

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

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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.