief Michio Hashimoto of the Environmental Pollution Section of the Ministry of Health and Welfare insisted to solve the problem with the cause of the disease as early as possible because the article of Prof. Shiraki was declared openly in "Kagaku". However, the Ministry of Health and Welfare could not decide to investigate the cause, because the decision was believed to be made by Minamata Disease General Investigation and Research Liaison Council, which was managed by the Economic Planning Agency. Under these circumstances, all reports by Kumamoto University were planned to be newly published in book form in both Japanese and English languages with the research expenses in the Ministry of Health and Welfare. It was approved at the assessment of the budget of the Finance Ministry in December 1964 that the achievements of past studies, which included the report by Prof. Irukayama and his co-workers in 1962, were compiled and published. In March 1966, it was published as "Minamata disease--A study on organic mercury poisoning--" by the Kumamoto University Research Group for Minamata Disease.

6. Report on Minamata disease at the international conferences

Minamata disease was introduced at the 7th International Congress of Neurology, which was held in Rome in September 1961. Asst. Prof. Tokuomi, Prof. Uchida, Prof. Takeuchi, and Prof. Kitamura reported the results of the studies by Kumamoto University, which showed that the causative agent was the methylmercury compound.

In September 1962, Prof. Kiyoura reported "the hypothesis of amine" at the 1st International Conference of the Water Pollution Prevention (WPCF = Water Pollution Committee Federation) held in London. Moore, who discussed there, had some doubts about the hypothesis. He confirmed preliminarily the results of the studies by Kumamoto University, and he offered a counterargument against the hypothesis.

The 2nd WPCF was held in Tokyo in 1964. Prof. Irukayama was going to present a report on Minamata disease at the conference, but according to Jun Ui who attended the meeting of the Secretariat, this presentation was left over by the request of the Secretariat, which asked to withdraw this report on this occasion, because this problem was too politically hot.

At the 3rd WPCF held in Munich in September 1966, Prof. Irukayama and Ui presented again the reports on Minamata disease in Kumamoto and Minamata disease in Niigata, respectively. Thus, it was commonly recognized among the investigators of water pollution that the causative agent for Minamata disease is the methylmercury compound contained in the factory wastes.

Chapter 4.

The Process of Investigation of the Cause of Minamata Disease and Confirmation of the Pollution Source (3)

--During the period from May 1965, when the outbreak of Minamata disease in Niigata was officially reported, to September 1968 when the Government's unified policy toward the disease was reported--

1. Outbreak of Minamata disease in Niigata

(1) Outbreak of Minamata disease in Niigata

In January 1965, Asst. Prof. Tadao Tsubaki of the Institute of Brain Research, University of Tokyo School of Medicine (Prof. of the Dept. of Neurology of Niigata University School of Medicine from April, 1965) examined a patient with suspected poisoning with organic mercury in the Niigata University Hospital. In April and May of the year, a patient each, who showed the condition was detected, and Prof. Tsubaki and Prof. Yukiaki Ueki (Neurosurgery) reported these cases to the Health Department of Niigata Prefecture. The Prefectural Government declared officially on June 12 that there were 7 patients with organic mercury poisoning in the basin of the Agano River, 2 of whom died.

With regard to Minamata disease in Kumamoto, some measures to control disputes between Chisso and the patients and fishing people were made at the end of 1959 (financial settlement and establishment of drainage disposal facilities). For this reason, the investigation of the fundamental cause, inspection of chemical plants (Showa Denko, etc.) of the same kind as that of Chisso, or any countermeasure against these plants has remained not to be conducted. Then, there was the outbreak of second Minamata disease in Niigata Prefecture.

(2) Countermeasures against Minamata disease in Niigata by the Niigata Prefectural Government, Niigata University, and the Government

With reference to Minamata disease in Kumamoto, the Niigata Prefectural Government demanded investigation and research to the Government. The Prefectural Government and Niigata University jointly established the head office of organic mercury poisoning research in Niigata Prefecture on June 16, 1965. On the same day, Prof. Tsubaki and Prof. Ueki of Niigata University and the Director Hirokazu Kitano of the Health Department of the Niigata Prefectural Government, reported that the cause of the disease is estimated to be fishes in the Agano River. On June 28, the Niigata Prefectural Government guided the Niigata Fishermen's Cooperative Association to prohibit fishermen from catching fishes and shellfishes in the basin of the lower Agano.

In the Government as well, a liaison joint conference of the ministries and offices interested was held on June 30 of the year, and it was decided that the cooperation system for investigation of the cause would be organized with the special research funds by the Science and Technology Agency (STA).

The tasks subsequently confronting the Government and the organizations were the detection of patients and the confirmation of the source of drainage of organic mercury. The Health Department of Niigata Prefecture collected samples from the waste water and mud of the three plants, in which mercury was used, in the basin of the Agano River, and asked Niigata University to analyze them. On the other hand, the Departments of Neurology and Neurosurgery of Niigata University, School of Medicine started conducting house-to-house investigations of the inhabitants (2,813 people of 412 houses) on the lower Agano in cooperation with the Niigata Public Health Center from June 14 of the year. The investigations included subjective findings, situation of the use of agricultural chemicals, situation of consumption of river fishes, drinking water, occupations, the cause of death of family members, the state of livestock and cats, etc.

Mercury levels in hairs were determined in 172 people who complained with subjective findings on the investigations, and 61 persons were detected to show 50 ppm or higher (21 of them showed 200 ppm or higher).

Similar investigations were added to 19,888 inhabitants of 3,849 houses in the periphery of the districts of the outbreak mainly by the Niigata Prefectural Government, the cities, towns, and villages interested, and the Niigata Public Health from June 21, 1965. Some efforts were then made to detect potent patients by medical examination on 120 people, who included those with symptoms, their family members, and the people eating river fishes in large quantities, and by the determination of mercury levels in hairs in 300 subjects including controls. The following were added: 384 children of the districts of the multiple were medically examined; mercury levels in hairs were determined in 81 pregnant women; investigation was performed by medical institutions; the deceased were investigated. Thus, the diagnosis was made in 26 patients by the end of July, and it was disclosed that patients have been present since August 1964 and 5 people died.

When Prof. Tsubaki visited Minamata and talked with the doctors of Minamata Municipal Hospital, he was reported by them the possibility of fetal Minamata disease patients with miserable symptoms being born even from the mothers without clinical feature.

In July it has been decided as a measure to prevent the occurrence of fetal Minamata disease that the women with 50 ppm or higher of mercury level in hairs are guided to control conception. It has been believed that the countermeasure confined the number of the certification of fetal Minamata disease to only one case in Niigata Prefecture.

The survey on Minamata disease in Niigata was markedly improved in the beginning of the investigation, as compared to that for Minamata disease in Kumamoto. At that time, it was not considered that patients were distributed on the upper Agano. Therefore, the epidemiological survey did not include the whole area ranging from the mouth of the Agano River to the Showa Denko Kanose plant 60 km up the river.

On September 8, 1965, the Special Research Team for the Mercury Poisoning Affair in Niigata was inaugurated by the Ministry of Health and Welfare. The Team consisted of three groups, i.e., clinical group (Director Hidehide Nozaki of School of Medicine, Niigata University, etc.), testing group (Director Iwao Kawashiro of the Processed Foods Division of National Institute of Health Sciences, etc.), and epidemiological group (Director Shinichi Matsuda of the Epidemiology Division of the Institute of Public Health, etc.).

The source of generation of the substance was narrowed down to the Kanose plant of Showa Denko, because total mercury of high concentrations was detected from the mud collected in the vicinity of the outfall and the huge heaps of coal sludge in the plant. The plant was located on the upper Agano River, and acetaldehyde was continued to be produced until January 1965. At that time, however, the production has been ceased.

<Column> *Limit of the provisional amount of mercury ingested*

In 1972 the joint special committee on food additives by WHO and the Food and Agriculture Organization of the United Nations (FAO) estimated the minimum mercury levels, at which poisoning with nervous symptoms develops in adults, to be 50 ppm ($\mu\text{g/g}$) and 0.4 ppm ($\mu\text{g/ml}$) in hairs and hemocytes, respectively. The committee gave an advisory opinion to show that the provisional amount of methylmercury ingested weekly should be lower than 0.3 mg.

With regard to grounds for establishment of the standard, the committee assessed the minimum amount of the methylmercury compound at which Minamata disease patients in Japan developed the poisoning. Twenty-six affected people were officially certified to have had Minamata disease in Niigata, and 5 of them died. Two of the 26 showed the severe condition, and 16 of the 26 showed the mild condition with only slight signs (only subjective findings were shown). Thus, the proportion of mild cases in the 26 patients

accounted for 61%, but the total mercury level in hairs was 200 ppm or higher in most of the patients. The level was low 56.8 ppm in only one patient.

A group in Sweden, which makes a special study of mercury, estimated, from the data on mercury levels in hairs of Minamata disease patients in Niigata, that the mercury level in the whole blood at the time of the onset is 0.2-2 ppm. The group compiled the report showing that the mercury level in hairs was 50 ppm and the level in the whole blood was 0.2 ppm in the people who were most sensitive for the methylmercury compound. The WHO/FAO joint committee also supported the results shown in this report, because that at least 100 inhabitants showed 50 ppm or higher of mercury level in hairs in the districts of Japan, where fishes and shellfishes were polluted with the methylmercury compound, and that 23 of them showed 0.2 ppm or higher of mercury level in the whole blood in Minamata and Niigata.

WHO investigated the amount of methylmercury ingested by the human body through foods every day, which would induce accumulation of mercury of 50 ppm in hairs or 0.2 ppm in the whole blood (corresponding to 0.4 ppm calculated in terms of mercury level in erythrocyte). Relations of the amount of methylmercury ingested in healthy people to blood mercury level (Tejning in Sweden, Bakir et al. in Iraq) and hair mercury level (Kojima et al. in Japan) were obtained from the regression formulae. As a result, WHO gave an advisory opinion; the upper limit of methylmercury ingested in adults is 0.2 mg/head/week or 0.3 mg/week as the amount of mercury (per body weight of 60 kg), that is, 5 µg/kg/week.

In 1976 WHO published, "Environmental Health Criteria 1: Mercury", showing that the minimum level of methylmercury, at which the most sensitive adult populations are influenced, is 0.2-0.5 ppm of the blood level and 50-125 ppm of the hair level. According to the criteria, the amount of methylmercury ingested daily for a long term was 3-7 µg per kg of body weight, which corresponded to these levels.

In 1978, Prof. Tsubaki and his co-workers of Niigata University analyzed the samples from the patients again, who had shown the minimum mercury level in hairs (52 ppm) in the beginning of the outbreak of Minamata disease in Niigata, by changing the dithizone method to atomic absorption spectrophotometry. Since the level was revealed to be 82.6 ppm, the investigators suggested that the hair or blood mercury level determined at the time of the onset was not the true maximum of the patients. In "Environmental Health Criteria 101: Methylmercury" published by WHO in 1990, however, the levels advocated conventionally by the WHO (50-125 ppm for the hair level) were adopted. In the 33rd report as well, the provisional amount of methylmercury ingested weekly in adults remained to be 0.2 mg (3.3 µg/kg of body weight).

In "Environmental Health Criteria 101: Methylmercury", it is described that "The risk is particularly high in fetuses", indicating that "the children exposed to methylmercury in the uterus of the mothers, who have shown 20 µg/g or lower of the peak hair mercury level, must be investigated epidemiologically." Indicating "inadequate knowledge", the WHO recommended, "With regard to our understanding about toxicity of methylmercury and the potent risk, additional studies are urgently necessary in some fields of study in spite of important advances in our understanding. The most important field of them is the determination of the minimum methylmercury level which has influence on the dose-reaction relationships in the case of fetal exposure."

The permissible amount of methylmercury ingested used currently in Japan is 0.17 mg, i.e., the amount of the substance ingested weekly in an adult (50 kg of body weight), which was regulated as the provisional control level (in a notice of the Director of Environmental Hygienics of the Ministry of Health and Welfare) in 1973. At the same time with the regulation, the total mercury and methylmercury control levels in fishes/shellfishes were also regulated to be 0.4 ppm and 0.3 ppm, respectively.

(3) Efforts to investigate the cause of Minamata disease in Niigata and counterarguments of Showa Denko against the data from the investigation

At the joint conference of the Special Research Team for the Mercury Poisoning Affair in Niigata (sponsored by the Ministry of Health and Welfare) and the ministries and offices interested, which was held

on March 24, 1966, the epidemiological group of the Team presented a report entitled, “An epidemiological study of a outbreak of organic mercury poisoning in the villages along the shore of the Agano River”, indicating that the methylmercury compound in the waste water from the Kanose plant is the cause of the disease. However, MITI, which attended the joint conference as an observer, offered again a counterargument against the report. Therefore, the conclusion was deferred by the Special Research Team, and the contents discussed at the conference were also kept secret.

In response to the situation, Showa Denko offered a counterargument against the hypothesis (showing that the cause is the waste water from the plant) in June of the year. According to their opinion, it is impossible to explain the sudden, tentative outbreak of the disease, because waste water has been continuously drained from the plant for about 30 years. They developed another hypothesis showing that the cause is the agricultural chemicals flown due to the earthquake in Niigata on June 16, 1964

[Comments] Immediately before cessation of the production, it is highly probable that waste products from the process are acutely increased, because the amount of production is suddenly increased as the arrangement of facilities may be neglected at that time. In addition, some procedures for treating the waste products after the cessation may also induce tentatively environmental pollution

In November 1966, Prof. Tetsuzo Kitagawa of the Dept. of Technology, Yokohama National University reported the following hypothesis: the agricultural chemicals at the wharf of the Shinano River were flown out by the earthquake and the tidal wave in Niigata and flew backward on “the salt-water wedge” from the mouth of the Agano River to contaminate the area on the lower Agano. Showa Denko consistently supported the hypothesis of agricultural chemicals, and assumed a posture of disputing with the Research Team and Niigata University about the hypothesis showing that the cause of the disease is the waste water from the Showa Denko Kanose plant.

Shigeo Oketani, Emeritus Prof. of Tokyo Institute of Technology blamed the theory, which showed that the cause is Showa Denko, by delivering the copies of “*Getsuyo Hyoron*”, which named Prof. Tsubaki and Asst. Prof. Yukio Takizawa of Niigata University School of Medicine who concluded that the cause was the factory wasted fluid, to defame as if they had conspired with companies of agricultural chemicals.

In the basin of the Agano River, there were factories and agricultural chemical plants, where mercury is used, as well as the Showa Denko Kanose plant. The epidemiological group of the Special Research Team confirmed that the waste water from these plants did not flow into the Agano River, and excluded them from the subjects as causative plants. As a result, only the Kanose plant of Showa Denko remained to be the causative factory.

On April 7, 1967, the Special Research Team presented a report to the Ministry of Health and Welfare, in which it was concluded that the methylmercury compound generated secondarily in the process of acetaldehyde production at the Showa Denko Kanose plant flew into the Agano River and accumulated in the river fishes, which were consumed by the inhabitants who had the disease, i.e., the second Minamata disease. On April 18, the Special Research Team reported it to the Science and Technology Agency as well to declare the conclusion openly. On April 24, the Ministry of Health and Welfare established the following organization in the Food and Sanitation Investigation Committee to assess the conclusion: “The special sectional meeting for preventive countermeasures against danger/injury and accidents, which are derived from contaminated food products accompanying contamination of rivers” [chairman: Prof. Kohei Toyokawa of The University of Tokyo (Dept. Hygiene)]. On August 30, it was replied by the Ministry that the outbreak of Minamata disease in Niigata was based on the waste water from the Showa Denko plant. However, it was deferred for the Government to draw a conclusion till the Science and Technology Agency conducted research.

2. Movements after the official presentation of Minamata disease in Niigata

(1) Activities of the victims

The victims in Niigata requested to clarify early the cause of the disease on the Government's own responsibility and to determine the cause of Minamata disease in Kumamoto as well, which was regarded as having been tentatively settled down. However, these movements did not progress.

The patients and so on, who evaluated that the attitudes of Showa Denko were unchanged, demanded compensation to the Ministry of Health and Welfare, but Chief Michio Hashimoto of the Environmental Pollution Section of the Ministry eagerly recommended them to raise a suit. In June 1967, the patients and so on went to law against Showa Denko (as the defendant) for damages. This is the first suit, which was raised, among the four big suits for environmental pollution in Japan. It offered socially great impact to the public. Almost simultaneously with the movement, the suit for environmental pollution in Yokkaichi was raised in September 1967, and the suit for Itai-Itai disease in Toyama was raised in March 1968. With this opportunity, public opinion about problems with environmental pollution has considerably changed.

The plaintiff and the lawyers for the plaintiff of the trial for Minamata disease in Niigata visited Minamata City in January 1968, and talked with "Citizens' Council for Minamata Disease Countermeasures" organized hastily with Minamata Disease Patient's Families Mutual Aid Society. As a result, they presented a joint statement showing that the affair in Kumamoto is the same as that in Niigata and the Government should recognize the conclusions drawn by scientists and carry out activities of the relief for the patients.

(2) The collective view of the Government

A.. Elucidation of the mechanism underlying generation of the methylmercury compound as the causative agent for Minamata disease

In November 1965, Prof. Seiji Kitamura, who had moved to Kobe University, and Prof. Keigai Sebe (Pharmacology), who had retired under the age limit, succeeded in secondarily generating the methylmercury compound from the process of acetaldehyde production in experiments on models. In 1967 they clarified the mechanism.

In response to the outbreak of the second Minamata disease in Niigata Prefecture, the Environmental Pollution Section of the Environmental Hygienics Bureau of the Ministry of Health and Welfare conducted fundamental surveys on the plants all over the country, which use mercury, by using the commissioned research funds included newly in the budget. On this occasion, they overcame the opposition of the Economic Planning Agency. In 1966, surveys were conducted with the commissioned research funds on the following plants among these plants, which had the highest possibility being contaminated with organic mercury, and the related water areas: Chisso Minamata plant, Oumi plant of Denki Kagaku Kogyo, and Dainippon Celluloid Arai plant. Based on the results, the Environmental Pollution Section asked the Economic Planning Agency to carry out regulation.

In June 1966, Prof. Katsuro Irukayama and his co-workers of Kumamoto University reported the following in an article discussing the mechanism underlying the reaction of secondary generation of the methylmercury compound from inorganic mercury used as catalyst in the process of acetaldehyde production: the reaction of acetylene to inorganic mercury does not induce directly the secondary generation of the methylmercury compound, but the addition of iron salt, manganese dioxide, and a chloride to the mixture of acetylene and inorganic mercury is estimated to secondarily generate the methylmercury compound.

In August 1967, Prof. Irukayama and his co-workers reported the detection of methylmercury chloride

from the factory wastes (essential drain) in a rectifier in the process of acetaldehyde production at the Minamata plant.

B. Presentation of the collective view of the Government on the cause of Minamata disease

To prepare an answer at the Diet to the inquiry as to whether Minamata disease is included in the diseases associated with environmental pollution, which are defined in the Environmental Pollution Countermeasures Basic Act, the Government made the first decision of the cause and the pollution source regarding so-called “diseases caused by environmental pollution” in May 1968. The Ministry of Health and Welfare offered an opinion about Itai-Itai disease that developed in the basin of the Jintsu River, showing that the disease is chronic poisoning with cadmium in the waste water from the Kamioka Mining Station, Mitsui Mining and Smelting Co., Ltd.. According to the Mining Act, the company was no-fault; it was unnecessary to demonstrate an act of deliberation or a fault under only the condition that an adequate causal relationship has been observed. Cadmium is an essential factor for the outbreak of Itai-Itai disease, but no explanation would be given with this factor alone. Under these circumstances, it was more difficult to demonstrate the causal relationship between Itai-Itai disease and the causative agent than to demonstrate that between Minamata disease and the causative agent. However, the opinion of the Ministry showed the first case in which the policy, i.e., “the conclusion for preventing the second outbreak from the Government’s standpoint”, was established. Chief Michio Hashimoto of the Environmental Pollution Section of the Environmental Hygienics Bureau was asked by the vice minister of the Ministry of Health and Welfare, “What are you going to do if the company sued us?”, when he asked for decision about this opinion. He answered, “We will undergo the suit, if so”, and he obtained the decision.

Director Kiichi Miyazawa of the Economic Planning Agency, who recognized the success in the countermeasures against Itai-Itai disease from the opinion about the disease offered by the Ministry of Health and Welfare, asked the Minister Sunao Sonoda to offer an opinion about Minamata disease. On September 26, 1968, the Ministry of Health and Welfare made a decision about Minamata disease in Kumamoto as follows: The methylmercury compound secondarily generated in the process of production of acetaldehyde and acetic acid at the Chisso Minamata plant is the cause of the disease. On the same day, the STA drew a conclusion about Minamata disease in Niigata, as follows, because the surveys were conducted with the special research funds of the Agency: the waste water containing the methylmercury compound secondarily generated in the process of acetaldehyde production at the Showa Denko Kanose plant is much involved with the origin of the poisoning. These opinions were reported officially as the Government’s collective view. Twelve years have passed since May 1956 when the outbreak of Minamata disease in Kumamoto was reported for the first time.

In May of the year when the collective view of the Government was offered, the operation of the process of acetaldehyde production at the Chisso Minamata plant and the Oumi plant of Denki Kagaku Kogyo was ceased at last in Japan. Thus, the domestic production of acetaldehyde, which used mercury as catalyst, has been ceased.

With regard to regulations about fishery in the contaminated sea areas, only the self-control of operation by the Fishermen’s Cooperative Associations has been conducted, and any forced measure to prohibit fishery has not been taken till the Government’s collective view was offered.

In November 1959, an officer-in-charge of the Economic Planning Agency has visited to inspect the actual place of Minamata. In February 1960, the Water Quality Deliberative Council designated the sea area of the southern half of the Shiranui Sea as the water area of the survey by the (Old) Water Quality Control Law. In actuality, the Economic Planning Agency designated the Minamata sea area as the specific water area, and decided to prohibit detection of the methylmercury compound from the plants of vinyl chloride (acetylene technique) and of electrolysis of mercury electrode. The control based on the (Old) Factory Wastes Law was initiated in February 1969 after the production of acetaldehyde at the Minamata

plant was ceased.

CHAPTER 5. Discussion and Lessons

1. Approach to environmental pollution before the outbreak of damages to health or before discovery of damages to health

[Discussion 1]

The ideal mechanisms underlying the early comprehension of abnormalities in living things, its use for the prevention of damages to health, and the early detection of damages to health.

(1) Circumstances

Nihon Chisso Hiryo K.K., the direct ancestor of the present company, Chisso, which was established in 1908, started producing acetaldehyde at the Minamata plant in 1932. The disputes between the Chisso Minamata plant and the fishing people regarding contamination of the seas with waste water from the plant have already started since 1926 until 1968 when the operation was ceased.

The contamination in the vicinity of the Hyakken seaport was increased during the period from 1951 to 1952; the fishes in fish preserves died and smelled of stale fishes, and the fishery was decreased. The MFCA asked to the Fisheries Section of Kumamoto Prefecture the field survey.

In August 1952, Chief Clerk Reiji Miyoshi of the Fisheries Section of the prefecture conducted the field survey, and concluded that the reduced amount of fisheries as damages to fisheries has been caused by waste water directly flown from the Minamata plant and by the residues accumulating for a long time. He reported that it is desirable to analyze and clarify the components of the waste water if necessary. However, no countermeasures were considered against the results of the survey.

Since about 1953, it has been observed that cats died mad and birds showed abnormalities in the fishing villages around Minamata Bay. In 1954, the fishing people proposed Health Section of Minamata City to get rid of rats, because the number of the cats was suddenly decreased and the number of the rats was increased.

In 1953 to about 1955, patients with strange nervous symptoms started being observed, and they came to receive examination. However, any diagnosis was not made, and the diseases of the patients were not considered one same disease.

(2) Discussion

A. Prevention of environmental pollution by the companies themselves

The companies that deal with harmful substances are in duty bound to collect not only useful information on production but also information on toxicity of the substance. Since certain implementation of the collection will not be led by the independency alone of the companies, the legal framework, which will make the companies to comprehend potent toxic substances by means of PRTR (drainage of environmental pollutants, registration of transfer) systems and so on, is also necessary. Reports on environment based on the third-party audit should be presented by establishing some divisions, like the environmental preservation department, in companies and stationing specialized staff members there, and by obtaining the ISO certification for environmental management. Thus, the companies must fulfil their responsibility.

B. Correlations between abnormalities in living things and the influence on human health in Minamata

1) The outbreak of damages to human health due to environmental pollution was preceded by damages to

animals and plants in many cases. In the case of Minamata as well, abnormal changes have been observed in living things such as fishes, birds, and cats.

2) In the villages of fishing people, the cats died mad, and the number of the rats was acutely increased. Health Section of Minamata City was asked to get rid of rats, because fishing nets were bit off by the rats. The Government did not pursue to determine the cause, despite the fact that the inhabitants were very anxious about the miserable phenomena in the cats of the district. In the social sense about public health at that time, it may have been considered tentatively adequate as the countermeasure against these phenomena to get rid of rats. The abnormal phenomena in cats and birds were overlooked without further consideration, partly thereby making the phenomena to have been beyond remedy. Specific attention should have been paid to the fact that the inhabitants of the district (fishing people) were eating in large quantities the same fishes as those given to the cats, and the fact should have been discussed.

In those days, some fishing people brought ships to the area in the vicinity of the Hyakken Outfall as a protection against worms, because sea lice did not stick to any fishing boat moored at the area. The fishing people have known that the factory wastes had the strong insecticidal action.

3) The outbreak of damages to fisheries should be regarded as signs of the outbreak of damages to the inhabitants' health, and the influence of the outbreak on ecosystem should be investigated. Since the report on the investigation of damages to fisheries, which was offered by Chief Clerk Reiji Miyoshi in 1952, indicated accurately the source of the contamination, the Government and investigators should also have set about making inquiries about the pollution.

If the Government had conducted appropriate measures by putting the report by Chief Clerk Miyoshi to practical use and the Minamata plant had obeyed them, the condition of the subsequent damages of Minamata disease should have been different from the real condition. The report by Chief Clerk Miyoshi was not put to practical use, because that the Government involving agricultural industry and fisheries in those days was designed only to protect resources and industries and that the following way of thinking about damages to fisheries has been dominant: financial compensation would solve problems with the damages to fisheries. This way of thinking about the damages became the factor for allowing even serious damages to men. If the damages to fishes and shellfishes had been revealed to be signs of the influence on human lives and health, such a result would not have been led.

The same way of thinking about environmental pollution is observed in the following case as well: even though many fowls, which had the foods containing PCB, died in the Kanemi Dark Oil Affair, nobody considered that the phenomenon would connect with that in humans, and the Ministry of Agriculture, Forestry and Fisheries had no connection with the Ministry of Health and Welfare.

C. Early detection of the influence of chemical substances on the nature and humans

1) The stage, in which abnormal changes occur in the process of transfer of specific chemical substances to living things and of concentration, varies with chemical substances. On considering an influence sensing system and damage-preventing countermeasures, the time when the countermeasures are considered and their contents are also dependent on the point as to whether the subjects include only "the influence on humans" or "the influence (including the influence on the specific type of reproductive function) on ecosystem excluding humans". With regard to countermeasures against chemical substances, the following are important tasks to be assessed: what kind of influence sensing system should be constructed? what should the countermeasures be against them? when should the countermeasures be considered on the basis of the results of the detection of influence?

The measurement of mercury level in feathers, which was reported in Sweden, is one of the good indicators of annual changes of the environment in the determination of the influence of chemical substances

on the natural world.

2) In the aspect of study, it is necessary to study for the early comprehension of abnormalities in the nature and ecosystem. Study from an interdisciplinary viewpoint is necessary for this purpose. Scientists show a strong tendency toward the qualifying pursuit of problems according to special fields. In Japan, there has been no viewpoint showing that conclusions are induced from comprehensive observation.

Even though observation of the nature as a whole reveals various things, it is difficult for articles to be written with such a theme. Therefore, scientists tend to conduct studies by which achievements would be easily produced; e.g., individual substance is examined for toxicity.

D. Mechanism of early discovery of damages of environmental pollution to health

1) Even though the ranking order of the structure of diseases changes from acute diseases to chronic ones, the health and medical government still decides the order of priority from mortality rate. This fact is considered one of the reasons for the failure in prompt countermeasures against damages to health. A special attention should be called to such a difference in the sense, as observed in medical specialists.

2) In the side of the health and environmental government, it is necessary for early comprehension of problems with damages of environmental pollution to health to form a network with the actual setting of medical care, to establish health monitoring in contaminated districts, and to foster and station health manpower for these purposes.

With regard to diseases of unknown cause, which are observed in the actual setting of medical care, it is important to early assess the possibility of environmental damages to health being present, to comprehend and report it, and to offer problems. Enlightenment of the consciousness of the side of medical care and the Government is requested and the system, in which the Government takes the initiative in requiring reports, is also needed to this purpose.

To prevent damages of environmental pollution, it is particularly necessary for medical organizations to act in cooperation with the Public Health Center, which conducts activities of surveillance and grasps the situation of environmental pollution.

3) The first “person who discovers damage” is the inhabitant him/herself in many cases. For the early discovery of damages to health as well, a system by which straight opinions of the inhabitants are heard is needed. In Minamata, the plant was the cause of the disease. This fact and the existence of fetal Minamata disease were consistent with “scents” of the inhabitants, i.e., the victims.

(3) Lessons

1) Detective susceptibility to abnormalities in living things

Abnormalities in living things are signs of their influence on humans. The inhabitants, companies, and the Government must become aware of them. Neglect and underestimation of the information obtained by observations lead to big damages.

2) Plans for the system of monitoring and analysis of the information offered from the natural world and of establishment of the countermeasures

In Minamata, it was the duty of the company and the Government primarily to understand some facts appearing as signs of risk in connection with each other, and to avoid the risk through freedom of

information and by considering necessary countermeasures against the risk. However, there were no division for the general comprehension of the signs or scientific, technological or interdisciplinary measures to counter them. This fact induced and expanded the damages. A system, by which information from the natural world is monitored and analyzed, and the necessary countermeasures are established, must be planned.

3) *Mechanism of the Government, which allows the sensitive reaction to the inhabitants' opinions and specialists' findings and induces concrete activities*

The Government should listen to straight opinions among the inhabitants, i.e., the first persons who discover the abnormal phenomena in environment and humans, without coming to anchor in the supreme position because it has special knowledge and rights, take up the abnormalities perceived by specialists of health and environment, and should be sensitive for reaction to these abnormalities. The criteria and framework, which are used for putting the collected information to practical use and bringing about concrete behavior, must be established in the Government.

4) *Freedom of information and the feedback by the Government*

The information comprehended by the Government should be opened to the public at the maximum after appropriate comment is given so that the meaning will be understood. The results of examination of the samples from individual inhabitants should be returned to the person him/herself as a rule. This is essential for accelerating the participation of the inhabitants and obtaining their cooperation, who first offer information on environmental pollution.

5) *Survey, study, and education of ecological system*

As the ecological system of the local community, correlations among humans, water areas, biota, and social and cultural background factors must be comprehensively discussed in survey and study. The necessity of the education for the purpose is felt strongly.

2. *Initial approach*

[Discussion 2]

The ideal initial approach to the occurrence of a disease of unknown cause

(1) *Circumstances*

The measures to counter the patients in Minamata were initiated by the establishment of Minamata Strange Disease Countermeasures Commission of Minmata City by the actual setting of the Government and medical care on May 28 and the commencement of the survey on the situation of the outbreak after the official discovery of Minamata disease on May 1, 1956. As a result, it was revealed that a plurality of patients with the disease appeared in a specified area within the fixed period. The commission suspected an infectious disease as well in the beginning, and Health Section of Minamata City and the Public Health Center conducted disinfection as a countermeasure against the infectious disease. In July, the patients were dealt with under the diagnosis of suspected cases of Japanese encephalitis, and transferred into isolated wards for infectious diseases as an immediate measure.

The initial inspection of the cause of Minamata disease was proceeded by the City and Prefectural

Governments, the Ministry of Health and Welfare and Kumamoto University School of Medicine by arranging their investigation systems, respectively. Kumamoto University School of Medicine organized the Study Group of Kumamoto University School of Medicine for the Strange Disease in Minamata (the Kumamoto University Research Group) in August, 1956 by request from the Prefectural Government. The patients in the isolated wards for infectious diseases were admitted to the university hospital as those for teaching and education.

In the report by the Research Group on November 3, the suspicion of infectious diseases was almost ruled out from the clinical findings and the results of bacteriological examination. Heavy metal poisoning mediated by fishes and shellfishes was suspected, and attention was paid to waste water from the Chisso plant as the cause of the contamination.

As the approach to Minamata disease in Niigata, a system for the inspection of the cause has been established early by fully using the achievements of the studies on Minamata disease in Kumamoto, since May 31, 1965 when the report was offered. On June 16 of the year, the Niigata Prefecture and the School of Medicine, Niigata University established a research group and initiated health screening. The guidance for inspection of the cause and fishery was also quickly conducted.

(2) Discussion

A. Approach of people of the district at the time of the outbreak of Minamata disease

1) The cooperation system, which involved medical associations, medical organizations, the City Government, and the Public Health Center in Minamata City, after the official declaration of the outbreak of Minamata disease was highly evaluated. The role of the Public Health Center particularly as the coordinator in the field of health and hygiene was remarkable. In Niigata as well, the initial system for studies was successfully established by fully using the cases in Kumamoto.

2) Since the disease was considered not to have been experienced by any investigator from the situation of the outbreak and the clinical symptoms, it was necessary for inspection of the cause to analyze symptoms by observation close to patients. However, the system for “the patients used for teaching and education” was obliged to be used for the admission to Kumamoto University Hospital, because the Government or the Prefectural Government did not bear the hospital expenses. The limit of the patients used for teaching and education was usually about one in each division, but an exceptional special measure was taken; 6 and 8 patients were admitted to the Dept. Pediatrics and the First Dept. Internal Medicine, respectively.

B. A point left to be desired about the initial approach--Medical research

1) Judging from the situation of the outbreak in those days, acute infectious disease was suspected first in the name of common sense. Patients could also receive medical care without charge in the wards for infectious diseases. When the condition was revealed not to be infectious, the result should have been made known to the local community. The living conditions and opinions of fishing people should have been further observed and heard.

2) It took at least 3 months for the full-scale system for medical research to start, but the strong support from the university of the district should have been asked earlier. The Kumamoto Government has not offered any information collected in the past, such as the report by Reiji Miyoshi, on asking Kumamoto University School of Medicine to study. This fact accounted mainly for the prolonged process of the

subsequent inspection of the cause of the disease.

3) The system for inspection of the cause must be established as soon as possible, so that accurate approach to the disease will be early taken. With regard to countermeasures against patients as well, countermeasures against the widespread cases of the disease must be conducted as quickly as possible for the accurate approach to damages to health.

C. A point left to be desired about the initial approach--Approach of the company

1) The inspection of the cause of the disease proceeded uneventfully until the Kumamoto University Research Group suspected Chisso to be the source of pollution, but thereafter there have been trials and errors for a long time.

This is mainly because the plant did not open the details of the production process or allow an on-the-spot inspection or collection of samples. The Research Group did not pay attention to mercury at that time, saying "It is unbelievable that a large amount of expensive mercury has been thrown away", because the Group had only inadequate knowledge about chemical factories. If the substances used at chemical factories and the process, in which they are used, had been overtly shown, the source of the pollution would have been revealed earlier.

[*Comments*] Mercury was described as a catalyst for the water addition reaction in the process of industrial production of acetaldehyde from acetylene in most textbooks of "chemistry" used at high schools in those days.

The attitude of the plant, which was suspected of being the causative company, is decisively important for inspection of the cause, and cooperation of the company in making activities of inspection of the cause is essential. The suspected plant is often uncooperative in the third-party's making activities of inspection of the cause, and attempts to cover the facts, which show that the plant itself is the source of the pollution. Even if the behavior can delay the inspection of the cause, the plant eventually bears the responsibility for the spread damages. The plant must keep this fact in mind.

2) In the case of Minamata disease, the methylmercury compound as the causative agent was a chemical substance generated secondarily in the process of reaction, and it was of no utility value for the company. These facts provided one cause of the delayed pursuit in the process of inspection of the cause.

D. A point left to be desired about the initial approach--Decision of countermeasures and politics by the Government

1) With regard to countermeasures in the initial approach, it is important for the Government to take promptly and actively the initiative in leading the people concerned to play appropriate roles. For this purpose, the Head of the Public Health Center and so on, who are persons in charge of the actual setting, must be authorized to solve problems and be given free hands in the problems.

Since it was revealed at the end of 1956 that the situation was very serious and 17 of 54 patients died, the Kumamoto Prefectural Government should have received the facts as the serious affair and requested officially the investigation of the factory wastes. The Ministry of Health and Welfare should also have supported the request officially and initiated group work in the Government.

[*Comments*] Various stages are considered for the approach; e.g., a stage in which investigational study is conducted by preparing the budget and manpower for the study or in which countermeasures such as fishery control, etc. are assessed, a stage in which legal measures, such as an order to cease the causative behavior,

are considered, a stage in which necessary legislative measures are conducted, and a stage in which measures to compensate after the fact is considered.

2) The causes of Minamata disease are of manifold meanings; causative agent, medium, causative behavior, etc. The methylmercury compound, factory wastes, and contaminated fishes, all of them cause Minamata disease. As a phenomenon, the factory wastes killed people in the case of Minamata disease. The fishing people, who lived on the sea, have long suspected the factory wastes as the cause of the disease.

The theory, which was related to the subsequently offered hypothesis of toxic amine, showed that the family members of the fishing people suffered from Minamata disease because they had weakened or floating fishes. This is wrong and even intentional. It is unbelievable that the fishing people who have looked directly the dreadfulness of Minamata disease ventured to have eaten the apparently toxic fishes and shellfishes in large quantities. It is wrong to comprehend the cause of the disease as if the responsibility for the outbreak will be partly placed on the fishing people.

At the point of time when the suspicion of infectious disease was reduced and the factory wastes was suspected as the cause in November 1956, not only the self-control of fishery but also the assessment of measures to regulate the factory wastes should also have been needed.

3) In the case of Minamata disease, it took considerably much time for rigid specification of the causative agent, which included confirmation of causal relationship and dose-reaction relationship, etc. However, the cause was not so completely unclear as any countermeasure could not have been taken during the period. It has been revealed in the early stage after the outbreak that the fishes and shellfishes were the direct cause of the outbreak.

In the case of Minamata disease, little attention was given to the fishes and shellfishes, i.e., the first cause via the human mouth, because there was strength insisting the rigid specification of the cause. The affected people's lives and the cause should have been urgently inspected. It might be unnecessary to obtain detailed chemical formulae, but urgent countermeasures against the fishes and shellfishes as the cause should have been taken.

At the point of time when ingestion of the fishes and shellfishes in Minamata Bay was revealed to be the cause of the disease, the Government should have taken a measure to prohibit fishery without comparison of the compensation problem with damages to health, in consideration of severity of the damages. And, at the point of time when the factory wastes were suspected of having caused intoxication of the fishes and shellfishes, the Government has needed to conduct an on-the-spot inspection of the plant and to take measures to cease the drainage of toxic substances.

4) Once the situation has been evaluated to be urgent and to be treated by every possible means for the purpose of preventing the spread of damages on the basis of recognition of the fixed situation, various kinds of countermeasures should be considered. The evaluation is conducted by the Government, but at the same time, political decision also becomes necessary. The decision by the Government and political decision lacked decisively in the case of Minamata disease.

The field survey on Minamata was conducted considerably later by politicians including the Prefectural Governor, committees of the Diet, etc. Not only the mass media but also the Government is responsible for offering information to politicians, so that they can make appropriate political decisions.

(3) Lessons

1) Quick approach to the urgent situation affecting people's lives

It has no time for the cause to be confirmed in the urgent situation affecting people's lives. The person in a responsible post for solving problems must decide and conduct quickly, extensively, and

actively the ways to approach according to cases after he/she confirms the high probability of the cause. On this occasion, the problem with compensation, which accompanies the approach to the probable cause, is not taken into consideration. Administrative officials and politicians have the responsibility for the risks of the decision and implementation.

2) *Collection of widespread information under the condition free from longitudinal relations within the same division or organization*

On the basis of a viewpoint of inspection of the cause, widespread information must be corrected from various fields, while harmful influences of longitudinal relations within the same division or organization are avoided. In this case, the collection is not of the situation-approach type. Such information collection has a particularly important meaning in the early stage after the outbreak.

[Comments] In PRTR Law (regarding promotion of improvements in comprehension and management of the amounts of specified chemical substances drained to environment), collection of information from subjects of companies dealing with chemical substances is defined in Section 2 of Article 5 as follows: “The companies dealing with first-class specified chemical substances ought to report to the competent Minister the items defined by the Ministerial ordinance of the competent authorities concerning the amounts of the first-class specified chemical substances drained and transported in the previous fiscal year, which are grasped according to the regulations (shown in the previous section), every year by the first-class specified chemical substances and by companies according to the Ministerial ordinance of the competent authorities”.

3) *The active indication of information by companies and assignment of a duty of cooperation to companies*

With regard to matters of damages to human health, it is essential for duties of active indication of information and cooperation to be assigned to the company that may be the source of pollution.

4) *Cooperation in the actual setting of medical care and implementation of surveys in the districts of the outbreak*

In the early stage after the outbreak, it is effective to secure the cooperation system involving the Government and medical participants, to reconsider patients' charts and inpatients, and to conduct epidemiological survey in the districts of the outbreak.

[Discussion 3]

What is the cause of discrimination against Minamata disease patients? What kind of approach will be taken to the cause?

(1) *Circumstances*

It is understandable that an infectious disease was suspected in the beginning after the outbreak, because many patients with similar symptoms have appeared during the specific period. The patients were isolated from the public as patients with infectious diseases, who are free of charge of medical expenses. The isolation was helpful for reducing financial pressure on the patients' family members.

As inspection of the cause progressed, it became increasingly clear among investigators in the early stage after the outbreak that the disease was not infectious disease. This fact did not infiltrate adequately into the

inhabitants' minds, and misunderstanding with infectious disease did not completely disappear. This provided a cause of discrimination against the patients.

(2) Discussion

A. Discrimination related to infectious diseases

In the Minamata district there was discrimination against Minamata disease patients and their family members. When considering the fact and the cause of the discrimination, the discrimination originating from the fear of the feature of a "kibyō (strange disease)" to be infectious can be indicated first.

In those days there were discrimination and prejudice against patients with infectious diseases, but it was a matter of the highest priority to isolate the patients because there was a high tendency toward social defense. The movement to correct the discrimination was therefore considered not to have been so active. In the case of Minamata disease as well, infectious disease was first suspected. Even though heavy metal poisoning was revealed to be the cause later, the suspicion did not disappear among the general people. Therefore, the Minamata disease patients are considered to have received discrimination related to infectious diseases.

B. The validity of the fact that infectious disease was suspected at the time of outbreak

It was extremely common sense to have suspected first an infectious disease for the massive outbreak of a "kibyō (strange disease)". Some doctors have thought that the disease is not an infectious disease in the early stage after the outbreak, but the patients were transported to the isolated wards for infectious diseases, thereby having reduced the financial burden to the distressed patients and the families.

C. Approach to the disease after it was revealed not to be infectious

During the period between 1957 and the former half of 1958, no patient was confirmed, partly because it was fully known to the inhabitants that Minamata disease might be the poisoning due to ingestion of fishes and shellfishes, and they avoided the ingestion. As another reason for the fact that no patient was observed during the period, it was difficult for patients with symptoms to have complained of them under the condition of the world.

For the inhabitants of the district, however, the hypothesis of heavy metal poisoning did not completely remove the fear of infectious diseases. At the point of time when the disease was revealed not to be infectious, this fact should have been declared openly and fully known to the local community. It is doubted, however, whether the prejudice against Minamata disease patients would have been removed only by ruling out the infectious disease hypothesis. For correct comprehension of the disease by the inhabitants, it is important to conduct activities of educational movements mainly involving the Government.

D. Discrimination derived from interests in the district

There are causes of the discrimination, other than infectious disease. It has been widely known that the symptoms were derived from poisoning through fishes and shellfishes. If the fishes or shellfishes had poor demands, the fishing people might be at a loss. Many citizens of Minamata, who have been dependent on Chisso, as well as the executive of Chisso and the workers had dislikes for the existence of the patients and the outbreak, because they were at a loss of cessation of the operation as a result of suspicion of the factory wastes as being the cause of the disease. Even now, the discrimination due to interests can become an issue.

The background factors of discrimination against the patients included the poverty of the people involved in small-sized fisheries, consciousness of discrimination against emigrants from Amakusa, etc., and common consciousness of discrimination against handicapped people. Green envy at the receipt of a present of money in token of the company's sympathy also occurred later, having promoted the discrimination.

E. The importance of removal of discrimination against the victims and of defense of human rights

- 1) How should the warrantable care for the victims be conducted? In th case as well, which excludes infectious diseases, it is necessary to consider a measure to guarantee the victims' livings in medical care by using public expenses for medical treatment until the causative party is determined.
- 2) Much instruction was drawn from Minamata disease as to the importance of removal of prejudice and discrimination against the patients and their family members and of the defense of the human rights in cooperation of the persons concerned in the fields of medical sciences, health and welfare, and education.

(3) Lessons

1) *The role of the Government in preventing discrimination and persecution against the damaged inhabitants*

For avoiding discrimination and persecution against the damaged inhabitants, the thorough conduction and prevalence of accurate information and education of human rights are essential. When the etiology of "kibyō (strange disease)" was revealed, the wrong impression about the feature to be infectious, hereditary influence, and the mechanism of the outbreak should have been removed, and activities of the Government to drive home accurate knowledge should have been needed.

3. Health screening

[Discussion 4]

How was health screening of the inhabitants in the contaminated district conducted in the process of inspection of the cause of Minamata disease?

(1) Circumstances

The survey conducted to detect patients in the beginning of the outbreak in Minamata district was one of the surveys on the situation of the outbreak by Minamata Strange Disease Countermeasures Commission of Minmata City organized when the outbreak of a strange disease was reported. The patients' charts were reconsidered at various medical care organizations, and the results were reported to the Prefectural Government in August 1956.

The Scientific Resaerch Group of the Ministry of Health and Welfare conducted epidemiological surveys at Minamata City and Akasaki in Tsunagi village in November 1956. In December 1956, the First Dept. of Internal Medicine and Depts. of Pediatrics and Public Health, Kumamoto University School of Medicine, as well as the city commission, made calls on patients at their houses in the district of the outbreak (Modo, Tsukinoura, Dezuki, and Yudo), and conducted Fukuro elementary and junior high school health examinations and epidemiological surveys.

Yoshikazu Matsushima (Leader) and others of the Kumamoto Prefectural Institute of Public Health conducted the examination of mercury level in hairs in all areas of Shiranui Sea for 3 years after November

1960. They examined in 2,726 cases during the 3-year period. The First Dept. of Internal Medicine, Kumamoto University School of Medicine, investigated symptoms in the inhabitants of the Goshonoura district by a questionnaire survey on the basis of results of the survey, but no medical examination was conducted

[*Comments*] Kumamoto Prefecture and Kagoshima Prefecture started conducting health screening in 1971. The subjects of the questionnaire survey were approximately 110,000 inhabitants, and approximately 23,000 of them underwent medical examination. About half of the subjects received secondary medical examination. In the same year, the secondary research group [“the Minamata disease study group 10 years hence” (Leader: Prof. Tadao Takeuchi)] was established in Kumamoto University School of Medicine, and a health screening was conducted on a large scale.

In Niigata, Niigata University started conducting health screening about signs, situation of the use of agricultural chemicals, and situation of ingestion of river fishes by the house-to-house investigation system in 2,813 inhabitants on the lower Agano in June, 1965, in cooperation with the Public Health Center. In the same month, mainly Niigata Prefecture, the cities, towns, and villages concerned, and the Public Health Center conducted health screening by the house-to-house investigation system in ca. 20,000 inhabitants, medical examination of the people with symptoms, and the determination of mercury level in hairs. Thus, effort to discover potential patients was made, and it was revealed that the patient started being observed in August 1964 and that 26 patients appeared, 5 of whom died.

(2) Discussion

A. Purpose of health screening

In epidemiology, a hypothesis regarding a regularity factor for the occurrence of disease is inspected from the facts obtained from the results of health screening and clinical cases. A dose-reaction relationship is also inspected for the decision of causal relationship. There has also been the aspect of qualitative comprehension of the influence on health and the spread of damages (discovery of patients) in the health screening of inhabitants in the beginning of the study. The health screening for comprehension of the actual situation of damages is different from the epidemiological survey for inspection of the cause of damages in terms of the program.

B. Elucidation of diseases of unknown cause and inspection of the cause

1) The survey for elucidation of morbid features should also be early conducted on an adequate scale, because the true state of a disease becomes vague when various physical and social factors are added to the disease as the time passes.

2) The epidemiological survey of Minamata disease, which was conducted in the early stage after the outbreak mainly by the Dept. of Public Health, Kumamoto University School of Medicine, included investigation of the places of the patients, year, month, and season of the onsets, age, sex, and occupation of the patients, and abnormalities in animals. Valuable results were obtained.

The Kumamoto University Research Group was obliged to have concentrated its energy on research and study for inspection of the cause until July 1959 when the Group declared openly the hypothesis showing that organic mercury was the cause of the disease. Therefore, the Group could not afford to conduct wide-ranging and profound health screening for the inhabitants.

3) In the case of Niigata, findings of Minamata disease in Kumamoto accumulated and the causative

agent was also clear. Therefore, only the spread of the pollution could be dealt with as problem on the investigation, which was effectively conducted. In the case of Niigata as well, however, the investigation was not adequate in some aspects; the lessons obtained in Minamata were succeeded to the case of Niigata, but no investigation was conducted in the area of the middle reaches or up the Agano River, in which the suspected plant was located.

With regard to the clinical features of Minamata disease, the results obtained in Niigata could eventually be assessed in comparison with those obtained by the Kumamoto University Research Group.

C. Noncommittal implementation of health screening, etc.

1) The epidemiological survey on the spread of the damages and inspection of the cause, which has been conducted since the poisoning with waste water from the Chisso plant was suspected, was not adequate.

One possible reason why some problems with Minamata disease still remain unsolved is considered to be that no epidemiological controls could be collected, the range of health screening was restricted, the determination of hair mercury level was not continuous, and health screening was not thorough.

2) From midyear 1960 onward, the voice telling termination of the outbreak has dominated the public and even the research group. Since there have been no reports of new case from the district, the First Dept. of Internal Medicine, Kumamoto University School of Medicine has also described in the introduction of an article, "Minamata disease, which has struck terror into the inhabitants' hearts, also appears to have been stamped out because there have been no new case since 1961".

The Prefectural Government or the Government had no intention of conducting health screening of the inhabitants, which requires much expenses, time, and labors.

[Comments] In 1969, the Director Hasuo Ito of Public Health Department of Kumamoto Prefecture (the ex-Director of Minamata Public Health Center) answered a question about the necessity of simultaneous medical examination of the inhabitants, which was offered at the Kumamoto Assembly, as follows: "In the beginning of the outbreak, the patients with symptoms were examined at a medical care institution of the district, and no potential patients could be detected on the epidemiological investigation by questionnaire about health, which was conducted by the Director of the Epidemiology Division of the Institute of Public Health, and others (in The Scientific Research Group of the Ministry of Health and Welfare in November 1956). Even at present, the people with symptoms are being examined at medical practitioners of the district, who refer the patients to the Minamata Municipal Hospital, which is the best for medical examination of Minamata disease, and report suspected cases to the Board of Screening of Minamata Disease Patients. Since the door is thus opened for the examination, simultaneous medical examination is not necessary". However, even though the certification is applicable, it is not probable that health screening is unnecessary.

3) In Niigata, a house-to-house investigation was mainly conducted as an early survey. This method is highly evaluated in the sense of the detection of potential patients, and the data obtained should be used as lessons in case of environmental pollution. The people, who showed high hair mercury levels, and those with symptoms were followed up after the house-to-house investigation in Niigata, and 41 patients have been observed by December 1969.

[Comments] Thereafter, the second simultaneous medical examination was conducted in 11,904 people in 1970; the subjects consisted of the people, who answered to have had river fishes in large quantities on the first investigation, and MFCA members in the basin of the river. As the first step, symptoms were investigated by questionnaire (recovery rate, 92.5%). As the second step, 2,931 people were extracted from the subjects and medically examined in the district (the rate of the subjects examined, 72.1%). As the third step, close examination was conducted on 569 (73.1%) of the subjects at Niigata University, and 231 were eventually diagnosed as having Minamata disease.

The investigation in Niigata was exemplary. Even so, some of the people, who could not be detected on the investigation, were occasionally certified to have had the disease when they applied. This fact indicates that there is no perfect investigation of the influence of environmental pollution.

D. The role of the Government in health screening, etc.

1) The role of investigation as research activity of universities is different from that of investigation by the Government. Large-scaled health screening for meeting the social needs requires huge expenses and effort, and it must be tackled as the tasks confronting the Government and politics.

2) The survey for determining the range of damages must be early conducted on a large scale. When an abnormality is found, information should be opened to the person concerned and the society, and be practically used for the countermeasures.

3) The Kumamoto University Research Group made an effort singular in history to comprehend damages to health in the early stage after the outbreak. In those days, the survey including tens of thousands of subjects was needed when the districts of contamination and the control district were included, and the survey including everything was difficult.

It is impossible for one university alone to comprehend large-scale damages to health. The health screening after the decision of the cause of the disease may also be left to the causative party, but in the case of unknown causative party, the health screening must be conducted first on the Government's own responsibility.

In those days, the following way of thinking about survey of damages has not been widely adopted: large-scale and all-inclusive survey of damages from the aspect of public health should be performed. In fact, it may have been difficult for the Kumamoto Prefecture to conduct the survey on a large scale, but it has been possible even for the Prefectural Government to have conducted stepwise the survey by narrowing the district to be investigated. If the necessity of more widespread survey had been clarified from the results of the stepwise survey, the Government might have conducted the health screening. Some clues to the subsequent solution of the problems may also have been provided from the survey.

4) Investigation of contamination and health screening after the decision of the causative person should be conducted at the causative person's expense. When the causative person does not bear any of them, the system, in which the Government forces the causative person to bear them by exercising the right to indemnity, should also be considered.

E. Investigation of hair mercury level

The investigation of hair mercury level conducted by the Kumamoto Prefectural Institute of Public Health for 3 years after November, 1960 was designed to prevent new patient of Minamata disease by determining fluctuations in hair mercury level in the inhabitants along the shore of the Shinanui Sea. The investigation was conducted with a conduction fund of Chiyoda Mutual Life Insurance Co. because of prefectural budgetary limitations.

The procedure for the determination of hair mercury excelled as an epidemiological survey. However, it is very regretful that the valuable data of the investigation of hair mercury level were not put to practical use for the detection of (mild) patients or the investigation of the spread of contamination. The determination should be conducted regularly even after the investigation, because it might have shown the course of the

subsequent mercury pollution. The results of the investigation of hair mercury should also have been used for the consultation and guide for the subsequent approach by reporting them to the subjects.

F. Follow-up study

Continuously observation of patients was not conducted in Minamata disease or Kanemi Yusho. When a follow-up study of patients was attempted, it was impossible because of moving of many patients, or no cooperation was obtained from any patient because of the absence of continuous observation.

<Column> *What is epidemiology?*

“Epidemiology” is a field of medical sciences, in which the frequency, period, and distribution of damages to health in human population are investigated, and the causes of the damages and various related factors are clarified from the data.

Epidemiology has originally been designed to clarify the causes of infectious diseases, but in recent years, non-infectious chronic diseases and cancers are also included in the subjects of epidemiology. There is recognition that the occurrence of disease is regulated by interactions of factors, i.e., cause (etiology), host (humans), and environment (opportunity of contact with etiological factors, habit, etc.).

Therefore, epidemiological methods are briefly composed of (1) comprehension of the actual situation of damages to health (description of the distribution of diseases), (2) assessment of related factors (formation of a hypothesis and demonstration of the hypothesis through case-control and factor-control studies), and (3) decision of causal relationship (confirmation by experiments). When demonstrating epidemiological causal relationship, correlations between estimated causal factors (biological etiology, physical etiology, chemical etiology, and mental etiology) and facts that are considered the results are revealed by observation of human population. The correlations are believed to meet the following 5 conditions: consistency, strength, specificity, temporal relationship, and rationality.

(3) Lessons

1) Decision of the implementation of health screening by the Government

It is necessary first for considering countermeasures to securely comprehend the spread of contamination and damages. To realize this, it is necessary to conduct widespread health screening of inhabitants without adherence to countermeasures against the public order or compensation. If the survey including everything is difficult, at least sampling survey should be conducted. A survey on the control group may also be requested for the determination of regional characteristics.

The Government should decide on its own responsibility in terms of the following: whether health screening should be conducted; if so, on what scale it should be conducted.

2) Implementation of early, widespread, and thorough health screening

Inspection of the cause of the disease is needed to establishment of effective countermeasures. In health screening designed to inspect the cause, it is important to conduct early, widespread, and thorough epidemiological survey regardless of expenses or man-power labor.

3) Importance of follow-up studies

Follow-up studies on health of inhabitants in widespread regions, which pay attention to the extent

of exposure to the pollution, are extremely effective for prevention of the subsequent spread of damages and for the appropriate treatment of problems.

4. Inspection of the cause

[Discussion 5.]

How were the investigators involved with inspection of the cause of Minamata disease?

(1) Circumstances

A. Effort to inspect the cause

No academical persons in the technology field were included in any research group like the Kumamoto University Research Group. Since the plant was also uncooperative for the research, understanding of the production process by the people of the plant was extremely inadequate.

The Dept. of Pathology, Kumamoto University School of Medicine asked Head Hasuo Ito of Minamata Public Health Center to conduct an experiment in the actual place.

In the study report by the Kumamoto University Research Group in November 1956, contamination of fishes and shellfishes with the factory wastes was already suspected as the cause of Minamata disease. The Department of Public Health, Kumamoto University School of Medicine initiated an experiment of the development of Minamata disease in cats. In the first half of 1957, Minamata disease was confirmed to be poisoning with the fishes and shellfishes caught in Minamata Bay as a result of the experiments using cats by Head Ito of the Public Health Center and Prof. Kansuke Sera of the Dept. of Forensic Medicine, Kumamoto University School of Medicine. In spite of the confirmation, it has taken long time for the causative agent to have been specified since then.

Director Hajime Hosokawa himself, who has reported the occurrence of Minamata disease, started conducting experiments using cats in Chisso Hospital in May 1957. He initiated an experiment by directly adding the waste water collected in the processes of acetaldehyde production and vinyl chloride production, in which mercury was used, to the food for cats in July 1959. In October 6 of the year, the onset was observed in a cat numbered "400" (No. 400 cat) which was maintained with the food, to which the waste water in the process of acetaldehyde production was directly added. Hosokawa, however, avoided to declare the result openly with the intention of the executives of the technology division of the plant.

The Kumamoto University Research Group presented the organic mercury hypothesis as to the causative agent for the disease in July 1959 on the basis of the patients' symptoms and pathological findings and the fact that a large quantity of mercury was demonstrated from sludge of Minamata Bay. In 1962, Prof. Katsuro Irukayama extracted methylmercury chloride from the mercury sediment in the process of acetaldehyde production, and in 1965 Prof. Kitamura et al. succeeded experimentally in secondarily generating the methylmercury compound from the process of acetaldehyde production. In 1967, Prof. Keigai Sebe, Prof. Shoji Kitamura, and others confirmed the mechanism underlying reaction of secondary generation of the methylmercury compound from inorganic mercury in the process of acetaldehyde production. In the same year, Prof. Irukayama and his colleagues extracted the methylmercury compound from the wasted fluid of the rectifier in the process of acetaldehyde production in the Minamata plant.

Asst. Prof. Haruhiko Tokuomi, Prof. Tadao Takeuchi, and others presented the organic mercury hypothesis at the Japanese Society of Psychiatry and Neurology in April 1960, and Assis. Prof. Tokuomi received the society prize for the presentation. In September 1961, Drs. Takeuchi, Kitamura, Tokuomi, and Makio Uchida reported the achievements of study of Minamata disease at the 7th International Congress of

Neurology as well, which was held in Rome. Neurologists in foreign countries also knew that the cause of the disease was methylmercury poisoning.

[Comments] The Kumamoto University Research Group received the Asahi Prize in 1967, and Le Prix De L'institut De La Vie (the prize of the Life Research Institute of France) in 1977.

B. Counterarguments by companies

The causative company suppressed the office data on the experiments including the No. 400 cat experiment, which were disadvantageous to the company, and thereafter the experiments themselves were prohibited. Against the inspection of the cause mainly by Kumamoto University School of Medicine, the counterargument of only one company was changed to that of the Japan Chemical Industry Association. Particularly the explosive hypothesis compounds and the toxic amine hypothesis, which involved the mass media via the central academic society and authorities of universities, confused public opinions about the cause of Minamata disease.

(2) Discussion

A. Minamata Strange Disease Countermeasures Commission of Minamata City

Immediately after the official detection of Minamata disease in May 1956, the Public Health Center, the medical association, the (Minamata) Municipal Hospital, Chisso Hospital, and Health Section of Minamata City cooperated to organize Minamata Strange Disease Countermeasures Commission in the district, and made effort to detect patients, admit them to hospitals, and investigate them. However, the cause was unclear, and they asked Kumamoto University School of Medicine for its help. At that time, 3 months or more have already passed, and according to some people, the help of a university in the district should have been asked much earlier.

B. Relationship between the Kumamoto University Research Group and investigators

1) The Study Group of Kumamoto University School of Medicine for the Strange Disease in Minamata (the Kumamoto University Research Group) was organized in August 1956, but there were no research funds for the fiscal year. The Group applied scientific research funds by the Ministry of Education in May 1957, but it could get only ¥680,000 as the research funds. Thus, the investigators of Minamata disease had a very hard time in studying the disease in the early stage after the outbreak under the postwar situation in which instruments for studies, drugs, information in the literature, research funds, and investigators were deficient. No definite opinion was established even among the investigators of the same university. Trials and errors were repeated in terms of investigation of the disease, and it took 3 years for the causative agent to have been revealed to be organic mercury.

It was a general tendency at that time, but information exchange among the departments in the Kumamoto University Research Group was not necessarily adequate; occasionally, some studies repeated, and information in the Chisso plant was unevenly distributed.

2) Prompt communication and information exchange among the fields of industrial hygiene, local health, etc. and among clinical medicine, basic medicine, pharmacology, technology, etc. are essential for early inspection of the cause. Interdisciplinary studies are necessary and important, but it was difficult to realize them under the situation of studies and research in those days. In actuality, no inspection of the cause from a viewpoint of industrial hygienics was conducted.

3) In the beginning of the establishment of the Kumamoto University Research Group, there was no proposal of cooperation from the Dept. of Technology. The Group did not actively ask any investigator of the Dept. of Physical Science or Technology for his/her cooperation. The reaction with mercury used in the process of acetaldehyde production is so well known by students of the Dept. of Technology and the Course of Chemistry of the Physical Science Dept. that it is described in the textbooks for high school students. If the investigators in the wide-ranging field of the science and engineering system had participated in the Group, more comprehensive approach might have been conducted. The Pharmacology Dept. or Technology Dept. of the Science and engineering system did not participate in the Group.

However, the participation of investigators of the technology system is a two-edged instrument; inspection of the cause mainly by medical scientists was conducted, who took their position as a third party against the causative company, when considering inspection of the cause in conformity with the situation in those days. That was why the organic mercury hypothesis was declared openly. In this respect, some people have considered that it was rather favorable for these investigators in the technology system not to have participated in the Research Group.

4) In contrast with this, some doctors of Chisso Hospital were residents of Kumamoto University School of Medicine. Therefore, Chisso is considered to have constantly comprehended the situation of research progress of the Kumamoto University Research Group.

C. Experiment with cats

The experiments using cats by Head Ito of the Public Health Center and Prof. Kansuke Sera are highly indicative in the point that they led to important results, i.e., the abnormality with the fishes and shellfishes in Minamata Bay even without any high-grade instrument. Despite the fact that important results useful for countermeasures were obtained, however, only self-control of ingestion of fishes and shellfishes was appealed to the people, and any strong measure to prohibit the ingestion was not taken in Minamata.

(3) Lessons

1) Implementation of interdisciplinary studies by presentation of information and cooperation system arrangement among investigators

Interdisciplinary studies are necessary for environmental problems. Presentation of information to investigators and cooperation system among the investigators are essential for making the studies successful.

2) Necessity of investigators' recognition of the relationship between technology and decision of policy

Technology shows two-sidedness. It is necessary for considering countermeasures to recognize it. On the other hand, the pursuit of scientific rigidity, which includes a causal relationship, and of perfection of technique for countermeasures was employed to defer the defense of contaminated people and the decision of policy. Investigators must also recognize this fact.

3) Rightful evaluation of the Government in terms of the studies for practical use in conformity with actual conditions of the district

As confirmed by the experiments using cats that the fishes and shellfishes in Minamata Bay are the cause of the disease, it is important for drawing a useful conclusion in deciding countermeasures to

make innovations in the method of study, which can be implemented without any expensive device of measurement or up-to-date technique and which is appropriate for the district's circumstances, and to put them to practical use. It is also necessary for the Government to rightfully evaluate the achievements obtained by these studies and to encourage them.

[Discussion 6]

What should be expected from the company as its social responsibility for inspection of the cause? How should the company approach to the environmental pollution?

How will acts to prevent environmental pollution be expected from companies and the business organization, which are involved with chemical industries?

(1) *Circumstances*

A. Acts of Chisso, Showa Denko, and the Japan Chemical Industry Association

1) Chisso secretly changed the factory drainage channel to lead to the spread of damage. It requested the rigid demonstration of a causal relationship between Minamata disease and the factory wastes, and refuted stubbornly the achievements of study to the effect that the Chisso Minamata plant is the source of the occurrence of causative agent for Minamata disease. They did not declare openly the results of the No. 400 cat experiment performed in the plant, and further experiment was also stopped. Despite the fact that "Cyclator" is not useful for prevention of the spread of Minamata disease, its effect was exaggerated, leading to perplexed public opinion. Thereafter, methylmercury chloride was extracted from the wasted fluid in the process of acetaldehyde production in the Chisso, but the results of the experiment were not declared openly, either.

Chisso refused all on-the-spot inspections and requests for sample collection by outside investigators. Thus, Chisso had no attitude to cooperation.

2) Showa Denko insisted the agricultural chemicals hypothesis, and had a dispute with the research groups sponsored by the Ministry of Health and Welfare and Niigata University under the guidance of MITI. Since the differentiation of organic mercury used for an agricultural chemical (phenyl mercury used for paddy-rice plants) from methylmercury was not adequately understandable for the administrative authorities in those days, the hypothesis of agricultural chemicals insisted by Showa Denko perplexed the administrative authorities as well.

3) The Japan Chemical Industry Association positively started out to settle the problem, Minamata disease, which has become a social issue, from the standpoint of business community. The Association established the Tamiya Committee by utilizing authoritative investigators and academic societies' authorities, and eventually delayed inspection of the cause.

B. Contents of counterarguments of companies and business community

The Japan Chemical Industry Association offered a counterargument by raising the following points: (1) there have been no incidence of Minamata disease around other plants which possessed the process of acetaldehyde production; (2) assuming that the Chisso Minamata plant and the Showa Denko Kanose plant were the causes of the disease, why has not it occurred around other plants of the same kind? (3) The Chisso Minamata plant has started operation since the early time of Showa, and the Showa Denko Kanose plant has also started operation 12 years ago, but why were there incidences of Minamata disease dozens of

years after the start? (4) Why did not the disease occur before the outbreaks?

[Comments] It was impossible to explain the incidences observed from the latter half of the period between 1945 and 1954 onward in Minamata by the change in the acetaldehyde production volume. Emeritus Prof. Hajime Nishimura and his colleagues, the Faculty of Technology, University of Tokyo, elucidated the mechanism underlying the rapid increase in rate of secondary generation of the methylmercury compound by altering the promoter in 1951. The study was reported in “Gendai Kagaku”(Chemistry Today) (February and March issues, 1998) in 1998.

(2) Discussion

A. Penal responsibility and civil responsibility of companies

1) The companies, which damage the inhabitants' health with the chemical substances drained from the plants and lead them to death, should be taken to task for civil responsibility and penal responsibility.

With regard to penal responsibility for Minamata disease, the alteration of the drainage channel by Chisso became the conclusive factor for establishment of guilts of the Chisso's president and the chief of the plant, who were subsequently prosecuted for a criminal case (professional negligence accidental homicide). However, it is not true that only the alteration of the drainage channel is a problem. Even if a person's acts are socially useful transport business and medical care, he/she is taken to task for professional negligence accidental homicide in the case in which a man dies or receive damage by accident in the acts. If his/her intention is recognized, he/she is taken to task for homicide and injury as well. It is true in environmental pollution which damages human life and health with the chemical substances drained from plants. However, the people have only a superficial understanding of the fact. To let companies and the business organization do activities for preventing the victim from environmental pollution, the lodgment of crimes should be included in the judicial means.

2) With regard to civil responsibility for Minamata disease, Chisso and Showa Denko have been adjudged guilty of civil responsibility, but both companies neglected their duties to prevent the disease; they were uncooperative in inspection of the cause, and continued to offer counterarguments against the effort made outside to inspect the cause. During that period, the damage spread, and the civil responsibilities of both companies also became heavy. These acts indicate that causative company should not conceal the fact (that they are the causative companies) from public, but cooperate in early inspection of the cause and take preventive measures to counter damage.

3) Minamata disease in Kumamoto Prefecture was the first affair over the world, but the outbreak of Minamata disease in Niigata Prefecture was induced, despite that there has already been experience of Kumamoto Prefecture and that information and guidance for the disease have been offered by MITI. The responsibility of Showa Denko as the causative company is very serious.

4) Chemical plants will be taken to task for results, unless the safety of drainage is demonstrated by themselves on the basis of the way of thinking about the safety. In 1972, the laws of compensation for no-fault damage to health due to air pollution and water pollution were established, and the Environmental Pollution Crime Act was also established in 1970.

B. Approach of the business community

In the former half of the period between 1955 and 1964, when drainage from the Chisso plant was suspected of having caused Minamata disease in Kumamoto Prefecture and when the organic mercury

hypothesis was also declared openly, have other similar plants taken any countermeasures against the drainage? The Japan Chemical Industry Association, which has made a desperate effort to deny the organic mercury hypothesis, did not appear to have accepted the situation seriously or to have received checking by the business community itself. The data collected on the drainage by the Association were not declared openly. On one hand, the Association refused an on-the-spot inspection. It is necessary for the companies to inspect what kind of approach they have taken for the plants possessing the same type of production process, as well as the guide offered from MITI to the business community from the time onward when the organic mercury hypothesis was offered.

C. Presentation of information

1) When a company causes environmental disruption, it becomes its most duty to relieve the victims and to positively present the data. The companies, which were suspected of having caused Minamata disease, should have gone all out to cooperate in inspection of the cause by offering not only information but samples and to present the internal data and results when they were suspected. However, Chisso did not present positively the internal data. Positive presentation of information is essential not only for the Supervision but also for the inhabitants.

2) It is impermissible that the production process is closed in spite of the presence of potential risk on the strength of enterprise secret. It is also an important point how the economically non-valuable chemical substances generated in the process are treated.

These companies also have the right to offer counterarguments, of course, but it should be established as social morals that concealment and falsification of the matters concerned about human health should not be allowed.

D. Inspection of a correlation between working environment and environmental pollution within the plant

1) The frequencies of troubles and workmen's accidents in Chisso were higher than those in other chemical factories of the same kind. If education of workers about the safety and sanitation in the actual setting had been thorough and if the company's attitude toward observation of the relationship between the occurrence of abnormality in the plant and environmental pollution had been complete, the approach of the company to inspection of the cause may also have been different from the actual approach.

2) The following way of thinking is important: "a causal relationship of environmental pollution is grasped from the data on vocational diseases, because working environment of the plant should have been contaminated before the observation of environmental pollution outside the plant". In the examples of Chisso, attention must be paid not only to drainage but also the risk in workers who clean sludge (dregs) in the rectifier.

[Comments] Nobuko Iijima (environmental sociology) has summarized "A chronological table of environmental pollution, workmen's accidents, and vocational diseases" from such a viewpoint.

3) In the case of environmental pollution by factory drainage, which has influence on human health, the environmental administration and the administration for workmen's accidents and vocational diseases have to be consistently proceeded in cooperation with each other, because similar damages may have occurred in the workers as well in the plant as the source of pollution.

(3) Lessons

1) *Recognition of penal and civil responsibilities for environmental problems and those with environmental pollution*

Companies have responsibility as its social existence, and it is distinctly impermissible for them to regard only profit-making activities as supreme objective. It is also proper in any time that criminal acts or illegal acts, which may induce some risk to at least human life, should not be permitted. In environmental problems and those with environmental pollution, it is known that companies have responsibility to obey the regulations by the administrative laws and to compensate for damage. However, it should also be emphasized that some cases may be taken to task for penal responsibility. The Minamata disease affair was just a crime.

2) *Liability of chemical factories for security of the safety*

Chemical factories always have to confirm the safety by using the highest knowledge and technology when they drain waste water. In case of doubt about the safety, the necessary maximum measures to prevent danger and injury, which include cessation of operation, have to be immediately considered. In chemical factories particularly, it is essential to confirm the safety of the secondarily generated materials, which are excluded from the economically valuable subjects.

3) *Reconsideration of companies' close-to-the-vest method on the strength of protection of the Government*

The prophylactic measures to counter environmental pollution and presentation of information will lead to companies' interests from a long-term viewpoint. The same administrative organization may control simultaneously checking of the companies in terms of environment and protective development of the companies. However, the system, which will avoid the companies' abusing the protection by the Government and refusing the presentation of information, should be established.

4) *Inspection of a correlation of workmen's accidents and vocational diseases with environmental pollution*

Industrial hygiene and education of the safety are also important. The correlation of workmen's accidents and vocational diseases with environmental pollution must be inspected.

[Discussion 7]

How was the role of the Government in inspection of the cause of the disease and how were relationships among the ministries and offices concerned? How was the role of the Prefectural Government in inspection of the cause?

(1) *Circumstances*

A. *The Ministry of Health and Welfare*

The Ministry of Health and Welfare was reported by the Kumamoto Prefectural Government about the disease in August 1956, and the Epidemic Prevention Section of the Public Health Bureau managed the problem. From 1957 onward, the problem was under the control by the Food Sanitation Section. The Scientific Research Group of the Ministry of Health and Welfare was established in November 1956, and the

achievements of studies and the countermeasures were reported to the ministries and offices concerned and the autonomy concerned in 1957. In October 1959, the Ministry asked MITI to consider the most appropriate treatment of factory wastes in the current stage as soon as possible, and a report by The Food and Sanitation Investigation Committee of the Ministry of Health and Welfare was offered in November of the year.

The Environmental Pollution Section was established in 1964, and a basic survey was conducted on the factories using mercury all over the country in December 1965. The Ministry of Health and Welfare assisted publication of a report entitled "Minamata disease--A study of organic mercury poisoning--", into which achievements of past studies on Minamata disease were compiled by Kumamoto University School of Medicine, with trust money for investigation and research of environmental pollution in 1965. In 1966 the actual state of environmental pollution with mercury was conducted on three factories.

The opinion of the Ministry about Minamata disease was acknowledged at the cabinet meeting in September 1968.

B. Fisheries Agency

In November 1959, the Fisheries Agency requested of the Economic Planning Agency that Minamata Bay waters should be regarded as the specified waters based on the (Old) Water Quality Control Law and investigated as early as possible, because Minamata disease is considered attributable to fishes and shellfishes, which were probably influenced by factory wastes, from many points.

At the same time, it has been clarified to MITI that harmful substances are almost organic mercury compounds. Therefore, as a part of the fundamental measures to solve the substances, the Fisheries Agency requested of MITI that the Ministry would pay a particular attention to appropriate countermeasures against factory wastes as quickly as possible.

C. MITI

MITI has constantly raised an objection against the organic mercury hypothesis; in November 1959 they offered a counterargument against the hypothesis at "the liaison conference of ministries concerning food poisoning in Minamata". In this month, drainage survey was conducted on factories of production of acetaldehyde and vinyl chloride all over the country, but the results were not declared openly.

MITI offered a report to the Ministry of Health and Welfare and the Fisheries Agency, to the effect that the Ministry indicated Chisso to adequately cooperate with research groups in terms of abolition of the direct drainage channel to the Shiranui Sea from the Chisso plant, early completion of drainage disposal facilities, and surveys including inspection of the cause, although it is impossible to ascribe the cause to drainage from Chisso because a number of problems still remained unsolved on regarding harmful substances as the organic mercury compound.

D. Economic Planning Agency, MITI, Ministry of Health and Welfare, and Fisheries Agency

In Minamata Disease General Investigation and Research Liaison Council, each ministry had the following rights: Food sanitation and medical care were included in the right of the Ministry of Health and Welfare, fisheries in the Fisheries Agency, factories in MITI, and the entire evaluation in the Economic Planning Agency. The investigators who raised objections against the organic mercury hypothesis also participated in the council.

At the 1st conference of Minamata Disease General Investigation and Research Liaison Council held in January 1960, Prof. Raisaku Kiyoura presented questions about the organic mercury hypothesis. At the 2nd conference in April of the year, he presented "the toxic amine hypothesis". The 4th conference was

held in March 1961, but thereafter, any conference of the council was not held. Prof. Katsuro Irukayama analyzed the methylmercury compound in the mercury sediment from the Chisso plant. With this opportunity, the Kumamoto University Research Group concluded that the methylmercury compound was the cause in 1963, but all ministries and offices neglected the conclusion.

Saikai National Fisheries Research Institute of the Fisheries Agency conducted mercury surveys of the fishes and shellfishes in the Shiranui Sea during the period from 1960 to 1961.

E. Kumamoto Prefecture

The activities of research study to inspect the cause of Minamata disease in Kumamoto Prefecture were proceeded by Minamata Strange Disease Countermeasures Commission of Minamata City in which Minamata Public Health Center participated. In August 1956, the Kumamoto Prefectural Government and the Commission asked to inspect the cause to Kumamoto University School of Medicine, and in March 1957, Liaison Committee of Countermeasures against the Minamata Strange Disease of Kumamoto Prefecture started to assess the countermeasures supported by the prefectural budget.

In April 1957, the Director of Minamata Public Health Center maintained cats with fishes of Minamata Bay at a room in the Center, and succeeded in inducing the onset.

The Kumamoto Fisheries Experiment Station reported the alteration of the drainage channel in June 1959. The Kumamoto Prefectural Institute of Public Health conducted surveys of mercury level in hairs during the 3-year period from November 1960.

F. Niigata Prefecture

The Niigata Prefectural Government and School of Medicine, Niigata University, established a research group, and the prefecture, city, and the Public Health Center conducted wide-ranging health screening of the inhabitants.

(2) Discussion

A. The Government

1) At the time of outbreaks of Minamata disease, the Environmental Pollution Act or the Environment Act has not been arranged. Even if a problem with the countermeasures taken by the Government was posed under these circumstances and the actual state in the past was justified as it was, no lessons will be generated. It is necessary to inspect the following points, for instance: what was the ideal public health government? Through what channel was information about outbreaks of the tragic affairs transferred and how was it connected to the Government's countermeasures?

2) Inspection of the cause of Minamata disease and prophylactic countermeasures against damages are just the reverse of each other. Under the relationship, MITI in the Government, which fundamentally had the role of industrial development and strong political power with support from the industrial world on the background, has taken the leading position, and continued to insist, from a standpoint of support of the plant, that the cause could not rigidly be specified. For this reason, the countermeasures taken in the Government were completely delayed, and no effective countermeasures were taken, leading to the spread of damages.

Of the four big affairs of environmental pollution, Minamata disease showed scientifically the most overt causal relationship, but it took long time for the government's collective view to be offered in 1968; it took 12 years since the disease was found for the first time in 1956, it took 9 years since 1959 when the Ministry of Health and Welfare offered the report by The Food and Sanitation Investigation Committee of the

Ministry of Health and Welfare, and it took 3 years since 1965 when the outbreak of the second Minamata disease was observed in Niigata. These results indicate that it was too late for the Government's decision to be made.

It is important to take countermeasures quickly and appropriately in the stage in which the possibility of a chemical substance inducing damage or the possibility of the company being the causative factor is not yet determined finally. On this occasion, who will judge to "determine" these points? What is the purpose? What kind of process will be used for the judgment? These points also become issues.

In Niigata Prefecture, the Government has heavy responsibility for the risk control, because it induced the outbreak of the second Minamata disease. No complete countermeasures against the outbreak and spread of damage of Minamata disease in Kumamoto Prefecture have been taken, resulting in the outbreak of the second Minamata disease.

3) It is not said that the Government's information has been displayed to the inhabitants in a series of process. When the countermeasures prove a disadvantage to economic interests of the industries, commerce, agriculture, and tourist business, counterpressure against the request for information presentation and countermeasures from the inhabitants and the nation is applied to the Government. To avoid the Government's bending to such pressure, it is important to constantly make clear the attitude to display information and to obtain their understanding by explaining to the inhabitants reasonable evidence including scientific technology, etc.

B. The Ministry of Health and Welfare

1) From 1956 onward, when the disease was officially found, the Ministry of Health and Welfare has led inspection of the cause, but as the cause has been narrowed down to the Chisso Minamata plant, the attitude of the Ministry of Health and Welfare seems to have become passive probably because of the pressure by the industrial field. The Ministry of Health and Welfare was confined to the range of food sanitation administration, despite that the Establishment Act defines maintenance of the nation's health. Immediately after the report by The Food and Sanitation Investigation Committee of the Ministry of Health and Welfare, the Ministry disorganized the special sectional committee of food poisoning, and relinquished its responsibility to elucidate the cause of Minamata disease.

In 1957, the Ministry of Health and Welfare did not approve the indication for the Food Sanitation Act to an inquiry by the Kumamoto Prefectural Government, but when the cause was mostly specified by presentation of the organic mercury hypothesis and a report by The Food and Sanitation Investigation Committee of the Ministry of Health and Welfare in 1959, there have been no evidences of the indication for the Food Sanitation Act having been discussed. The reason, "the cause is unknown" may have been an excuse made for the fact that no countermeasures have been taken. All acts of the Ministry have been passive.

According to a note of reminiscences written by Representative Kenshi Wanibuchi of the special sectional committee of food poisoning in Minamata, on November 12, 1959 (when a meeting of The Food and Sanitation Investigation Committee of the Ministry of Health and Welfare was held) the Chief of the Food Sanitation Section asked the Representative Kenshi Wanibuchi, who visited the Ministry of Health and Welfare, not to conclude that the cause of the toxic change of fishes is the factory drainage, while organic mercury is not yet detected in the factory wastes from Chisso. According to the note, Wanibuchi objected to the request, but at the conference on the day as well, the relation to the plant was not reported for the reason that organic mercury has not been detected from the factory wastes.

2) The Ministry of Health and Welfare showed no response to the report as well (organic mercury salt was detected from the mercury sediment in the process of acetaldehyde production of the Chisso Minamata

plant) offered by Prof. Katsuro Irukayama in 1963.

C. MITI

1) MITI, Light Metal Industries Bureau, which has had the strong power in the industrial world and the Government, protected the standpoint of the company, which insisted that rigid inspection of the cause is necessary for the certification of drainage from Chisso as the cause of Minamata disease. Therefore, official certification of victim of environmental pollution disease was delayed, resulting in a considerable delay of relief of patients. In 1959 the 1st-stage E-P conversion plan by MITI was almost completed. In December the 2nd-stage E-P conversion plan was determined at the departmental council, and Chisso was also planned to be included in the plan. After the study review by Kumamoto University was presented openly in the article written by Prof. Hirotsugu Shiraki, University of Tokyo, in January 1964, the Economic Planning Agency and MITI should have been taken to task for the country's nonperformance as the center of responsibility of Minamata Disease General Investigation and Research Liaison Council and as the ministry in charge of management of "the laws of regulations including factory wastes, etc.", respectively.

2) Why did MITI let Chisso construct the drainage disposal facilities without effect to remove organic mercury? The Fisheries Agency has requested to cease drainage of factory wastes and to approve on-the-spot inspections of factory wastes, and it is doubtful why the Fisheries Agency consented to the approach of MITI, which included mainly the establishment of such a drainage disposable facility. It is characteristic that the indication made by the Fisheries Agency from a standpoint of protection of marine resources was neglected. This fact is an expression of the attitude in those days, which shows that economic factors take priority over natural environment. The concrete approach made from a viewpoint of sea contamination was halfway.

D. Measures against the cause of the disease as the Government and cooperation of the ministries and offices

1) On inspecting the cause of Minamata disease and considering countermeasures against the disease, the Government has not fulfilled at all its responsibility to make a comprehensive decision. The approaches of each ministry and each office have been confined to the duties of the office based on the Supervision Act and the range of business matters, and the history of Minamata disease typified active and passive conflicts of attribution among the ministries and offices. The object of the Establishment Act by each ministry should be rigidly recognized. The way of the Government's measuring against Minamata disease was in a contrast with the case in Yokkaichi; to countermeasure against environmental pollution in Yokkaichi in 1963, both the Ministry of Health and Welfare and MITI cooperated in organization of "Kurokawa Investigation Team" to develop the subsequent comprehensive policy.

In fact, many investigators felt senses of emptiness against the way of approaching to Minamata disease in Niigata by cooperation among ministries and offices. For instance, research and investigation of organic mercury poisoning in the basin of the Agano River were conducted mainly by the Ministry of Health and Welfare according to the joint system of the wide-ranging ministries and offices concerned, which included MITI, Economic Planning Agency, Ministry of Agriculture, Forestry and Fisheries, and the STA, but the expenses for promotion and adjustment of special studies by scientific technology were cut off after the interim report in 1965. Under the circumstances, the studies left unfinished by the Ministry of Health and Welfare were respectively subjected to additional investigation with the research funds for each dept. of School of Medicine, Niigata University, and the final report was published.

2) Under the cabinet system, the Government is obliged to neglect the influence of the party in political

power on the administration, on making decisions. However, it still remains unclear who is taken to the task for what point, and how extent is the person taken to the task, as a public worker and as the administration concerning the results. Minamata Disease General Investigation and Research Liaison Council has played so only the slight role that there is no better alternative for the council having been told to have intended to disseminate the problem by widening the field of discussion. In this sense, the council is regarded as the outcome of unwise point. In the liaison council of ministries, consent is not obtained even when only one ministry objects to the opinion. At that time, the Economic Planning Agency had a responsibility for supervisory judgment, but a person who takes a strong leadership in the Government is needed to it. The system in which such a person is nominated by the cabinet is required.

It is important to bring about good understandings and make adjustment among ministries and offices, but if a mistake is made in nominating the lead agency on this occasion, the efforts of the ministries and offices, which are eager to inspect the cause, will be suppressed, leading to delayed inspection of the cause. The selection of lead agency is not merely an expression of disputes among ministries and offices, and it is necessary to clarify the person in charge of making a decision of the lead agency.

3) Conflicts of attribution among ministries and offices become big issues for the national government workers concerned, whereas attention should be paid to the point that the conflicts are not essential problems for the nation. The interests of the nation other than bureaucrats may be lost in the process of establishment of bills and policies by discussion and adjustment by the ministries and offices. This point should also be taken into consideration.

4) As a method of solving discord among the ministries and offices, power of the Government, which shows remarkable vertical relations and separation of ministries and offices, may be transferred to local communities, and a method of solving the discord is arranged in a unified manner under the heads of local autonomies.

E. Prefecture and city

1) To establish quickly and exactly the system of inspection of the cause, it is very important for the Government, the metropolis and districts, and municipalities to have the initiative and for local autonomies to actively measure themselves against the inspection. The decisions made by the directly elected heads are particularly important.

The roles of the following people and organizations are also particularly important: Investigators of universities and colleges, who are engaged in inspection of health damages due to environmental pollution with social and ecological background; public health centers as the nuclei of the local autonomies, environmental pollution and health institutes of the districts, etc.

On this occasion, it is necessary for activities of the inspection of the cause by organizing the inspection system according to the autonomy's initiative and for open presentation of the results to cultivate professionals of public health, environmental science, to distribute them to public health centers, health institutes of the districts, research institutes for environmental science, and to complete adequate apparatuses, and so on.

With regard to inspection of the cause of Minamata disease, the main role of the City Government may be a supporting activity in the actual place, which will include guide for investigators. The role of the City Government in relieving patients is important. Even so, the social welfare council of Minamata City has done no activity.

2) In the investigation in Niigata Prefecture, they went up to the Agano River, but the investigation ceased in the prefectural border. When environmental pollution and the spread of damages were investigated,

cooperation and adjustment may become necessary in the border of prefectures in some cases. In case of Minamata disease in Niigata Prefecture as well, adequate communication of Niigata Prefecture with Fukushima Prefecture up the river may have been necessary. With regard to communication of Kumamoto Prefecture with Kagoshima Prefecture, Minamata Public Health Center has early got in touch with the Izumi Public Health Center in Kagoshima Prefecture in order to detect and hospitalize patients.

(3) Lessons

1) *Self-consciousness of rights and responsibilities of each of politicians, administrative officials, and investigators*

Politicians, administrative officials, and investigators should be aware of their respective rights and responsibilities. Particularly, administrative officials must be aware of the meaning of guarantee of the status, and even if the countermeasures remain uncertain, the administrative officials must decide to practice the countermeasures.

2) *Monitoring of the cross-sectional council of ministries and officials*

The object and achievements of the establishment of organizations in the Government, which consisted of ministries and offices, must be monitored. In case of Minamata disease, Minamata Disease General Investigation and Research Liaison Council was used as a justification for nonperformance of countermeasures by each ministry or official. The roles of ministers as politicians are particularly important for the problems about which opinions of each ministry and office are divided.

3) *Guarantee of research activities of investigators and judgment on the Government's responsibility*

It is important for the Government to guarantee the investigators' activities to inspect the cause, to judge their opinions on the Government's own responsibility, and to conduct the measures to prevent damages.

4) *The exercise of local autonomies through original ideas and innovations, which includes the use of the right of establishment of regulations*

The roles of local autonomies of the actual place and research organizations in inspection of the cause are extremely important. The Government should not intervene them with the vertical administration and administrative power. The local autonomies adhering closely to the inhabitants should not mind only the intention of any governmental ministry or office. They must consider the measures to enhance welfare of the inhabitants on the basis of "the true aim of local self-government", even though they occasionally conflict with the Government's policy. As local autonomies have the right to establish regulations, they should carry out considerable activities through original ideas and innovations.

[Discussion 8]

How did the outbreak of Minamata disease in Niigata Prefecture influence on Minamata disease in Kumamoto?

(1) Circumstances

The 4th conference of Minamata Disease General Investigation and Research Liaison Council was held in March 1961, and since then, the activity has stopped. The Government offered a report to the Diet as “the activity is under investigation”.

In August 1962, Prof. Katsuro Irukayama and his colleagues reported to a journal of an academic society that “methylmercury chloride was extracted from the mercury sediment in the process of production of acetaldehyde and acetic acid at the Chisso plant. On February 16, 1963, they reported the extraction of the causative agent at a briefing session of the PHS Research Team. After the extraction was reported on the mass media, the Kumamoto University Research Group presented on February 20 that the causative agent is concluded to be alkyl mercury. Furthermore, Prof. Irukayama et al. reported an article about the mechanism underlying the reaction of secondary generation of the methylmercury compound in June 1967. It was thus academically confirmed that Minamata disease in Kumamoto Prefecture was caused by the methylmercury compound secondarily generated in the process of production of acetaldehyde and acetic acid at the Chisso plant.

On the assessment of the budget by the Ministry of Health and Welfare in December 1964, trust money for investigation and research of environmental pollution, which was channeled into publication of “Minamata Disease”, which compiled achievements of studies by the Kumamoto University Research Group, was approved. It was published in March 1966. Basic surveys were conducted on the plants using mercury throughout the country in December 1965.

However, the outbreak of Minamata disease in Niigata was presented in June 1965. Some patients went to law against a company for damage suit in 1967. In January 1968, the plaintiff and lawyers of the trial in Niigata visited Minamata to talk with Minamata Disease Patient’s Families Mutual Aid Society and Citizens’ Council for Minamata Disease Countermeasures, and presented a joint statement to the effect that “since the affair in Kumamoto is the same as that in Niigata, the Government should recognize the conclusion made by the scientists, solve the affairs, and carry out the relief of victims”.

In August 1967, Prof. Irukayama and his colleagues presented detection of the methylmercury compound from the wasted fluid of a rectifier in the process of acetaldehyde production of the Minamata plant.

There were outbreak of asthma in Yokkaichi, and a plan to develop the Mishima-Numazu complex was withdrawn. Under the circumstances, an opinion about Itai-Itai disease was offered by the Ministry of Health and Welfare in May 1968, although the cause of Minamata disease remained scientifically uncertain at that time. This was the first decision made by the Government and politics. Thereafter, the nation’s public opinion about environmental pollution began to change considerably along with presentation of environmental pollution in Yokkaichi and Itai-Itai disease environmental pollution to the court.

In September 1968, the Government presented the collective view announcing that Minamata disease in Kumamoto and organic mercury poisoning in Niigata were recognized as environmental pollution diseases (*Kogai-byo*) attributed to Chisso and Showa Denko, respectively.

(2) Discussion

A. Influence on inspection of the cause

With regard to the cause of Minamata disease in Kumamoto, inspection itself was proceeded from an independent standpoint, and it had no particular influence of the outbreak of Minamata disease in Niigata. However, with the opportunity of the outbreak of Minamata disease in Niigata, Minamata disease in Kumamoto also became reconsidered. Thus, the outbreak of Minamata disease in Niigata played the important role in political and social recognition of the cause of Minamata disease in Kumamoto.

B. Influence on countermeasures

1) The outbreak of Minamata disease in Niigata led to the second spotlight of problems with Minamata disease in Kumamoto from social and medical standpoints; outbreaks of the second Minamata disease triggered reconsideration of the first Minamata disease, Minamata disease in Kumamoto, from various aspects including Governmental policies, official definition of the cause, another look at the range of Minamata disease, and compensation. The victims in Niigata visited Minamata, and this gave a clue to starting a drive to consider the victims in Minamata.

Unless Minamata disease in Niigata had occurred as another tragedy, the affairs of Minamata disease in Kumamoto Prefecture might have been left frozen without having been dealt with again as the problems. They might have shown the circumstances different from the actual ones. The tragedy, Minamata disease, might have been left unsolved unless the second Minamata disease had occurred. In this sense, Minamata disease is a double-barreled tragedy.

2) With regard to the range of Minamata disease, Prof. Tadao Tsubaki and his colleagues of Niigata University reported, at the 63rd meeting of the Japanese Society for Internal Medicine in April 1966, that the incidence of symptoms in patients with Minamata disease in Niigata was different from that in Minamata disease in Kumamoto. Since then, a tendency to reconsider the conventional range of Minamata disease has been increased.

[Comments] On establishing the (Old) Special Measure Act (1969) concerning the relief of damages to health due to environmental pollution, comparison of diagnostic criteria for Minamata disease in Kumamoto and those for Minamata disease in Niigata became needed.

3) With regard to the drive to consider the victims in Minamata, Minamata Disease Patient's Families Mutual Aid Society in Kumamoto presented to patients in Niigata (The Society for the Victims, etc.) a fund-raising campaign of ¥10,000 as a struggle support, with a letter showing "serious indignation to the imperfect administration of Showa Denko and the Government". With this opportunity, Minamata disease patients in Niigata visited Minamata, and issued a joint statement that "the Minamata disease affair in Kumamoto Prefecture is the same as that in Niigata Prefecture" in January 1968. Such interchange among the patients in Kumamoto and Niigata had much influence on the subsequent development of the Minamata disease affairs.

4) Minamata disease in Niigata has been called the second Minamata disease, but Minamata Disease General Investigation and Research Liaison Council of the Economic Planning Agency, which has existed as a matter of form, has not drawn any conclusion to Minamata disease in Kumamoto. Therefore, the Government regarded the disease in Niigata as organic mercury poisoning in the basin of the Agano River, not Minamata disease. Thus, in one aspect, the Government will not recognize mistakes honestly because it sticks to the past circumstances.

However, Director Kiichi Miyazawa of the Economic Planning Agency in those days, who observed the political and social responses to the opinion of the Ministry of Health and Welfare about Itai-Itai disease and the subsequent results, approached the Minister Sunao Sonoda with a proposal to deal with Minamata disease by the Ministry. With this opportunity, the Government's opinion started to be decided.

(3) Lessons

1) *Inspection of the cause and completeness of countermeasures*

With regard to inspection of the cause of Minamata disease in Kumamoto, the cause had been

elucidated at the science level, while the Government officially recognized the disease of Minamata disease in Kumamoto and the damage of the cause because of outbreaks of the second Minamata disease in Niigata. This indicates that nothing could have been done unless “the second fault” had been made. Politics and the Government should not attend to the affairs with the attitude that countermeasures finish after their settlement as social problems. After all, it is more important to thoroughly elucidate the cause and establish countermeasures against the first affair and to prevent the recurrent outbreak.

5. Countermeasures

[Discussion 9]

What position did Chisso take in postwar chemical industries and industrial policies as well as the local community? How did the the position influence inspection of the cause?

(1) Background

In 1945, Nippon Nitrogen Fertilizer Co., Ltd. became the subject of dissolution of the big financial combines. The Nobeoka plant was divided and became independent as Asahi Chemical Industry Co., Ltd.. Some of the employees newly established Sekisui Chemical Co., Ltd. too. The entity of Nippon Nitrogen Fertilizer Co., Ltd. made a new start with the Minamata plant as the only plant.

Simultaneously with the war defeat, restitution of the Fertilizer Div. started in the Minamata plant, and in about 1950 the production scale was restored to the prewar scale. Improvement and reforms of the technology were serially conducted in the organic synthesis division of Chisso plant during the 10-year period from 1950. In 1952 manufactures of Octanol and DOP were made and engrossed the market. Even after the war, the company constructed the firm position as a general chemical industrial company.

During the period between 1955 and 1964, Japanese industrial policy mainly tended to strengthen the competitive position of chemical industry by conversion of raw materials from coal to petroleum. In the industrial policy, coal chemistry was also transferred to petrochemical industry by expanding coal chemistry before the conversion. Because of the policy, the demand of sodium hydroxide was markedly increased, and the importance of vinyl chloride industry as the way of secondarily generated chlorine to be used was also increased. Thus, Octanol production at Chisso rode the crest of a boom.

From 1960 onward after the settlement of the affairs with a contract with Chisso on the present of money in token of their sympathy, Chisso has not opposed openly the organic mercury hypothesis under the guide of MITI. The place of arguments was moved to the Tamiya Committee prepared by the Japan Chemical Industry Association.

The Association allotted the expenses for the Tamiya Committee to the companies concerned; the volume allotted to Chisso was largest, followed by that allotted to Showa Denko.

(2) Discussion

A. Relationships among Chisso, the Japan Chemical Industry Association, and MITI in postwar chemical industry and industrial policies

Industrial production of acetaldehyde by the water addition reaction was highest in Chisso all over the country; it was 45,244 tons in 1960, accounting for 40% of the domestic production. The Japan Chemical Industry Association started out to deal with problems about Minamata disease on behalf of Chisso, probably because the Association was apprehensive about the spread of the organic mercury hypothesis, i.e.,

the hypothesis showing that the plant was the cause, not only to Chisso but also other domestic plants of the same kind. Chisso had been protected handsomely by the Government by arrangement of production in terms of the industrial policy. After the war defeat much attention was paid to production of fertilizers according to the priority production system. It can be said that Chisso outlived the postwar condition in confusion owing to the fertilizer production. Acetaldehyde had taken the extremely important position in the high growth policy centering on protection in the organic synthesis division of Chisso plant and heavy chemical industry. Under the circumstances, Chisso was positioned as the leading plant, and the role lasted until the business community was converted to petrochemical industry.

The importance of such a position of Chisso in the chemical industrial world and the Japanese industrial policy delayed decisively inspection of the cause. The company, the business community, and the Government, in which MITI took the initiative, denied the organic mercury hypothesis in one united body, and proceeded in cooperation with each other in order to prevent the spread to other plants of the same kind. Inspection of the cause was occasionally interfered with. It may safely be said that the connection of MITI, the Japan Chemical Industry Association, and Chisso showed the “adhesive” relationships among politics, officials, and companies. This is the postwar system of Japan, and became the force of traction of the line of high growth.

In the middle of 1950s young technicians at that time felt strong affinities with chemical plants like Chisso, which proceeded unique industrialization on the basis of technology in Europe, because they felt resistance to the postwar technological introduction from the U.S. They resisted the conversion to petrochemical industry as well, and had a sort of technological nationalism; they were impatient for the fact that domestic technology had not been fully used. Some of the technical officials of MITI have also thought so in the Japanese industrial policy, and they have recognized that Chisso takes the lead in these chemical plants.

B. Minamata as the town of the government of Chisso

The town of the government of a company indicates a town formed by the preponderant dominance of a private company in a specific area and by the consciousness of the inhabitants who accept and support the dominance.

Chisso came into existence as a dominator of the town over the long period by exerting much influence on public finance, economy, and politics of the town.

The Chisso plant has been long and closely involved with Minamata City in terms of economical, political, and human relations since 1908. Minamata City did not ask Chisso to cease factory operation, partly because economic growth took priority over others in Japan after the war's end particularly, even though the factory wastes were strongly suspected of having caused Minamata disease. Rather, the City Government moved with various organizations in the direction of cessation of drainage from the plant, which is led to cessation of the Chisso's factory operation.

(3) Lessons

1) Radical reform of the attitude of business community to causative companies, which are pled for each other, and early prophylactic measures to counter outbreaks of the second Minamata disease.

Chisso, which has played the important role and taken the important position in chemical industry, has much influence on the entire world of chemical industry. Business community pleads for causative companies for fear that the affairs will spread other companies of the same kind. Ultimately, this proves a disadvantage to the entire business community. The Japan Chemical Industry Association has never shown reflection about its negative role in the Minamata disease affair.

Early cooperation in inspection of the cause without pleading for mistakes and consideration of appropriate countermeasures against outbreaks of the second Minamata disease will lead to interests of the whole business community.

2) The function of local community to check companies

It is clear that the fate of the community depends on existence of specific companies. Even so, the community and the inhabitants will be damaged further considerably when the companies commit important mistakes. Local communities including autonomies also have to possess the function to adequately and quickly check activities of the companies without protection of the companies' mistakes.

[Discussion 10]

How about the change of the drainage channel by Chisso?

(1) Background

In September 1958, Chisso changed the drainage channel for the waste water in the process of acetaldehyde production, which had been flown into the Hyakken Seaport of Minamata Bay; the waste water was tentatively stored in the Hachiman Pool, then the supernatant fluid was drained to the mouth of the Minamata River.

In March 1959, it was revealed that the area of outbreaks of the disease spread from the mouth of the Minamata River, where there had been no patients, in the direction of Tsunagi.

MITI notified Chisso of putting the drainage channel back where it was in October 1959.

(2) Discussion

A. Change of the drainage channel is the crime adjudged guilty in the criminal trial

According to the criminal trial of Minamata disease (decision of the final appeal on February 29, 1988), in which the president of Chisso and the chief of the plant were adjudged guilty of a crime, the company and the plant neglected their duties to pay attention to the factory wastes and drained them to the mouth of the Minamata River by changing the drainage channel without consideration of appropriate countermeasure, despite the fact that they could recognize the involvement of a causative toxic substance in the factory wastes owing to the notification by the Ministry of Health and Welfare.

Chisso changed the drainage channel in spite of some people's oppositions within the division of Chisso. The change was not expected as a prophylactic countermeasure against environmental pollution. Rather, it was a means of concealing the cause as a temporary makeshift and showed a remarkable aspect of countermeasures against the fishing people. As a result, the change of the drainage channel should be regarded as the act equal to "living-body tests".

B. Countermeasures against possible affairs induced by the change of the drainage channel

Chisso had prepared nothing including the establishment of a monitoring system for the affairs that could be induced by the change of the channel. These affairs were not known at all to the Kumamoto Prefectural Government, Minamata City, or local resident. Such an important change of countermeasure should be explained to the organizations concerned as well as the local resident, so that they will satisfy of the

explanation, particularly in the situation in which the waste water was suspected of having caused the pollution.

Even if the area of outbreaks spread, Chisso did not take any countermeasure, whereas MITI, which had known the change of the drainage channel, responded to the results. The Kumamoto University Research Group was not adequately aware of the change of the channel until this time. Even after the association between the change of the channel and the area of outbreaks was recognized, the knowledge was not put to practical use for the measures to comprehend the spread of pollution and damages and to prevent the spread of damages.

(3) Lessons

1) Prophylactic countermeasures against environmental pollution with chemical substances, the first rule of which is suppression of drainage, not dilution or diffusion.

Dilution and diffusion of pollutants may be used as a method for draining, but the line between the dilution-diffusion and the spread of damages is very thin. On making some important changes, e.g., change of the channel, the subsequent monitoring on the company's own responsibility is essential for the changes. When environmental pollution due to accumulation of chemical substances is becoming an issue, it is necessary to decrease the amount of chemical substances drained to zero.

2) Morals of respect for human life in management of companies

Moral degeneracy of respect for human life in management of companies ultimately makes the companies to carry out the matters equal to a living-body test. Minamata disease is a typical example of the matters.

[Discussion II]

What is the Chisso's intention of having set up the "Cyclator" and how were the acts of the maker of environmental pollution-preventing equipments set up? What is expected from the prophylactic countermeasures of companies against environmental pollution?

(1) Circumstances

In settlement of compensations for fishery between the MFCA and Chisso on August 6, 1959, a request for setting-up of drainage disposal facilities was offered. On September 23, Chisso started construction for setting-up of drainage disposal facilities including "Cyclator".

Chisso placed orders with a water management company for equipments for neutralizing wasted fluid and for separating solid sediments. None of the equipments was designed to remove the methylmercury compound, but Chisso advertised that the factory wastes became clean and safe because turbid waste water was cleared with the Cyclator.

On the other hand, the water management company, which designed the Cyclator, kept silence for foreign advertisement of Chisso, although the company knew that the Cyclator gave no guarantee to removal of mercury. A designer for the system of the company heard the performance of the president of Chisso at the ceremony, i.e., drinking of the post-management water at the ceremony on December 24. According to the subsequent statement by the designer, he/she thought that the performance would produce illusions in people's minds as if the system produced drinking water, and the designer was disgusted with the performance.

Thereafter, Chisso increased production of acetaldehyde and profits.

(2) Discussion

A. Objective of setting-up of the Cyclator

1) Chisso attempted to set up the Cyclator with much expenses. Its attempt aimed at countering the fishing people by clearing turbid waste water, of which fishing people complained and by draining to Minamata Bay, so that it would be nice to look at. MITI has also been asked by the Ministry of Health and Welfare to consider the most appropriate treatment for factory wastes as soon as possible. The Ministry had to find an answer to the request.

2) Setting-up of the Cyclator strongly advertised the safety of waste water, and it was not a reflection of Chisso that seriously measured itself against prevention of environmental pollution. In actuality, the Cyclator itself was not designed to remove organic mercury. Verbal evidence by the designer for the apparatus of the company that received the orders also indicated that Chisso and its president himself overtly deceived a number of citizens including the Kumamoto Prefectural Governor. Their attitude is very pernicious.

In those days, there was no marketable technique for removing organic mercury. According to one opinion, no countermeasures other than cessation of drainage of factory wastes or factory operation were considered for removal of organic mercury. There was a suspicion that the people who had the fishes and shellfishes contaminated by the factory wastes died or were affected. In this stage, circulation and recycling within the system, as Chisso conducted later, should have been adopted, or the wasted fluid should have been stored as a tentative measure until development of the processing technique.

3) As long as drain waste water is concerned, circulation and recycling allowed to avoid the exterior drainage. However, wastes accumulated in large quantities in the process of aldehyde production in those days, decreasing the performance. Therefore, activity of the promotor in the system was maintained by disposal of wasted fluid.

In actuality, the wasted fluid was drained at the time of disorder and checking of the apparatus as waste water as it was, and continued to contaminate the sea, even after the switch to the complete circulation system in June 1966.

B. Acts of the maker of environmental pollution-preventing apparatuses

The approach of the maker, which acquiesced in the Chisso's extravagant advertisement after completion of the Cyclator, eventually deceived many people concerned including the Prefectural Governor. In this respect as well, their approach is problematic.

C. Measures of companies to prevent environmental pollution

1) On introducing patented techniques of foreign countries to Japanese companies, how do they think about the mechanism of the production process and the merits/demerits? This has a very important meaning for developing countries. Information that is useful for considering countermeasures is obtained by preliminarily paying attention to environment risks.

2) In those days, Chisso was evaluated for the development of the independent techniques. On the other

hand, social ethics may have been deficient in industrialization of Chisso. The fishing people burst into the Chisso plant. The offices were also broken. If not properly handled, Chisso might have been driven into cessation of the factory operation. Thus, Chisso assigned excellent technical experts to inspection of the cause and countermeasures against environmental pollution. Chisso did not act without exterior regulations or pressure. If the data on Chisso's internal studies and on mercury had been offered from the beginning of inspection of the cause, the development of the affairs might have differed from the actual situation. A number of victims might have been avoided. The internal studies at Chisso appeared to have scattered and vanished because of fights for low wages. This fact reflects the limit of company's internal studies. Information presentation by companies is essential for environmental problems.

(3) Lessons

1) Responsibility of manufacturers and distributors of environmental pollution-preventing apparatuses for explanation of them

The manufacturers and distributors of environmental pollution-preventing apparatuses are responsible for constantly clarifying the safety and limit of their own products. When they acquiesce in extravagant advertisements by users of the products, it means that they conspire with the users' mistakes.

2) Presentation of information about the contents of companies' countermeasures against environmental pollution

Companies may commit a fraud upon the public without shame under the mask of the administration and specialists for the sake of pursuing their own interests. Company's fraudulent countermeasures ultimately lead to pressure of a lot of expense to them.

With regard to company's countermeasures against environmental pollution as well, presentation of accurate information is essential, and it is important for the information to be checked by specialists on the outside according to a system.

[Discussion 12]

What kind of countermeasures should the Kumamoto Prefectural Government and the Government have considered? How could these countermeasures have been realized?

(1) Circumstances

From the first of the outbreak of Minamata disease, there was a suspicion that the disease was caused by fishes and shellfishes.

The Kumamoto Prefectural Government could not specify the kinds of fish and shellfish or the extent of toxicity, but it strongly suspected that the fishes and shellfishes in Minamata Bay were the cause of Minamata disease.

In November 1956, Head Hasuo Ito of Minamata Public Health Center and others guided self-control of ingestion and fisheries of the fishes and shellfishes in Minamata Bay.

When the Kumamoto Prefectural Government referred to the Government about the application of the Food Sanitation Act in August 1957, it was answered in September of the year that the Act is not applicable. Therefore, the Prefectural Government only guided self-control of fishing and selling.

The contract of the victims with Chisso about a present of money in token of the company's sympathy

was signed on the basis of mediation by the Kumamoto Prefectural Governor and others in December 1959.

(2) Discussion

A. The exercise of the right to regulate

1) The Administrative Agency is in duty bound to notify prohibition of fishing and selling of all the fishes and shellfishes in Minamata Bay and waters around the Bay (on the basis of Paragraph 2 of Section 4 of the Food Sanitation Act) or to regulate drainage of the waste water containing mercury or the compound outside the plant against the Chisso Minamata plant [on the basis of the (old) law of regulation of factory wastes and so on]. The Administrative Agency should have used appropriate and opportune on-the-spot inspections concerning the outbreak of Minamata disease and prevention of the spread with evidence of the Food Sanitation Act, the Fisheries Act, the Fisheries Resources Protection Act, the (old) law of water quality preservation of waters for public use, and the (old) laws of regulation of factory wastes. The Administrative Agency has a legal responsibility for the fact that it neglected the duties, according to the following opinions:

- In August 1957, the Kumamoto Prefecture referred to the Ministry of Health and Welfare about the applicability of the Food Sanitation Act to the affairs in the prefecture. In July 1958, there was a notification from the Director of the Public Health Bureau of the Ministry of Health and Welfare. The spread of damages was induced by change of the drainage channel during the period from September 1958 to about September 1959. In July 1959, the Kumamoto University Research Group presented the organic mercury hypothesis. The Food and Sanitation Investigation Committee of the Ministry of Health and Welfare issued a report on the hypothesis in November 1959. Prof. Katsuro Irukayama and his colleagues extracted organic mercury from sludge over the period from 1962 to 1963. Under these circumstances, the right to regulate the factory wastes could have been issued at every time point. In other words, some countermeasures including prohibition of fishing should have been taken during the period between 1957 to 1959, because it was almost revealed during the period from 1957 to 1958 that the noxious fishes and shellfishes caused the disease, and in 1959 it has been clear that the methylmercury compound accumulating in the fishes and shellfishes caused the disease and the drainage source was the Chisso Minamata plant. Furthermore, the fact that the cause has not been rigidly specified has been regarded as the reason why the right to regulate has not been exercised. However, even after Prof. Irukayama et al., reported specification of the cause, the Government has not acted eventually. Some people have criticized the Government for not having intended to take any countermeasure.
- The Ministry of Health and Welfare, which denied the application of the Food Sanitation Act to the affairs in 1957 because of the absence of evidence of the fishes and shellfishes' having become noxious, has not monitored continuously the fishes or shellfishes since then. When the report by The Food and Sanitation Investigation Committee of the Ministry of Health and Welfare was issued in November 1959 as well, there was no trace of assessment of the application of the Food Sanitation Act to the affairs. The occurrences were still observed in those days. Despite the fact that "assaulters could have been punished, simultaneously with prevention of the spread of damages, by the exercise of various disciplinary rules, if the Government had had a mind to do so" in the situation (Verdict at a hearing of intermediate appeal in the Kawamoto trial: Verdict at the Tokyo High Courts in June 1977. Decision.), no effective countermeasures were taken. It is incomprehensible.
- In April 1957, Head Ito of the Public Health Center demonstrated in experiments using cats that Minamata disease was caused by ingestion of the fishes and shellfishes in Minamata Bay. Therefore, the

Prefectural Government should have prohibited fishing in the Bay in order to prevent the spread of damages.

- The prefectural rules for fishery adjustment (Paragraph 32) decided by the Fisheries Resources Protection Act include the rule of ordering companies to establish facilities for removal of harmfulness. Therefore, the Government might have been able to apply the Fisheries Resources Protection Act to the affairs at that time.

[Comments] The Government and the Prefectural Government insisted in the trial concerning the application of the Fisheries Resources Protection Act as follows: there is no legal evidence of such right to regulate; in the situation at that time when the causative agent for Minamata disease has not been clarified either, the countermeasures centering on the administrative guide were taken as much as possible; therefore, the Government or the Prefectural Government has no responsibility for any national compensation for the outbreaks of Minamata disease or prevention of the spread.

2) The problems with the root of the way that legal responsibilities of the Government and the Prefectural Government for the administration based on these laws and regulations are currently being contested at law. However, the following facts must be honestly reflected as the way that the administration should be: it took long time for the cause of Minamata disease to have been decided and for adequate guide to have been given to the companies, having led to outbreaks of such serious and misery damages. Moreover, on thinking about countermeasures against problems with environmental pollution by the administration in the future, these facts should be considered as rigid lessons from viewpoints of the exercise of the rights of public workers to regulate, prevention of the spread of damages, policy decision with much attention paid to health and life, quick and precise approach, and presentation of information.

<Column> *The laws of countermeasures against Minamata disease*

The Food Sanitation Act, which is designed to prevent the development of sanitary injuries due to food and drink and to secure the safety of public health, regulates business managers. The Act in those days has also regulated to prohibit selling of food products, which contain toxins or toxic substances and to which these substances adhere, and collection, production, processing, and cooking for selling of these food products (Paragraph 4). In Paragraph 22, it was regulated that administrative countermeasures against the business managers, who contravene the rules, were considered as follows: the business managers are ordered to abolish food products or to suspend business.

The Fisheries Act is designed to develop fishery production capacity by making fishing people and fishing industrial workers to organize unions and by rationalizing the utilization of water surface. In Paragraph 65 of the Act, it is defined that the competent Minister and prefectural governors can establish Ministerial ordinances and rules to restrict and prohibit “catch or collection” and treatment of aquatic animals and plants and selling for the purpose of controlling and adjusting fisheries. The Fisheries Resources Protection Act is designed to develop fisheries by promoting protection and cultivation of fisheries resources. In Paragraph 4 of the Act, it is defined that Ministerial ordinances and rules can be established as in Paragraph 65 of the Fisheries Act. On the basis of the regulations of these two Acts, the rules of the fishery adjustment in Kumamoto Prefecture have been established in Kumamoto Prefecture as well for the purpose of adjusting fisheries by protecting reproduction of aquatic animals and plants by controlling fisheries. The rules include mainly permission of fisheries and restrictions of prohibition and method of fishing during a fixed period in a fixed area. It was also regulated that permission may be cancelled when the Governor approves of the beneficial necessity, and that the substances, which are harmful for protection of reproduction of aquatic animals and plants and which may be abandoned and leak, are prohibited to be left and the persons, who act

contrary to the rules, are ordered to take measures to remove them.

“The laws of water quality preservation of waters for public use” (The Water Quality Control Law) and “the laws of regulation of factory wastes, etc.” (The Factory Wastes Law) were regarded as the laws called “Two-step Water Quality Act”, which was designed to prevent water pollution, until establishment of the Water Pollution Prevention Act”. According to the Act, the Director of the Economic Planning Agency specified the waters by the Water Quality Control Law, which had problems with water pollution, and established the criteria for water quality of the waste water drained to waters of individual area, then the Cabinet decided the facilities indicated for regulations and the competent Minister with Cabinet order by the Factory Wastes Law in order to maintain the criteria for water quality of the specified waters. The competent Minister had to regulate drainage from the facilities originating request.

It is rigidly ventilated in the history of the affairs whether these laws could have been utilized as the evidence of administrative measures to prevent the spread of Minamata disease, which include prohibition of fishing in the vicinity of Minamata Bay, prohibition of selling of the fishes and shellfishes, cessation of the factory operation, and improvement in the facilities for waste water.

B. Attitudes of the Government and politics to the outbreaks of Minamata disease

1) In the beginning of the outbreak of Minamata disease, the spread of damages should have been prevented by the following means, regardless of the causative agent in the factory wastes or the mechanism underlying the generation of a causative agent: fishing should have been prohibited on the basis of the results of experiments using cats by Head Ito of the Public Health Center; the causative plant should have been let take countermeasures by declaring openly a suspicion that the disease was caused by factory wastes.

At the early time when waste water from the Chisso Minamata plant was suspected, the Kumamoto Prefectural Government or the Ministry of Health and Welfare should have requested an answer by referring to Chisso with official documents. If so, Chisso, which accepted the reference, might have been obliged to answer. With the opportunity of the answer to the reference, Chisso might have investigated by itself, and might not have been able to subsequently avoid its responsibility.

2) How do the politics and administration approach to the situation developing in the actual setting? Various innovations will be required, but the inhabitants' health is most important, and it is fundamental to protect environment from being disrupted.

The appearance of new patient due to change of the drainage channel, presentation of a report by The Food and Sanitation Investigation Committee of the Ministry of Health and Welfare, and speech of the T-I Minister Ikeda at the Cabinet should have triggered new performance of general survey of the plant itself by the organization centering on the Ministry of Health and Welfare, MITI, the Fisheries Agency, and the Economic Planning Agency with the aim at evaluating the source of generation of the causative factor for the disease. Such a survey was not conducted, though. By contrast, a survey by the Kurokawa Investigation Team on governmental consignment (Ministry of Health and Welfare and MITI) started from November 1963 in Yokkaichi, and basic comprehensive countermeasures were initiated on the recommendation of the Team.

With regard to the Minamata disease affair, there has been no trace of active countermeasure by the politics or the administration. Rather, some brakes were applied to inspection of the cause within the administrative division, leading to the spread of damages. The political intention to solve the problem early was not observed in the Governmental setting-up or administration of Minamata Disease General Investigation and Research Liaison Council. The liaison council became the means of prolongation of definition of the cause and of evasion of responsibility of each ministry.

All the process of assessment including the contents of a liaison committee of each ministry should be

opened for the progression of countermeasures against environmental pollution and public health. It is also important to select the place of presentation of the process; ministers should express it at press conference after the Cabinet, and ministers as politicians should conduct the presentation at places, so that it will be dealt with on the mass media.

C. The roles of local autonomies

1) The Kumamoto Prefecture, which was involved with mediation of the contract of the victims with Chisso about a present of money in token of the company's sympathy, has intended to mediate fishery disputes and to control the Minamata disease affair as a disorderly affair.

Thereafter, in the verdict about the first suit for Minamata disease at the Kumamoto District Court, it was due to approve that the contract of the victims with Chisso about a present of money in token of the company's sympathy acted contrary to Paragraph 90 of the Civil Law Act, i.e., public order and morals. However, the contents of the mediation, with which the Prefectural Government had also been involved, had the following problems: even though the waste water from Chisso was the causative factor, there was an article of relinquishment on the victims' right to demand reparatious payment; the amount of present of money in token of the company's sympathy was small; and so on.

2) In centralization of power from the Meiji era onward, there were also excellent points such as insurance system, education system, etc., but environmental pollution, which converged at industrial provincial cities, reflect harmful influences of centralization of power.

National indications had to be asked for the exercise of the right to regulate, which was the institutional trust' business. This point thereafter weakened the consciousness of the people concerned in Kumamoto Prefecture on solving problems with Minamata disease, and proved a disadvantage to appropriate approaches. For appropriate decision of district's problems in the district, decentralization of power including the environmental administration must be strongly promoted in the future.

In those days, inspection of the cause of Minamata disease in Kumamoto progressed to some extent, because there were Head Ito of the Public Health Center and the Kumamoto University Research Group as the reliable main investigator and the organization in the district.

The achievements made in the aspect of administrative countermeasures included construction of the exclusive ward for Minamata disease patients and rehabilitation center of the Minamata Municipal Hospital.

(3) Lessons

1) *The starting point of the approach of the Government and the Prefectural Government to outbreaks of Minamata disease is a decision to avoid the repetition of the tragedy of Minamata disease and their concrete acts.*

The Government did not take any countermeasure that could have been taken at end point of each affair, having resulted in the spread of damages. The Government and the Prefectural Government should decide not to repeat such tragedy without forgetting the process of their faults. The decision and their concrete acts become the starting point of their environmental countermeasures in the future.

2) *Responsibility for the explanation of the measures to prevent the spread of damages*

In order to prevent the spread of damages, the Government and the Prefectural Government should decide policies paying attention to health and life and consider quick and appropriate

countermeasures by utilizing maximally the rules, which are applicable to each occasion, and they should present necessary information. They should fulfill their responsibility for explaining the reason why they take a certain countermeasure and that why they do not take the countermeasure to the nation. If the legal right to prevent the spread of damages is inadequate, the Diet should quickly conduct new legislation.

3) *“Lesson” from the actual place and hearing of the opinions of the people concerned including critics*

It is important first for not only the administrative person-in-charge of the actual place but also the governmental person-in-charge to walk and look at the actual place. After listening well to the patients, the families, and critics including NGO, a fair evaluation should be made so that the nation understand it well.

4) *Promotion of decentralization*

For early and appropriate solution of local problems with environment and health, decentralization must be promoted by making the local autonomies of the district to have the competence.

6. *Decision of policies*

[Discussion 13]

How was the priority order of policies and values?

(1) *Circumstances*

On conducting Japan’s postwar rehabilitation, the Government took the priority production system by paying attention to fertilizers and coal. Immediately after World War II, reactivation of the fertilizers division started in the Minamata plant, and the postwar production scale was restored to the prewar scale in about 1950.

Since about 1955, technical innovations consisting mainly of heavy chemical industrialization and renewals of facilities have been politically promoted, and high economic growth at an annual rate of about 10% was achieved. Japan strived for economic growth by the joint efforts of government and people with enforcement of Japanese competitive position in the world for a national guide.

Chisso succeeded in induction and synthesis of Octanol from acetaldehyde in 1952, then products of a plastic material essential for molding of vinyl chloride, DOP, were also manufactured. They soon had a monopoly position in the market, and sustained increased production upon increased production, along with increased production of acetaldehyde as the raw material.

MITI prepared “countermeasures against cultivation of petrochemical industry” for the benefit of Japanese economic independence and enforcement of the Japanese competitive position in the world in 1955.

In 1958 there was a confused fight between fishing people and the plant in terms of fishery damages of factory wastes of Honshu Paper Co., Ltd. in Edogawa. The Tokyo Metropolitan Government ordered the company to stop the operation tentatively, but in case of Chisso, the Ministry did not guide the company to stop the operation.

In November 1959, the Minamata Municipal Assembly adopted a resolution act containing the company’s request for the avoidance of cessation of operation, since cessation of Chisso’s operation leads to the extremely important result. Representatives including Minamata Mayor, the Municipal Assembly, the

Chamber of Commerce and Industry, the Agricultural Cooperative Association, and the labor union appealed to the Governor.

The Basic Act of Countermeasures against Environmental Pollution was established on July 21, 1967. According to the Act, health protection was considered to have a first priority. The subjects of the articles harmonious with economy was excluded also in the protection of living environment by arrangement of the concrete laws concerning countermeasures against environmental pollution in 1970.

(2) Discussion

A. Evaluation of background of the era

1) Since the time of outbreaks of Minamata disease was the era when economic growth was given the highest priority, there was only slight concern about environmental problems. There were loud cries for economic growth and increased outcome all over the country.

Moreover, the Japanese people tend to think generally that some damages are the victims necessary for the great benefit of the majority of the nation. The tendency may be a cause of outbreaks and the spread of Minamata disease. The Japanese postwar rehabilitation is believed to have been successful by the catch-up system. However, when considering the presence of Minamata disease, it cannot be said that the Japanese postwar rehabilitation was successful. It is necessary to reflect on the fact that the postwar high growth of the Japanese society could be achieved only at a considerable sacrifice in Minamata. Thinking about problems with Minamata disease means that the postwar society and the ideal way of the politics and the administration themselves are reconsidered.

2) In the centralized system of politics, economy, and society, no particular attention was paid to any district, and a viewpoint of districts as sources of labor supply and locations of factories was dominant over all the others. Minamata disease occurred in Kumamoto Prefecture far from Tokyo, particularly in Minamata at the southern extremity of the prefecture. The situation has had much influence on the course of the Minamata disease affair. When considering the course of the Edogawa plant of Honshu Paper Co., Ltd., the Minamata disease affair might have developed in a manner quite different from that of the actual affair, if the disease had occurred in Tokyo Bay.

B. Consideration of environment and human life in corporate activity

1) On establishing policy and evaluating corporate activity while conflicting economic interests are adjusted, all circumstances of the interests will be taken into consideration by the usual administrative means for the purpose of selecting the interests in balance.

However, when health and life conflict with economic interests, no appropriate solution is ultimately observed, except for the case in which health and human life take priority over everything. The corporate activity inducing damages to health should be strictly regulated, and the information should also be presented.

2) The mechanisms underlying control or management of chemical substances with uncertain safety are needed, and PRTR is one of the examples of the legal system concerning them.

With regard to countermeasures against chemical substances with uncertain safety, how should the balance with economic activity be considered? At present, the way of balancing itself has changed, and "Environment report", "Environmental finance", "ISO14000 Series (Environmental management system)", and so on have been established as the mechanisms underlying the facilitation of independent countermeasures of business companies. These mechanisms should not be designed to conceal corporate

information, and should be combined with presentation of information.

[Comments] “Environment report” is designed to comprehensively present the independent countermeasures of business companies to reduce the extent of influence of corporate activity on environment and reduce the influence. The report is occasionally called an environmental act plan, environmental statement, and environmental action plan. The concrete descriptions contained environmental management system including management policy, the goal and plan, organization system for environmental problems, and the situation of approach to the ISO14001 standard. Other contents were the measures to reduce CO2 drainage, waste matters, and environmental burdens (recycling, etc.).

“Environmental finance” provides means and tools of determining how environmental preservation activity of business companies is being conducted and how it is efficient. The report is one of the efficient procedures for increasing corporate activity of companies and the environmental efficiency (the concept of the burdens to environment, which accompany goods and production of service).

“ISO14000 Series” is the standard of environmental management system (in which policy and goal concerning environment are established and managed) produced by a private international organization, International Standardize Organization (ISO) by the request of “The United Nations’ Conference on Environment and Development (Earth Summit)” held in 1992. In Japan, the Japan Industrial Standard (JIS) corresponding to the ISO14000 Series has been issued.

3) With regard to the chemical substances drained, which may have influence on human health, the extent of the risk must be evaluated as the guideline for policy decision.

On this occasion, such corporate activity that neglects the safety, as observed in the Minamata disease affair, is not admitted. As of the end of 1956, 17 of 54 Minamata disease patients died in Minamata, showing the very serious situation. When the Government is confronted with such a serious situation, it must reconsider promptly the extent of the risk and be flexible for considering countermeasures.

At present when endocrine-disturbing chemical substances (environmental hormones) and so on are becoming issues, the course of the Minamata disease affair is very suggestive. In this sense, the outbreak of fetal Minamata disease indicates something symbolic.

4) The possibility of an accident occurring while dealing with dangerous substances still remains, as observed in the accident of explosion at a plant of agricultural chemicals in Bopal, India in 1984. It will need a viewpoint as to how the events that have occurred in the past in Japan are profited for the purpose of preventing accidents and injuries.

C. The restoration of health from damages and compensations for damages

The restoration of health from damages and compensations for damages should be conducted by the causative party, companies. A system, in which the causative company bear both expenses for contamination test and health screening, should also be considered. When the causative company goes down, however, the victims will not be able to receive compensations for damages. In the event of lack of funds for the restoration of health from damages and for compensations for damages in individual causative company, another system, in which compensations to fixed extent can be conducted within the range according to the rules showing burdens to causative companies, is also required.

It will take long time with much effort for the restoration of the entire local community from damages. Relief of the victims’ health from damages may be inadequate according not only to the present system of rights but also to the administrative system.

(4) Lessons

1) The Japan's responsibility of presenting the policy for economic development, over which human life and health have priority and which does not induce environmental pollution

In the Governmental policy for economic development, things are polluted first, then they are cleaned, so to speak. The policy has induced irreparable results in our experience. The tragedy of Minamata disease was repeated twice in Japan. This fact is a symbolic affair indicating that a policy, in which human life and health have priority over economic development, is needed. It is also the Japan's responsibility to show a policy for economic development, which will not induce such tragedy, to developing countries.

2) Decision of policies taking the values of environment into much consideration

On deciding the Governmental policy, it should not be allowed for the economic value to have priority over others without any restriction. The value of environment must be taken into much consideration. In the era when economic development is a matter of the highest priority, however, the industrial party may frequently criticize that insistence on consideration of environment is in exclusive support of environment. To counter the criticism, the increase in public opinion and social pressure including concerted action by the residents are needed.

3) Inclusion of prophylactic countermeasures on the basis of evaluation of the risk of chemical substances

With regard to chemical substances and so on, which may have influence on human health, a system, in which the risk is preliminarily evaluated and countermeasures according to characteristics and stage of the risk are decided and conducted, is needed to the Government and companies. The evaluation of risk must be constantly reconsidered according to the subsequent surveys and studies.

[Discussion 14]

How was the relationship between politics/administration and scientists? How were the roles of politics/administration and scientists? How were social obligations and ethics of scientists (particularly those who study environmental pollution)?

(1) Circumstances

In May 1956, Minamata Strange Disease Countermeasures Commission of Minamata City was established, being composed of the Public Health Center, the Medical Association, the (Minamata) Municipal Hospital, Chisso Hospital, and Health Section of Minamata City. In August of the year, Health Dept. of Kumamoto Prefecture reported the outbreaks of Minamata disease to the Epidemic Prevention Section, the Public Health Bureau of the Ministry of Health and Welfare. In the same month, the Minamata Rare Disease Research Group of Kumamoto University School of Medicine (the Kumamoto University Research Group) was organized. The Ministry of Health and Welfare organized The Scientific Research Group of the Ministry of Health and Welfare for Minamata Disease in November. The Director of the Epidemiology Division of the Institute of Public Health and others conducted epidemiological field surveys.

In January 1959, a Special Task Group on Minamata Food Poisoning started in The Food and Sanitation Investigation Committee of the Ministry of Health and Welfare, Ministry of Health and Welfare.

In August 1959, Prof. Raisaku Kiyoura, the Tokyo Institute of Technology investigated seawater of Minamata Bay, and stated at a press conference as follows: "Seawater of Minamata Bay is not so seriously

contaminated with mercury. The mercury hypothesis should be carefully declared openly”.

On November 10, 1959, MITI guided Chisso to complete drainage disposal facilities and to inspect the cause in cooperation with the organizations concerned as soon as possible. The Ministry asked the domestic plants of acetaldehyde and vinyl chloride production to investigate drainage. On November 11, the Ministry distributed the Kiyoura's report at “the liaison conference of ministries concerning food poisoning in Minamata”. On November 12, a joint committee of The Food and Sanitation Investigation Committee of the Ministry of Health and Welfare reported that “the main cause of Minamata disease is a certain type of organic mercury compound”, then the sectional committee of food poisoning in Minamata was disorganized. The source of the generation was not described.

In February 1960, Minamata Disease General Investigation and Research Liaison Council (that was composed of the Supervision of the Economic Planning Agency, MITI, the Ministry of Health and Welfare, Fisheries Agency, and investigators) hold the first conference.

In November 1966, Prof. Tetsuzo Kitagawa of Dept. of Technology, Yokohama National University presented “the salt-water wedge” hypothesis as follows: the agricultural chemicals at the wharf of the Shinano River were flown out by the earthquake and the tidal wave in Niigata and flew backward from the mouth of the Agano River to contaminate the area on the lower Agano. Showa Denko consistently supported the hypothesis of agricultural chemicals.

In May 1968, a uniform view of Itai-Itai disease was offered by the Ministry of Health and Welfare as a result of political decision, and in September of the year, an official view of Minamata disease was presented by the Government.

(2) Discussion

A. Relationships between scientists' opinions and the administrative judgment

1) In the beginning of outbreaks of Minamata disease, the administration and investigators struggled to inspect the cause together in Minamata City. The activities of Minamata Strange Disease Countermeasures Commission of Minamata City of the actual locate and the efforts of the Kumamoto University Research Group and the Study Team of the School of Medicine, Niigata University to inspect the cause of the disease have been highly evaluated.

As the cause was narrowed down, however, to the Chisso Minamata plant and Showa Denko Kanose plant, neither Chisso nor Showa Denko approved the conclusions made by these investigators. Furthermore, the administration, particularly MITI, has played the role as a breakwater for Chisso. In the meantime, some investigators advocated the theories, which were different from the previous one and which were advantageous to companies, having given wrong impression to public opinion.

2) From 1960 onward, Minamata disease in Kumamoto has been socially settled down, but the scientific studies were continued. However, the report by Prof. Katsuro Irukayama and the article, i.e., an outline, on Minamata disease, which was reported in a general scientific journal, “Kagaku (Science)”, by Prof. Hirotosugu Shiraki of the University of Tokyo School of Medicine, were not so dealt with in any academic meeting or the mass media. Neither the Ministry of Health and Welfare nor Minamata Disease General Investigation and Research Liaison Council responded to this fact. For this reason, the presentation of the Governmental official view was delayed, and the relief of patients on the basis of the judgment as having Minamata disease was also delayed.

3) With regard to administrative tasks in which scientific findings become issues, the administration must judge appropriately scientists' discussion and consensus. For the evaluation of policies by the administration by standing aloof from a dispute over a point of sciences, the ability to understand the dispute

is needed to the administrative inside. However, when the administration evaluates that solution of problems is being delayed in the situation in which an unproductive dispute over a point of sciences continues endlessly, the administration must demand the political decision by showing possible choices and the consequences and lose no time in deciding policies.

B. The administration's support and duty to research studies

1) Research studies need expenses. The administration should not make universities/colleges or investigators to raise funds for research studies, but secure and distribute the budget for research studies necessary for inspection of the cause and for comprehension of the actual conditions of damages and contamination in the first stage of research study. On commissioning researches to scientists, eligibility and clearness must be secured for the researches via the evaluation and decision by committees and commissions on the outside. A system in which achievements of researches are put to practical use for decision of the administrative policies should be established.

With regard to studies on environmental pollution, there are some studies that are not designed to inspect the cause. They are obliged to be regarded as delaying and confusing the inspection. On distributing the budget for researches, the objective of researches of environmental pollution must be clarified.

2) In Japan, attention is paid to the diseases that become usual main causes of death, e.g., stroke and cancers, in medicine, but only little interest is taken in toxicology. Governmental support is needed to toxicology for a long time.

C. Standpoints and roles of investigators

1) What should be the ideal stand of investigators and scientists, who are involved with problems about environmental pollution and environment? All the investigators have freedom to study as respective scholars and to have their own opinions, but, as a rule, they have responsibilities for their opinions, and present the achievements of studies to academic and technical journals with proofreading system.

There is another problem; when achievements of studies and experiments of some scientists and investigators are reduced to society, and social reactions to the achievements occur, it becomes an issue to which extent they should personally bear the social responsibility for the reactions. However, the problem must be considered separately from the relation to the administration.

2) In the Minamata disease affair, the statements of the investigators involved with companies and business community had constant much influence on the public at some periods; they interfered with inspection of the cause in one case and justified the nonperformance of countermeasures in the other case. Thus, none of the statements were put to practical use for the relief of or countermeasure against the victims.

It is particularly necessary for elimination of interference with the pursuit of truth to clarify the process of the fact that the "investigators" supporting the counterarguments offered by the Chisso plant and the Japan Chemical Industry Association, which can be regarded as "a shadow of organization" in the process of inspection of the cause, delayed inspection of the cause with position in the academic society and abundant funds for researches in the background.

3) It is very regrettable that there is a difference in social evaluation between a central organization and an organization in the district in the field of study research as well. Kumamoto University was written in a journal "Mizu (Water)" as "wretched university" or "ekiben daigaku (station-lunch university)". Young investigators of the university were infuriated at the statement, but many investigators neglected such a noise, and the investigating staff members engaged in inspection of the cause did not result in confusion, either.

(3) Lessons

1) Science as a tool for the administrative decision

Science is only an instrument to decide respective acts for the persons interested other than scientists, who include the administration. In the event of social problems particularly, which are involved with life and property, the administration must understand this situation of science, and decide on the administration's responsibility even under the scientifically uncertain situation as well.

2) Self-knowledge of science that can become one tool for protection of the causative company

All scientists should recognize that science becomes a weapon for protection of the causative company. The scientists, who investigate environmental pollution, particularly must be aware of the objective standpoint as a scientist and of the engagement in the work involved with the inhabitants' lives and property. In environmental pollution, it is constantly asked that for whom and for what the studies are conducted. This must be kept in their minds.

3) Discernment of scientists for the justice without adherence to the existing academic theory or authorities

There is the fact that academical sectionalism and authorities dominate the field of science as well. If a scientist acts counter to the authorities, he/she may receive restrictions in the aspect of funds. However, the existence of scientist, who does not adhere to any existing academic or administrative authority, is important. In the administration as well, it is necessary to discern the scientist's justice without adherence to the existing academic theory or authority.

4) Scientific researches depending on the actual settings of the occurrences of damages

Scientists, particularly the investigators of environmental pollution, must depend on the actual settings of the occurrences of damages

[Discussion 15]

How about the roles of the mass media?

(1) Circumstances

It was reported in the issue as of August 1, 1954 of Kumamoto Nichinichi Shimbun (The Kumamoto Daily News) that "cats were totally destroyed by epilepsy, and people are ready to cry for help against the remarkable increase in the number of rats".

The disease was adopted for the first time to the issue as of May 8, 1956 of The Nishinippon as follows: "A strange infectious disease in Minamata which induced the dead and mad men".

The problems with Minamata disease went into headlines for the first time in Tokyo in a news item of "fishing people riot" in November 1959.

At the time of the contract about the present of money in token of the company's sympathy, metropolitan the mass media published the counterarguments against the organic mercury hypothesis with heavy headlines, having led to loss of the confidence of the representatives for the patients, who had been

encouraged by the organic mercury hypothesis established by Kumamoto University and had proceeded negotiations on compensations.

The local paper "*Minamata Taimusu* (Minamata Times)" had accurately reported the situations of the patients and the circumstances of inside of Chisso.

Since 1959 when the problem with Minamata disease was settled by the contract about the present of money in token of the company's sympathy, the number of reports on the problem by the mass media has decreased.

In the latter half of the period from 1955 to 1964, the mass media reported the hypothesis different from the organic mercury hypothesis, which was presented in the Tamiya Committee, without any revision, having played the social role in showing an erroneous impression that there may be various theories about the cause.

Kumamoto Nichinichi Shimbun (The Kumamoto Daily News) scooped its rivals with a report on the hypothesis by Prof. Katsuro Irukayama and his colleagues (at the meeting of study report on supportive funds for PHS by the NIH) as "Organization during the process of production".

(2) Discussion

A. The role which the mass media should play in the Minamata disease affair

1) In the beginning of the outbreaks of Minamata disease, even the mass media had no recognition about environmental pollution disease; they pursued only the phenomena occurring in front of them, and just reported.

However, the force of the mass media is important for motivating people to countermeasures. The mass media played the constant role in informing of the presence of Minamata disease in the early stage of the outbreaks of the disease and of the process of inspection of the cause, but they should have offered warnings to the seriousness of the affair by interpreting facts and phenomena and conducting an investigational report in a special program. The mass media might have played the role in more rigidly criticizing the administration, politics, and companies.

2) The mass media have the considerable force to excite and make up public opinion. They should be conscious of this respect, distinguish facts from the truth, judge the correct contents, and pose necessary social problems by themselves without missing opportunity. As the readers' responses particularly, the number of people who consider the events reported to be "true" will increase if the quantity of information reported is large, and the number of people who concern will decrease if the quantity of information is small or unless information is reported. Much attention should also be paid to these points.

Moreover, the countermeasures of the mass media against the problem about Minamata disease have, as a whole, been poor until 1968 when the governmental unified view was issued, since 1960 when the possibility of settlement of the problem was tentatively offered. The presentation of the article by Prof. Irukayama in an academic journal in 1962 and the scientific article by Prof. Hirotsugu Shiraki in 1964, for instance, were hardly dealt with by the mass media, regardless of their scientific importance. From 1960 onward, the problem about Minamata disease has been poorly adopted by particularly national newspapers.

In those days, television did not spread, and there was the first report on the occurrence of a "kibyō (strange disease)" by the mass media. This report may have excited apprehension in the wide-ranging inhabitants. The riot of fishing people was further published with heavy headlines as a problem with sensationalism of news, showing that the mass media also played a part of the role in forming an impression as the affair disturbing the public peace and order.

B. The practical use of other communications media

Communications media including INTERNET will increase in the future, but the mass media via printing and reflections are still important communications media.

Furthermore, the literary works by Michiko Ishimure, the photographs taken by Sisei Kuwabara and Yudin Smith, and films by Noriaki Tsuchimoto and his group, all of which were conducted on their own individual responsibilities, played the important role in reporting the truth of Minamata disease and appealing the seriousness of the affairs.

(3) Lessons

1) Significance of the news based on continuous investigation

Items of news by the mass media have much influence. The mass media need the news based on investigation as well as continuous and investigational work, not fragmental news or those based on vain sensationalism.

[Discussion 16]

How did the police and the public prosecutors office function?

(1) Circumstances

On November 2, 1959, the Kumamoto Prefectural Alliance of Fishing Cooperatives proposed to Chisso a collective bargaining for cessation of operation. Since Chisso refused its proposal, the fishing people broke into the plant. A collision took place between them and the police, and there were 100 or more wounded. In January 1960, the Prefectural Police Station arrested 35 fishing people including the president of the MFCA in Tanoura, Ashikita-gun.

At the time of the contract about the present of money in token of the company's sympathy in 1959, no lawyers supported the patients.

In February 1963 when Kumamoto Nichinichi Shimibun (The Kumamoto Daily News) contained an article on the presentation of confirmation of organic mercury in the plant by Prof. Katsuro Irukayama, a chief public prosecutor of the Kumamoto District Public Prosecutors Office gave the following comment: "We have not touched about this problem, because no distinct cause has been known, but we must be much concerned about it if some conclusions were drawn." However, there were no concrete movements of the prosecution.

(2) Discussion

A. Trends in the environmental pollution affairs; the victims tend to be indicted for the affairs and the assaulters tend to be taken to no task for the affairs.

1) In the affair of intrusion of fishing people, the fishing people who were agitated were arrested. Certainly, acts of violence should be avoided in every case, but the affair began to assume serious proportions because the company did not comply with the fishing people's request. In the Minamata disease affair, the fishing people as the victims received indictment first of all, and they were convicted of the affair. On the other hand, Chisso was not taken to task for the affair.

2) The police and the public prosecutors office consistently regard the Minamata disease affair, which

includes the affair of protest by the fishing people of the districts along the shore of the Shiranui Sea, as “problems of the public order”, and no acts were conducted from the standpoint of prevention of the spread of victims. The police or the public prosecutors office did not act, probably because they may have been conscious that the causative problem was unsolved. It is also considered that they may have failed to see all the conditions in the large range of a crime of environmental pollution.

Such an attitude was criticized in the verdict of the Tokyo High Court as well in the Kawamoto trial as independent negotiation in June 1977. In the primary verdict of the third suit in Kumamoto in March 1987, it was judged that the Chisso Minamata plant, which had continued to drain the untreated waste water, could have been strictly controlled to increase effectiveness of the regulations on the basis of the laws and regulations of performance of police’s duties in about November 1959. Thus, the nonperformance of the Kumamoto Police Station was doubted by the judgment.

B. The suppressive effect of investigation on the spread of damages and timing of investigation of Chisso

1) In the affairs such as the Minamata disease affair, the administration also should consider actively judicial means including criminal indictment, and so on.

With regard to the police and the public prosecutors office as well, the police should have entered the plant by the exercise of its right to investigate, when the source of pollution was narrowed down, collected evidence of the process of production and waste water management, and investigated the executives of the plant for the purpose of avoiding the spread of the damages.

There were two occasions as timing of the initiation of investigation of Chisso; i.e., in 1959 when new patients were induced by the change in the drainage channel and in 1962 when the source of pollution was traced by Prof. Irukayama et al. In February 1963, a chief public prosecutor of the Kumamoto District Public Prosecutors Office gave the comment, “We have not touched about this problem, but we must be much concerned about it if some conclusions were drawn”. On this occasion, however, there were no movements of the prosecution.

One possible reason for the nonperformance by the police or the public prosecutors office in 1962 is considered to be that Minamata disease has been socially believed to have ceased in 1960. This wrong belief proved a disadvantage to progression of the subsequent countermeasures. If enforced investigation had been conducted on this time point or at the time earlier, the spread of the damages of Minamata disease should have been prevented and the situation of the Minamata disease affair should have been very different from the real situation. However, it is also important another viewpoint to think about efficient methods other than criminal indictment for the purpose of preventing the spread.

In actuality, the public prosecutors office indicted the executives of Chisso in 1976, i.e., 20 years after the disease was officially found. Furthermore, the patients’ complaint triggered the indictment. They indicted the ex-president of Chisso and the ex-chief of the plant, but the indictment had no suppressive effect on crime any more, because it was too late.

2) There was no continuous monitoring system for Minamata disease from 1960 onward. If it had been present, the report by Prof. Irukayama might have been dealt with in a manner different from that in the real situation in 1963, and if investigation had been conducted at that time, outbreaks of the second Minamata disease could have been minimized.

3) The administration should have decided while conducting stepwise countermeasures along with inspection of the cause, but it was unclear under the legal system in those days where the responsibility lies. Thus, the administration was locked up within the competence of the laws concerned.

(3) Lessons

1) *The exercise of the right to actively investigate affairs of environmental pollution and environment*

The roles of the police and the public prosecutors office are to investigate and expose crimes, and the roles function just after occurrence of affairs and events. In the problem with environment, however, their investigation and exposure may get too late unless their roles are active, because the wrong acts are frequently continuous.

2) *The practical use of criminal indictment just for the causative person for environmental pollution*

Criminal indictment is conducted strictly on the victims as the countermeasures against the public peace and order, but what is really necessary for the countermeasures is the more strict attitude toward the causative person for environmental pollution.

3) *The function of criminal indictment to prevent the spread of damages of environmental pollution*

When deciding something, the administration must be fully resolved to be ready to do criminal indictment in case of need.

4) *Systematization of public suits*

A system, in which the Administrative Agency can sue companies for something (public suits), is also needed.

[Discussion 17]

How did the patients act?

(1) *Circumstances*

On August 1, 1957, Minamata disease patients organized the Benefit Society for Victims of a Rare Disease in Minamata (President: Eizo Watanabe; Later, Minamata Disease Patient's Families Mutual Aid Society) for the sake of cooperation in inspection of the cause of the strange disease and of the relief of the patients. Since nobody supported the patients or the families, who were placed in a fix, in those days, they were completely isolated in the local community.

On November 25, 1959, Minamata Disease Patient's Families Mutual Aid Society demanded that Chisso pay two hundred and thirty-four million yen to 78 victims as compensations, and started staging a sit-down demonstration in front of the main gate of the Minamata plant on November 28. They made a representation to the Kumamoto Prefectural Governor to ask for conciliation of mediation by the Shiranui Sea Fishery Dispute Mediation Committee. On December 12, the Committee (Chairman: the Prefectural Governor) started out to mediate the dispute concerning the demand.

On December 25, the negotiation between the Kumamoto Prefectural Alliance of Fishing Cooperatives and Chisso was settled, and Minamata Disease Patient's Families Mutual Aid Society also signed to the contract about the present of money in token of the company's sympathy on December 30.

The victims in Niigata Prefecture went to law against Showa Denko for damages in June 1967. This was the first suit of the four big suits at law for environmental pollution in Japan.

In January 1968, the plaintiffs and the lawyers of the trial of Minamata disease in Niigata visited Minamata City, and talked with Minamata Disease Patient's Families Mutual Aid Society and Citizens'

Council for Minamata Disease Countermeasures. As a result, they presented the joint statement about the relief of the patients.

(2) Discussion

A. Progression of solution of the problem with Minamata disease owing to movements by the victims

With regard to Minamata disease in both Kumamoto and Niigata, the compensation or countermeasure has not progressed until movements by the victims occurred. Likewise, the compensation for fisheries has not progressed until movements by the victims occurred.

Consequently, the amount of payment was suppressed to be inadequate, and the cause of the disease also remained unclear. This problem with the contract about the present of money in token of the company's sympathy provided an important clue in the new development of the Minamata disease affair by complaints from patients after the representation of the Governmental unified view.

B. Recognition of the actual state by communications with patients

General citizens and the labor union showed the protective attitude to movements by the patients for Chisso. Under these conditions, Citizens' Council for Minamata Disease Countermeasures was organized to support mentally and physically the patients and the families. The actual state became known for the first time by the communications with patients.

(3) Lessons

1) Progression of the solution induced by the victims' own movements

The victims' own risings of negotiations and acts yield the force to open the closed situation. The administration and investigators must listen to the victims' voices sincerely. This becomes the first step to solving the problem.

Even though the administration settles the affair by isolating the victims in conspiracy with the company, the problem will not be solved at all.

2) Necessary and essential support to the victims as the social weak

For the complaints from the victims as the social weak to be enlightened in society, supportive activities of wide-ranging citizens including investigators and jurists are necessary and essential.

[Discussion 18]

How did the local residents approach to the problem?

(1) Circumstances

Soon after the riot of fishing people on November 2, 1959, the Mayor and representatives of the Municipal Assembly, the Chamber of Commerce and Industry, the Agricultural Cooperative, the Labor Union, etc. presented a resolution by the Minamata Municipal Assembly to the Governor on November 7, which proposed that "early inspection of the cause of Minamata disease, denial of violent acts, countermeasures against the relief of patients and fishing people, and early completion of drainage disposal

facilities by Chisso”. In the resolution, they asked to avoid cessation of Chisso’s operation.

Kateikai, Suikosha, the New Nippon Nitrogen Minamata Plant Consumers’ Cooperative presented a written petition for the denial of violent acts and an objection to cessation of drainage of the factory wastes to the Prefectural Governor and the President of PFF as of November 9, 1959.

In January 1968, Citizens’ Council for Minamata Disease Countermeasures (President: Ms. Fumiko Hiyoshi; Later renamed, Citizens’ Conference for Minamata Disease) was organized for the purpose of supporting Minamata disease patients.

In June 1968, the Minamata Ashikita Branch presented, “The request to the Minamata disease struggle branch” to a teachers’ union conference. In August of the year, all Japan Prefectural and Municipal Workers’ Union (AJPMWU) Headquarters in Kumamoto Prefecture presented “a resolution for supporting the struggle against Minamata disease” in the 17th National Regular Congress.

(2) Discussion

A. The theory showing that the cause of the disease is considered to be Chisso by intuition of the local residents

The inhabitants of Minamata, who were the victims and, simultaneously, the first “persons who discovered the disease”, have perceived by intuition that the plant is the cause. A system for absorbing the honest voices of inhabitants is needed.

B. Citizens’ acts in the town governed economically by the company

How did the citizens and NGO behave in Minamata?

In the beginning, general citizens were fear of infectious diseases, and avoided the patients with a strange disease as much as possible. However, soon later when there was a rumor that waste water from Chisso was considered to be the cause, they protected Chisso, and the tendency toward cold treatment of the patients gradually spread. When the contract about the present of money in token of the company’s sympathy was established in December 1959, the trend toward green envy and contempt increased. Until Citizens’ Council for Minamata Disease Countermeasures was organized in 1968, there were hardly any movement of support by general citizens.

Nowadays, concerted action by the residents, ombudsman, and the Japan Federation of Bar Associations may move. In those days in which the conditions are different from those at present, the social welfare commission or any human rights protective committee of the district, or the Japan Federation of Bar Associations did not move. At any rate, it was very difficult to act contrary to Chisso on the side of the patient party in the town governed economically by the company, except for only a part of people.

The residents of the town were always identified with the company; it means that they may move in the good direction or ill direction. The Minamata disease affair was an example of the ill movements of the conspiracy of the company with the residents.

(3) Lessons

1) Transmission of precise information for judgment by the local residents

The residents of the town governed economically by the company are always identified with the company, but if a person’s fate is entrusted to a company, the trust may often betrayed by the company.

Arguments of the local residents, which may have to be adopted in politics, are very important for

the detection, prevention, and the relief of victims. For this purpose as well, information and correct knowledge of Minamata disease must be transmitted precisely to the local residents.

[Discussion 19]

What role did the labor union of the causative company play?

(1) Circumstances

On August 19, 1959, the New Nippon Nitrogen Labor Union passed at a board of representatives that the Union supports the fishing people's struggle as a rule.

In response to the fishing people's riot affair on November 2, 1959, the Union hold an emergency board of representatives on November 4, and expressed its regret that such an inauspicious event occurred, although early inspection of the cause and countermeasures against patients and fisheries must be promoted.

On November 6, 1959, the Union decided to be strongly opposed to cessation of the factory operation, and presented a resolution to the President of Chisso, the Prefectural Governor, and the Chairman of the Kumamoto Prefectural Alliance of Fishing Cooperatives.

At the end of 1959, Chisso offered the following conditions at the time of the negotiation about a lump sum: (1) the contents of the management are not written in bills of the Union; (2) the tents lent to the patients' families, who staged a sit-down demonstration in front of the plant, are returned to the plant. The Union also accepted the conditions. In those days, labor and management showed in one the attitude that production had priority over everything and the company was protected.

Keen labor-management disputes for the Chisso's steady wage system occurred during the period from April 1962 to January 1963. The New Nippon Nitrogen Labor Union was divided into the New Nippon Nitrogen Labor Union (the First Union) and the New Nippon Nitrogen New Labor Union (the Second Union), resulting in the division of the shops and citizens into two parts. Because of the spread to the riot, a riveted feeling of confrontation remained not only among the Chisso laborers but also among the citizens. During this period, Minamata disease was kept out from the citizens' concern, and the Chisso's internal studies for inspection of the cause were also discontinued and became extinct.

On August 29, 1968, Chisso stopped a plan to export mercurial waste fluid (ca. 100 tons) stored by Chisso to Korea in response to the protest by the New Nippon Nitrogen Labor Union against the plan. At the regular conference on August 30, the Union decided to the effect that "We think shame to have ever done nothing, and must have the company approve its responsibility for Minamata disease, support the victims of Minamata disease, and struggle with the disease".

(2) Discussion

A. Facilitation of the tendency of the general public becoming indifferent to the Minamata disease affair by labor dispute

In 1959 the fishery disputes were solved, factory waste water disposal facilities were established, and the contract about the present of money in token of the company's sympathy was signed. Thus, Chisso proceeded to settle the Minamata disease affair. In addition, a keen labor-management dispute about the steady wage system broke out, and the problem with Minamata disease was further kept from the residents' concern.

B. Responses of the First Union to Minamata disease patients with the opportunity of defeat of labor dispute

After the stabilized wage disputes, the labor union was divided. Under the situation, the discriminative treatment for the First Union gave a clue in understanding the situation of the patients, and sympathies with Minamata disease patients spread in the First Union. Labor accidents frequently broke out in the Minamata plant, and the First Union increased criticism of the company from a viewpoint of structure, i.e., “there are labor accidents inside, and there are outbreaks of Minamata disease outside”.

“The declaration of shame” made by the First Union is revolutionary as the whole movement of labor unions as well in Japan, because the organization’s completeness, i.e., the absence of mistakes in the movements of labor unions, was denied by the declaration.

(3) Lessons

1) A breakaway from force of habit of labor unions in Japan, i.e., those by companies, which antagonize the victims in one united body of labor-management

Since the labor unions in Japan are unions by companies, there is always the fear that they may antagonize the victims of problems with environmental pollution and environment in cooperation with the companies.

However, the involvement of labor unions with countermeasures against environmental pollution also leads to the elevation of their own social status. For this purpose as well, the unions must not only pay attention to their interests but also be so conscious that they will act with adequate recognition of social conditions surrounding the companies.

[Discussion 20]

What do outbreak of fetal Minamata disease mean? How about the approach to them?

(1) Circumstances

In the district where many patients were observed in Minamata, many children have been found to have had symptoms resembling those of cerebral palsy since the former half of the period from 1955 to 1964. In 1959, Prof. Shoji Kitamura reported these infantile patients.

Prof. Sukenori Nagano and his colleagues of the Dept. Pediatrics, Kumamoto University School of Medicine also examined infantile patients and suspected the relations to Minamata disease.

In March 1961, one of the patients, who was a girl aged 2 years and 6 months, died. As a result of autopsy by Prof. Tadao Takeuchi et al., the condition was concluded to be fetal Minamata disease. Asst. Prof. Tokuomi et al. also confirmed the result from findings of the brain. Masazumi Harada and his colleagues of the Dept. Psychoneurology also regarded the 16 cases found in Minamata as being the same disease due to the same cause, and diagnosed the cases as transplacental Minamata disease.

In September 1962, the second autopsied case was also diagnosed as fetal Minamata disease from pathological findings. Therefore, the 16 cases, whose diagnoses had been deferred, were diagnosed as fetal Minamata disease in November of the year.

(2) Discussion

1) High incidence of infantile cases showing symptoms and signs of cerebral palsy were observed in the second half of 1950s, but any relation of the outbreak to Minamata disease could not be confirmed. This was owing to the following reasons: it has not been generally considered that toxic substances easily pass the placenta, it has not been demonstrated that methylmercury passes the placenta; the patients themselves have

not had the contaminated fishes or shellfishes; their mothers had no obvious clinical signs of Minamata disease; both mothers and their children showed high mercury levels in hairs, but mercury levels in hairs were also high in healthy mothers and their children living in the same district, etc.

2) It has nearly been confirmed from clinical and epidemiological aspects that the cases of cerebral palsy are related to Minamata disease, but there was no relief until autopsies of these two cases. Thereafter, only 5 cases more were found by Asst. Prof. Yoshitaka Harada et al. of the Dept. Pediatrics, but many suspected cases were found subsequently (after the Governmental unified view was offered). Some of them were already dead.

When the definite diagnosis was made in 1962, the administration should have made efforts to detect patients with similar symptoms, but such a countermeasure was not taken. The decision of a new fact requires scientific circumspection, but it should not delay the actual relief.

3) Despite the fact that the cause was unknown, no epidemiological survey using controls was conducted. Many of the cases diagnosed as fetal Minamata disease were serious cases, but no investigation was conducted about manifestation of the slight influence. If it had been investigated, even the influence of a trace of methylmercury on fetuses, which could not have been detected later, might have been determined.

4) Some chemical substances transfer to infants via the breast milk and pass the brain-blood barrier and the placenta-blood barrier. The outbreak of fetal Minamata disease seem to have given a warning of these possibilities again to human beings.

(3) Lessons

1) *Investigation should be conducted first on a new event.*

When a new event, e.g., influence on a fetus, occurs, investigation of the actual condition should not be conducted until scientific and medical demonstration is completed.

2) *Necessity for rigid epidemiological survey from the early stage of outbreaks*

In the case as well, in which the influence on fetuses is elucidated, rigid epidemiological survey using controls is needed from the initial stage after the outbreak.

3) *The existence of a variety of mild cases*

In damages of environmental pollution to health, it must be kept in mind that the severity depends on the degree of exposure to environmental pollution, and combinations of symptoms are not always the same.

Chapter 6.

Comprehensive Lessons from the Minamata Disease Affair

We must recognize honestly that we have committed grand mistakes in the historical process of the Minamata disease affair. These mistakes included structural ones such as the ideal way of the administration and business activities.

Outbreaks of Minamata disease were derived from the structure of modern society in which the development of scientific technology and chemical substances was continued in pursuit of the development and convenience of industry.

Environment certainly continues to send signals of the risk to us, but we neglected them and did not conduct any effective countermeasure against the spread of damages. The subsequent accurate follow-up was not conducted, either. These situations resulted in irreparable damages to the inhabitants' health and induced deadly environmental disruption. Moreover, the tragedy was repeated twice.

The most rigid lessons obtained from Minamata disease are as follows: On the ground of scientific disputes about decision of the pollution source and the causative factor for the disease, it took 12 years for the Governmental policy to have been politically and socially decided, because the relations in the competence among ministries and offices also became a difficulty in the decision, and pollution and damages spread during the period, inducing further outbreaks of the second Minamata disease.

The causative companies were uncooperative in inspection of the cause, and concealed facts. The companies and industry were protected by the chemical industry world and MITI with authorities of the academic world. It becomes a serious problem what roles the Governmental and local administrations, politics, the public prosecutors office, and the mass media played in a series of these acts.

1. The actual setting must be directly observed, and the approach to the affair must be initiated from sincere hearing from the inhabitants.

The starting point of the approach of the local and governmental administrations to the affair is sincere hearing of complaints of abnormal events in environment and humans in the actual setting from the inhabitants. On the basis of the data, opinions of specialists for healthy and environment must be requested, then fair and prompt evaluation should be made.

2. Protection of health against damages must have priority over everything, and the administrative decision is required according to the certainty of the cause.

It is fundamental that the administration secures activities of investigators to investigate for the purpose of inspecting the cause and carries out measures to counter damages by its evaluation and on the responsibility of the administration. In many cases, however, of fatal emergency conditions, there is no time for the cause to be determined. All the conclusions made remain uncertain.

The person, who has the responsibility for solution of a problem, must think that protection of human health has the priority over everything, and after the cause was confirmed to a certain degree, the person must decide and carry out the effective and appropriate countermeasures considered according to individual occasions promptly, widely, and actively. Nor an administrative official nor a politician is permitted to escape from the responsibility for the decision and the implementation.

Useless deferment of countermeasures may eventually lead to criminal acts that may induce more serious damages.

3. Collection and presentation of information in various scenes are necessary.

It is important, just in the early stage after the outbreak, to collect information in various wide-ranging fields from the transectional aspect of organization on the basis of the viewpoint of inspection of the cause, rather than the means of approaching to events. The related information in the past must also be thoroughly collected, and the information must be presented to the persons concerned.

In the process of inspection of the cause, the information kept by companies and the administration must be opened to investigators and the victims. For the problems such as environmental ones particularly, to which interdisciplinary studies are needed, exchange of information among investigators regardless of special field is essential.

The administration must promote active effort and opening of information to the public by companies about environment by introducing the PRTR system, etc.

The experience of Minamata disease indicates that preventive countermeasures against environmental pollution and opening of information to public for the purpose of preventing damages will lead to the interests of companies themselves from a long-term viewpoint.

4. Companies have the social responsibilities

It is clear that companies have the responsibilities for their social existence and that their activities should not be designed only to pursue interests. Therefore, it is axiomatic that such an activity of company as will damage human life is absolutely prohibited every time. The Minamata disease affairs were criminal acts caused by activities of the companies without consciousness of the social responsibilities.

Epilogue.

Problems with Environmental Pollution, Which Man is now Confronted with--Conclusions--

The methylmercury compound, the cause of Minamata disease, was generated as a byproduct without industrial utility value and drained in the process of production at a chemical plant. There has been no process that a trace of the methylmercury compound drained in environment exerts harmful action to humans and animals via the biological condensation. With such experience as a momentum, international countermeasures against the safety of chemical substances (International Programme on Chemical Safety) were established. The result that the methylmercury compound had influence on fetuses via the placenta has also disproved common sense of toxicology up to that time.

At present, 100,000 kinds of chemical substances are used as raw materials and materials of products at factories over the world. A considerable proportion of them are considered to have the fixed possibility to exert harmful influence on human health and ecosystem through pathways in environment (environmental risks), although there is difference in extent of the influence. For these enormous chemical substances, the man power or budget, which is required for checking their environmental risks, is not adequate, and the environmental risks of many chemical substances are not yet evaluated adequately under the present situation.

Moreover, harmfulness, which was not predicted at the time of production, may also be discovered owing to advances in science, as in endocrine-disturbing chemical substances (environmental hormones) and flon, although the harmfulness is much different from Minamata disease in terms of the character and importance of the risk of damages to individuals. At present, there are also apprehensions about the influence of long-term exposure to low-concentration chemical substances on ecosystem, the spread of pollution through a plurality of environmental media (air, water, soil, etc.), and the complex influence of chemical substances from a viewpoint of earth environmental preservation.

Nowadays, chemical substances are utilized in various forms and are inseparable from the people's life. However, they have both sides, useful and harmful, and problems with chemical substances are further complicated. With regard to the countermeasures, control alone of drainage and emission is inadequate. Total management from the environmental aspect, which includes the substances used in products and used/abolished as products, is needed. Since the harmful influence of chemical substances remains scientifically unclear in many points, opening of necessary information and individuals' wise acts based on the information are required from a viewpoint that how the environmental risks of chemical substances should be avoided or the risk should be reduced.

When we turn our eyes to various foreign countries including developing countries, there are still a number of areas in which there may be risks of pollution with mercury, e.g., use of mercury for gold refining, pollution with mercury in coal, drainage of mercury from plants, etc.

In order to counter such problems with chemical substances inside and outside Japan, so that the failure like Minamata disease will not be repeated, we must learn the experience in the past, particularly the history of many victims induced as a consequence of the absence of any particular countermeasures, or the history of efforts to have overcome the failures, and must put the hard experience to practical use as lessons.

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