

# Appendixes

## Appendix 1. The Diagnostic Criteria and Therapeutic Guidelines for Yusho

**Table 1.** The Diagnostic Criteria for "Yusho" and Tentative Therapeutic Guidelines for "Yusho"<sup>a,b</sup> (1968)

### 1. Diagnostic Criteria

These criteria can be applied only to the specific disease called "Yusho" showing peculiar clinical manifestations, which arose in western Japan and is suspected to have been caused by the use of a specific brand of rice bran oil. Therefore, they cannot be applied to other dermal diseases which may have been caused either directly or indirectly by the use of cooking oils.

#### *Referential conditions of attack*

- 1) The use of a specific brand of rice bran oil.
- 2) Familial occurrence is seen in most cases. When not, some inquiry must be made as to the reason.
- 3) The attack occurred in most cases after April 1968.
- 4) Some lapse of time seems to be necessary before the outbreak of symptoms after the use of this rice oil.

#### *Diagnostic criteria*

Symptoms and signs: Swelling of the upper eyelids, increased eye discharge, lack of appetite, changes in nail color, loss of hair, swelling of the limbs, nausea, vomiting, a feeling of lassitude, numbness of the limbs, arthralgia and dermal symptoms are demonstrated by many victims. In particular, increased eye discharge, change in the nail color, and acneiform eruptions are the most representative symptoms of this disease. Furthermore, the above symptoms are often accompanied by weakened eyesight and weight loss.

The general signs of the present disease that are observed without the use of any special tests include the following :

#### 1. Ocular signs

Increased eye discharge (secretion of the meibomian gland), hyperaemia, opacity, and pigmentation of the ocular and fornix conjunctivas, pigmentation of the corneal limbs and transient visual disturbance are observed.

It is also desirable to check for secretion by Giemsa staining in order to differentiate the findings with other ocular diseases.

#### 2. Dermal signs

With abnormal keratinization as the main lesion, the following dermal signs are seen among patients:

- 1) Pigmentation and occasional flattening of nails are seen without any discernible deformation.
- 2) Blackish fine spots seen at the follicular orifice which is markedly enlarged and elevated.
- 3) Increased perspiration on the palm.
- 4) Keratotic papules developing especially in areas where active perspiration and the secretion of sebum (in the axillae etc.) are observed.
- 5) Acneiform eruptions. Varying from comedone to acne conglobata in severe cases.

- 6) Cyst formation of the sebaceous gland (often seen in the genital region).
  - 7) Child cases also show the above dermal signs but some have slightly different ones. That is to say, there are some cases in which many exfoliative erythemas as big as a pinhead can be seen all over the body, in particular, in the flexor aspect of the limbs, with slight itching.
  - 8) No itching is experienced in most cases or, if any, it is only slight and no scratching is seen.
  - 9) The skin becomes a slightly dirty-yellowish color, but in most cases no distinct pigmentation is seen.
  - 10) Seborrhea sicca.
  - 11) Pigmentation of the oral mucosa and of the gingivae is occasionally seen.
  - 12) An increase of cerumen is observed.
3. General signs
- 1) Anemia, hepatome and splenomegaly are not seen in most cases, but fever and disturbed liver functions are occasionally seen.
  - 2) Patients often present with numbness of the limbs and feelings of weakness, but no distinct paralysis is observed. In addition, some patients show a weakened or undiscernable deeper reflex. Hyperalgesia is occasionally seen at the periphery of the limbs.

Most of the above signs are seen in typical cases. However, it may at times be necessary to diagnose some patients as doubtful cases of Yusho, while comprehensively taking into account such signs as excess sweating at the palms, pigmentation of the nails, increased eye discharge, comedone formation at the malar region, and other subjective symptoms.

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## 2. Tentative Therapeutic Guidelines

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1. The administration of SH compounds.
  2. The administration of vitamin B<sub>2</sub>, etc.
  3. The external application of ointments or lotions containing sulfur or other keratolytic ingredients.
  4. Hexachlorophene and other similar substances are used to keep the skin clean, in an attempt to prevent secondary infections and to remove unpleasant odors.
  5. If any secondary infection is noted, chemotherapy is also considered.
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<sup>a</sup>: Katsuki, S. (1969) Foreword. *Fukuoka Acta Med.* 60, 403-407 (in Japanese).

<sup>b</sup>: Translated by M. Kuratsune.

**Table 2.** The Diagnostic Criteria for Yusho and Guidelines for Therapy of Yusho<sup>a,b</sup>  
(Revised on October 26, 1972)

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### 1. Diagnostic Criteria

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Yusho is considered to be due to either acute or subacute poisoning by PCB. The general symptoms and signs currently seen are retarded growth, neuroendocrine disturbances, phenomena of enzyme induction, respiratory disturbances and abnormal lipid metabolism. As for local symptoms and signs, acneiform eruptions and pigmentation as dermal or mucosal lesions, and ocular signs are seen.

1. Conditions of attack  
Proof that Kanemi rice bran oil contaminated with PCB had been ingested. Familial occurrence is seen in most cases.
2. General symptoms and signs.
  - 1) Subjective symptoms.

- (1) A feeling of general lassitude.
- (2) A feeling of heaviness in the head or headache.
- (3) Changeable abdominal pain.
- (4) A feeling of numbness or pain in the limbs.
- (5) Articular swelling and arthralgia.
- (6) Cough and sputum.
- (7) Altered menstruation.
- 2) Objective signs.
  - (1) Bronchitis-like signs.
  - (2) Sensory neuropathy.
  - (3) Bursitis.
  - (4) Growth retardation and dental abnormality in children.
  - (5) SFD (Small-For-Dates Baby) and systemic dark pigmentation in neonates.
- 3) Laboratory test results.
  - (1) Abnormal properties and concentrations of PCB in the blood.
  - (2) Increased neutral lipids in the blood.
  - (3) Anemia, lymphocytosis, and hypoalbuminemia.
  - (4) Reduced conduction velocity of the sensory nerve and adrenocortical hypofunction.
3. Cutaneomucosal signs.
  - 1) Acneiform eruptions.  
Black comedones and acneiform eruptions seen in the face, buttocks and other intertriginous sites, and their suppurative tendencies.
  - 2) Pigmentation.  
Pigmentation in the face, palpebral conjunctivas, gingiva and nails of both the fingers and toes.
  - 3) Ocular signs.  
Swelling and hypersecretion of the meibomian glands, and palpebral edema.

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## 2. Therapeutic Guidelines

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### 1. Acceleration of excretion of PCB.

Although it is presumed that the concentration of PCB in patients with Yusho has been substantially reduced by now, the acceleration of the excretion of PCB is still essential. However, no effective drugs to accelerate the excretion have yet been developed, due to the special nature of PCB.

The present conceivable methods for the acceleration of excretion of PCB are as follows:

- (1) Fasting.
- (2) Enzyme induction methods.
- (3) The oral administration of appropriate adsorbents of PCB.

The adaptation and practice of fasting or enzyme induction methods, however, require a great degree of caution.

### 2. Symptomatic treatments.

Symptomatic treatments include: the administration of various detoxication drugs (e.g., glutathione of reduced form), remedies for lipid metabolism, analgesics, and vitamin B preparations for central nervous symptoms, and cough medicine for respiratory symptoms. Hormone therapy is also considered for endocrinous symptoms. Various symptomatic treatments for dermal symptoms have also been performed and plastic surgery is also done in some cases.

Various ophthalmology, orthopedic surgery and conservative dentistry clinics conduct

thier own symptomatic treatments for the symptoms demonstrated by these patients.

3. Treatment for complications.

Patients with Yusho who show nervous and endocrinous disturbances, and signs of enzyme induction often have complications that tend to become severe. Therefore, they must be treated with due caution.

Furthermore, the biotransformation of drugs is also intensified by enzyme induction so that the administration of drugs at usual doses often fails to work effectively.

<sup>a</sup>: Urabe, H. (1974) Foreword. *Fukuoka Acta Med.* 65, 1-4 (in Japanese).

<sup>b</sup>: Translated by M. Kuratsune.

**Table 3.** The Diagnostic Criteria for Yusho<sup>a,b</sup> (Revised on June 14, 1976)

The Diagnostic Criteria for Yusho was revised on October 26, 1972. Since then, some changes in the symptoms and signs have been observed over the course of time and the following criteria are now considered to be appropriate:

Conditions of attack.

Proof that Kanemi rice bran oil contaminated with PCB was ingested. There are also some cases in which PCB is transferred from mothers with Yusho to their children. Familial occurrence is also seen in many cases.

Important manifestations.

1. Acneiform eruptions.

Black comedones seen on the face, buttocks and other intertriginous sites, comedones with inflammatory manifestations, and subcutaneous cysts with atheroma-like contents which tend to suppurate.

2. Pigmentation.

Pigmentation in the face, palpebral conjunctivas and nails of both the fingers and toes (including so-called "black babies").

3. Hypersecretion of the meibomian glands.

4. Unusual composition and concentration of PCB in the blood.

Symptoms and signs for reference.

1. Subjective symptoms.

- 1) A feeling of lassitude.
- 2) A feeling of heaviness in the head or headache.
- 3) Paresthesia of the limbs (abnormal sensation).
- 4) Increased eye discharge.
- 5) Cough and sputum.
- 6) Inconstant abdominal pain.
- 7) Altered menstruation.

2. Objective manifestations.

- 1) Manifestations of bronchitis.
- 2) Deformation of the nails.
- 3) Bursitis.
- 4) Increased neutral fat in the serum.
- 5) Serum  $\gamma$ -GTP
- 6) Decrease of serum bilirubin
- 7) Neonatal SFD (Small-For-Dates Baby).
- 8) Growth retardation and dental abnormality (retarded eruption of permanent teeth).

## Notes:

1. With reference to the above conditions of attack, symptoms, and manifestations, and taking into account the age of the examinees and the temporal progress of their illness, a diagnosis has been comprehensively made.
2. These diagnostic criteria are to be used to determine whether a patient is affected with Yusho or not, but they are not necessarily related to the severity of Yusho.
3. In regard to the abnormal properties and concentration of PCB in the blood, regional differences as well as the patient's occupation should also be considered.

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<sup>a</sup>: Taki, I. (1981) Foreword. *Fukuoka Acta Med.* 72, 131–135 (in Japanese).

<sup>b</sup>: Translated by M. Kuratsune.

**Table 4.** Supplement to the Diagnostic Criteria for Yusho Revised on June 14, 1976<sup>a,b</sup> (Adopted on June 16, 1981)

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1. The phrase, "4. The unusual composition and concentration of PCB in the blood", which is indicated as an important manifestation in the Diagnostic Criteria for Yusho (Revised on June 14, 1976), is followed by a new phrase, "5. The unusual composition and concentration of PCB in the blood".
  2. According to the studies hitherto undertaken, the following conclusions have been made in regard to the concentration of PCB in the blood:
    - (1) 0.1 ppb and over: an abnormally high concentration.
    - (2) 0.03–0.09 ppb: the boundary concentration between (1) and (3).
    - (3) 0.02 ppb (detection limit) and below: normal concentration.

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<sup>a</sup>: Yoshimura, H. (1983) Foreword. *Fukuoka Acta Med.* 74, 189–192 (in Japanese).

<sup>b</sup>: Translated by M. Kuratsune.

## Appendix 2<sup>c</sup>. Members of the Clinical, Chemical, and Epidemiologic Study Subgroups

**Table 1.** Members of the Clinical Study Subgroup

Committee and secretariat	Member	Position
Clinical committee	Kentaro Higuchi <sup>b</sup>	Professor, Dermatology
	Toshiyuki Yanase	Professor, Internal Medicine
	Tomiichi Masuya	Professor, Internal Medicine
	Yoshigoro Kuroiwa	Professor, Neurology
	Ichiro Taki	Professor, Gynecology and Obstetrics
	Hiroshi Ikui	Professor, Ophthalmology
	Seiichi Kawata	Professor, Otorhinolaryngology
	Masao, Aono	Professor, Conservative Dentistry
Committee on Clinical Examinations	Michio Hashimoto <sup>a</sup>	Professor, Pathology
	Kiyoshi Tanaka	Professor, Pharmacology
	Jyunji Nagai	Associate Professor, Chief, Central Clinical Laboratory, University Hospital
	Haruo Uzawa	Instructor, Internal Medicine
Committee on Physical Check-up	Osamu Shimono <sup>a</sup>	Director General, Department of Public Health, Fukuoka Prefecture
		Staff of University Hospital and health officers
Secretariat for the Clinical Study Subgroup	Chisato Hirayama	Associate Professor, Internal Medicine
	Makoto Okumura	Instructor, Internal Medicine
	Sachio Hisanaga	Instructor, Gynecology and Obstetrics
	Masayasu Goto	Instructor, Dermatology
	Kenji Sugi	Instructor, Ophthalmology
	Tamotsu Morimitsu	Instructor, Otorhinolaryngology
	Tetsuji Santa	Assistant, Neurology
Hiroshi Okada	Instructor, Conservative Dentistry	

<sup>a</sup>: Chief of the committee.

<sup>b</sup>: Chief of the subgroup and of the committee.

<sup>c</sup>: Prepared by M. Kuratsune.

**Table 2.** Members of the Chemical Study Subgroup

Name	Position
Kaoru Inagami	Professor, Chair of Food Technology, Department of Food Science and Technology, Faculty of Agriculture <sup>b</sup>
Osamu Koga	Associate Professor, Chair of Animal Breeding, Department of Animal Science, Faculty of Agriculture <sup>b</sup>
Masanori Kuratsune	Professor, Department of Public Health, Faculty of Medicine <sup>b</sup>
Saburo Makisumi	Professor, Department of Legal Medicine, Faculty of Medicine <sup>b</sup>
Kenji Manako	Director, Fukuoka Prefectural Institute of Public Health, Fukuoka Prefecture
Junji Nagai	Chief, Central Clinical Laboratory, University Hospital <sup>b</sup>
Michihiro Sugano	Associate Professor, Chair of Nutritional Chemistry, Department of Food Science and Technology, Faculty of Agriculture <sup>b</sup>
Kenjiro Takeshita	Professor, Coal Chemistry, Applied Chemistry Division, Research Institute of Industrial Science <sup>b</sup>
Hisao Tsukamoto <sup>a</sup>	Dean, Professor, Department of Physiological Chemistry, Faculty of Pharmaceutical Sciences <sup>b</sup>
Keihei Ueno	Professor, Chair of Organic Analytical Chemistry, Department of Organic Synthesis, Faculty of Engineering <sup>b</sup>
Seiya Yamaguchi	Professor, Department of Public Health, School of Medicine, Kurume University
Yoshio Yamada	Associate Professor, Department of Soil Fertility and Plant Nutrition, Faculty of Agriculture <sup>b</sup>
Shigenori Yamamoto	Director, Kitakyushu City Institute of Public Health
Hidetoshi Yoshimura	Professor, Department of Hygienic and Forensic Chemistry, Faculty of Pharmaceutical Sciences <sup>b</sup>

<sup>a</sup>: Chief of the subgroup.

<sup>b</sup>: Kyushu University.

**Table 3.** Members of the Epidemiologic Study Subgroup

Name	Position
Masanori Kuratsune <sup>a</sup>	Professor, Department of Public Health, Faculty of Medicine, Kyushu University
Morio Ogata	Director, Department of Public Health, Ohmuta City
Kazutaka Oki	Director, Bureau of Public Health, Kitakyushu City
Namio Saruta	Professor, Department of Hygiene, Faculty of Medicine, Kyushu University
Osamu Shimono	Director General, Department of Public Health, Fukuoka Prefecture
Teizo Ueda	Director, Department of Public Health, Fukuoka City
Seiya Yamaguchi	Professor, Department of Public Health, School of Medicine, Kurume University

<sup>a</sup>: Chief of the subgroup.



### Appendix 3<sup>d</sup>. Chronological List of the Study Groups for Yusho

Study Group	Time	Chief
Kyushu University:		
Study Group for YUSHO	1968–1969	Prof. Shibanosuke Katsuki, Medicine
Study Group for the Therapy of Chlorobiphenyls Poisoning	1969–1971	Prof. Kentaro Higuchi, Dermatology
Study Group for the Therapy of “Yusho”	1971–1973	Prof. Kiyoshi Tanaka, Pharmacology
ditto	1973–1975	Prof. Harukuni Urabe, Dermatology
ditto	1975–1976	Prof. Teruo Omae, Medicine
ditto	1976–1977	Prof. Kohtaro Sugiyama, Medicine
ditto	1977–1979	Prof. Hiroshi Ibayashi, Medicine
ditto	1979–1981	Prof. Ichiro Taki, Obstetrics and Gynecology
ditto	1981–1983	Prof. Hidetoshi Yoshimura, Pharmaceutical sciences
ditto	1983–1984	Prof. Masanori Kuratsune, Public Health
Nagasaki University <sup>b,c</sup> :		
Study Group for Yusho	1968–1975	Prof. Michio Nogita, Dermatology, Nagasaki University
Nagasaki:		
Study Group for Yusho in Nagasaki	1975–1977	Prof. Michio Nogita, Dermatology, Nagasaki University
ditto	1977–1984	Prof. Hikotaro Yoshida, Dermatology, Nagasaki University
National <sup>a</sup> :		
Study Group for the Therapy of “Yusho”	1984–1991	Prof. Masanori Kuratsune, Public Health, Nakamura Gakuen College
ditto	1991–	Prof. Hidetoshi Yoshimura, Pharmaceutical Sciences, Nakamura Gakuen College
1) Kyushu University:		
Study Group for the Therapy of “Yusho” at Kyushu University	1984–1988	Prof. Masao Aono, Endodontics and Periodontics
ditto	1988–1990	Prof. Hidetoshi Yoshimura, Pharmaceutical Sciences
ditto	1990–	Prof. Yoshiaki Hori, Dermatology
2) Nagasaki:		
Study Group for the Therapy of “Yusho” in Nagasaki	1984–	Prof. Hikotaro Yoshida, Dermatology, Nagasaki University

<sup>a</sup>: In 1984, the Ministry of Health and Welfare combined the Study Group for the Therapy of “Yusho” at Kyushu University, the Study Group for Yusho in Nagasaki, and 11 other prefectural study groups which had engaged in annual health examinations of Yusho patients, into the reorganized Study Group for the Therapy of “Yusho”.

<sup>b</sup>: Yoshida, H. (1985) Foreword (3). *Fukuoka Acta Med.* 76, 125 (in Japanese).

<sup>c</sup>: Yoshida, H. (1989) Foreword (3). The present situation of Yusho examination in the Nagasaki district and research directions. *Fukuoka Acta Med.* 80, 184–188 (in Japanese).

<sup>d</sup>: Prepared by M. Kuratsune.

### Appendix 4<sup>c</sup>. Workshops, Conferences and a Seminar Held by the Study Group for the Therapy of "Yusho"

Meetings	Date	Purpose	Attendants
Japan-U.S. Joint Seminar on Toxicity of Chlorinated Biphenyls, Dibenzofurans, Dibenzodioxins and Related Compounds	April 25-28, 1983	Discussion on the toxicity of chlorinated hydrocarbons focusing on Yusho and Yucheng	Coordinators: M. Kuratsune and Norton Nelson. Japanese and American researchers and guests from Republic of China
Yusho Conference	Sept. 8, 1983	Critical review of the achievements made by the Study Group (Kyushu University) by professionals not committed in the study of Yusho	Reviewers, <sup>a</sup> organizers (M. Kuratsune, H. Yoshimura and H. Urabe) and group members
Conference on Liver Cancer	Feb. 18, 1985	Comprehension of the most advanced detection methods and treatments of liver cancer to be applied to Yusho patients	Guests, <sup>b</sup> organizer (M. Kuratsune) and group members
Workshop on the Standardization of Health Examinations of Yusho Patients	March 25 and July 12, 1985	Technical standardization of annual nationwide health examinations of patients	Group members
Workshop on the Analysis of PCQs	Feb. 28, 1986	Standardization of the analysis of PCQs	Group members
Workshop on Schnare's Excretion Methods of Residual PCBs, etc.	June 15, 1988	Critical review of the applicability of Schnare's Methods to Yusho patients	Group members
Workshop on Chromosome Aberration	June 15, 1988	Discussion on possible chromosome aberration in Yusho patients	Guest: Prof. Nanao Kamata (Hiroshima University) and group members
Workshop on Gaschromatographic Patterns of PCBs in Blood and Tissues of Yusho Patients	Jan. 27, 1989	Standardization of the analysis of gaschromatographic patterns of PCBs in the tissue of patients	Organizer (H. Yoshimura) and group members

<sup>a</sup>: Twenty professors from Kyushu University and Kumamoto University, who had not been involved in research of Yusho before but were specialized in biochemistry, physical chemistry, pharmaceutical chemistry, pharmacology, nutrition, immunology, pathology, medicine, neurology, gynecology or otorhinolaryngology.

<sup>b</sup>: Eight authorities on liver cancer from Kyushu, Fukuoka, Kumamoto, Kurume and Nagasaki universities.

<sup>c</sup>: Prepared by M. Kuratsune.

### Appendix 5. The Annual Expenditures of "Research Funds for Investigation of the Influence of Thermal Conductors on Human Health"<sup>a</sup>

Year	Therapeutic study	Follow-up study <sup>b</sup>	Other studies	Total
1968-1974	29,379	31,510	144,268	205,157
1975	16,000	14,000	14,970	44,970
1976	21,000	19,000	14,197	54,197
1977	25,000	20,000	15,174	60,174
1978	29,000	21,000	21,060	71,060
1979	29,000	21,000	20,148	70,148
1980	29,000	21,000	3,500	53,500
1981	27,315	22,185	2,000	51,500
1982	27,500	22,850	2,000	52,350
1983	26,000	23,215	2,000	51,215
1984	32,000	26,866	2,000	60,866
1985	33,300	31,520	0	64,820
1986	37,300	31,714	0	69,014
1987	37,300	31,714	0	69,014
1988	37,500	31,498	0	68,998
1989	39,000	30,000	0	69,000
1990	39,000	30,000	0	69,000
1991	39,000	30,000	0	69,000
1992	39,000	30,000	0	69,000
1993	39,000	30,000	0	69,000
Total	631,594 <sup>c</sup>	519,072 <sup>c</sup>	241,317 <sup>c</sup>	1,391,983 <sup>c</sup>

<sup>a</sup>: Prepared from the materials provided by the Food Sanitation Division, Ministry of Health and Welfare.

<sup>b</sup>: Annual Health Examinations of Yusho patients.

<sup>c</sup>: Thousand yen.

## Appendix 6. The "Dark Oil" Incident

MASANORI KURATSUNE

"Dark Oil" is a dark colored oily by-product of the rice-oil production process at Kanemi, as shown in Fig. 3.1. Being rich in fatty acids, it was used as an ingredient for animal feeds.

In late February 1968, about 8 months before the incident of Yusho was first reported, Tokyu Ebisu Sangyo Co., Ltd. (abbreviated as T company) received complaint from many chicken raisers in the Kyushu district, that their chickens became sick and died by feeding the commercial feeds of the company (Kohanawa et al., 1969). Soon later, those fed with the formula feed of the Hayashi Kane Co., Ltd. (abbreviated as H company) were also found to have been similarly affected. An investigation made by Kagoshima Prefecture in March 1968 revealed that the disease was not infectious but was seen only in chickens fed with the formula feeds manufactured by T and H companies. Investigating these feeds and similar products of other companies, the cause was suspected to be related to the "dark oil" of Kanemi which had been used as a common ingredient of the feeds of both companies.

According to the investigations by the Fukuoka Fertilizer and Feed Laboratory, the Ministry of Agriculture and Forestry, and other institutes, the disease was first found in the Kyushu district in the middle of February 1968 and spread all over the western part of Japan, including the Shikoku and Chugoku districts, affecting more than two millions of chickens. Diseased birds manifested a lack of appetite, labored breathing, gasping, droopiness and ruffled feather, and autopsy revealed subcutaneous edema, hydropericardium, ascites, yellowish mottled appearance of the liver and pulmonary edema, indicating that the disease is very similar to "chick edema disease" (Schmittle et al., 1958; Sanger et al., 1958; Simpson et al., 1959). Kohanawa et al. (1969a) and Shoya et al. (1969) fed to chicks the feeds in question that were known to have been manufactured by the two companies on February 16, 17 or 20, 1968 or a sample of "dark oil" with unknown date of production, and succeeded in reproduction of most of the above lesions in all of these feeding experiments in May 1968. Chemical analysis of these toxic feeds failed to identify any toxic compound in them, but an analysis made on the sample of toxic dark oil soon after KC-400 was detected in the toxic rice oil by the Study Group for Yusho at Kyushu University in early November 1968 proved that the dark oil also contained approximately 1,300 ppm of KC-400 (Kohanawa et al., 1969b). Similar experiments were done by Kohga et al. (1970a,b, 1971) on a certain lot of "dark oil" and KC-400, confirming the findings by Kohanawa and his associates. On November 16, 1968, the Ministry of Agriculture and Forestry declared that the disease in question had been caused by feeding the chickens with the formula feeds that were manufactured by T and H companies around the middle of February 1968, using certain lots of "dark oil" produced by Kanemi, which had been contaminated with KC-400 (Kohanawa, 1974).

The mechanism of the contamination of the dark oil is uncertain. As shown in Fig. 3.1, however, so-called "splash oil" and other miscellaneous oils of low grade arising from the deodorization process of rice oil are mixed with dark oil. It is also known that the rice oil in question heavily contaminated with KC-400 by a welding error in early February 1968

was subjected to a redistillation or redeodorization treatment in order to remove the KC-400 (see Section 3.4.6). It is quite probable that the miscellaneous oils formed in this redistillation process as well as the dark oil containing these oils must also have been heavily contaminated. Therefore, the feeds manufactured using such dark oil in the middle of February 1968 could well be toxic.

As mentioned, this dark oil incident had occurred about eight months before the incident of Yusho was disclosed to the public. If the Ministry of Agriculture and Forestry had informed the Ministry of Health and Welfare of this epizootics soon after its occurrence, spread of Yusho could have been prevented. Unfortunately, no good intermural communication existed among the government offices in those days. The sectionalism prevailing in the government was accused by the victims of Yusho at their five civil suits but their claim was accepted only at two of the suits (see Appendix 7). It is also noteworthy that Kanemi paid indemnities to T and H companies soon after the dark oil incident occurred, although the company, to our great regret, kept declining its responsibility for Yusho at courts for years.

## References

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## Appendix 7. The Kanemi Yusho Trials

MASANORI KURATSUNE

One criminal and seven civil suits have been filed in connection with Yusho incident.

### 1. Criminal Suit

As described in Section 3.4.6, the Kokura Branch Office of the Fukuoka District Public Prosecutor's Office prosecuted Kanemi following a legal consultation with Professor Shinohara and his associates about the leak of Kanechlor through the pinholes found in the pipe of the deodorization tank No. 6. The factory manager was found to be guilty of ignorance and sentenced to three years' imprisonment while the president of the company was not found guilty.

### 2. Civil Suits

Seven groups of victims of Yusho have filed civil suits for their damages. These suits are outlined in Appendix 7, Table 1. In six of seven trials including appeal ones that have given any court decision, courts accepted the so-called "Pinhole Theory" as the cause of the contamination of the rice oil. They found Kanemi to have been seriously negligent in using Kanechlor and in processing the oil and judged Kanegafuchi liable for failing to provide sufficient information concerning the toxicity and corrosiveness of PCBs, ordering the company to pay a large amount of damages to the plaintiffs. Kanegafuchi was obliged to pay it by execution of Provisional Disposition or by Compulsory Execution. The State was also accused of its administrative negligence in 5 trials and was judged to be liable in two of them. Later, in an appeal trial, the Fukuoka High Court (1986) accepted the so-called "Welding Error Theory", rejecting the "Pinhole Theory" and judged Kanemi and its president as guilty but Kanegafuchi and the State as not guilty on May 15, 1986.

The plaintiffs appealed to the Supreme Court against this decision. The Jokoku Appellants, while asserting the pinhole theory, insisted that regardless of which theory applies to the cause of the poisoning, Jokoku Respondent (Kanegafuchi) is liable. Whereas, Jokoku Respondent, asserting the welding error theory, denied any liability. On March 20, 1987, about 20 years after the outbreak of this food poisoning, the Supreme Court recommended the parties to enter into a compromise (stipulation) and a compromise settlement was finally reached. Some of the essential terms of compromise are outlined as follows (Fujimoto, 1994):

- 1) Jokoku Appellants and other Interested Parties affirm that Jokoku Respondent is not liable.
- 2) Jokoku Appellants and other Interested Parties recognize their duty to repay to Jokoku Respondent the various amounts of money received from Jokoku Respondent by execution of Provisional Disposition or by Compulsory Execution, etc., against Jokoku Respondent.
- 3) Jokoku Respondent shall pay to each Jokoku Appellant and each Interested Party the amount of Solatium (Condolence Money) set forth by the Court.
- 4) Each Jokoku Appellant and each Interested Party shall repay to Jokoku Respondent

any outstanding balance, but Jokoku Respondent shall not seek enforcement of such repayment by any compulsory procedure such as compulsory execution.

It is said that Kanegafuchi, a mere manufacturer of Kanechlor, has paid more than ¥10.4 billion to the plaintiffs and other victims, which is without doubt far more than what Kanemi, a careless user of Kanechlor, has paid to them. Attorneys for the plaintiffs said that they tried hard to let Kanegafuchi pay as much as possible, because Kanemi was thought incapable of paying much (Kato et al., 1978). It is unfortunate that fairness of the trials has been seriously doubted by legal circles and many others (Hayashi, 1987).

### References

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Table 1. Outlines of the Kanemi Yusho Civil Trials<sup>c</sup>

Trial	Fukuoka Kanemi Suit	Kokura First Group Suit	Kokura Second Group Suit
<b>First instance:</b>			
Date of filing	Feb. 1, 1969	Nov. 16, 1970	October 8, 1976
No. of plaintiffs	44	757	363
Redress claimed	877 m. yen	20,026 m. yen	8,380 m. yen
Defendants	Kanemi, Sannosuke Kato, (President of Kanemi) Kanegafuchi	Kanemi, Sannosuke Kato, (President of Kanemi) Kitakyushu City the State, Kanegafuchi	Kanemi, Sannosuke Kato, (President of Kanemi) Kitakyushu City the State, Kanegafuchi
Date of conclusion of examination	Oct. 30, 1976	Aug. 20, 1976	April 13, 1981
Date of decision	Oct. 5, 1977	March 10, 1978	March 29, 1982
Decision	Against defendants	Against Kanemi and Kanegafuchi	Against Kanemi, Kanemi's president, and Kanegafuchi
	Damages affirmed: 683 m. yen	Damages affirmed: 6,080 m. yen	Damages affirmed: 2,489 m. yen
<b>Appeal:</b>			
Appellant	Kanegafuchi	Plaintiffs and Kanegafuchi	Plaintiffs and Kanegafuchi
Date of conclusion of examination	March 4, 1983	March 11, 1983	June 14, 1985
Date of decision	March 16, 1984	March 16, 1984	May 15, 1986
Decision	Against Kanegafuchi	Against Kanemi's president, the State, and Kanegafuchi	Against Kanemi, Kanemi's president
	Damages affirmed: 392 m. yen	Damages affirmed: 4,704 m. yen	Damages affirmed 1,830.5 m. yen Plaintiffs's claims to the State and Kanegafuchi were dismissed. <sup>b</sup>
Final appeal (Appellant)	Kanegafuchi	the State and Kanegafuchi	Plaintiffs
<b>Supreme Court:</b>			
Jokoku Appellant	Plaintiffs	Plaintiffs	Plaintiffs
Jokoku Respondent	Kanegafuchi	the State and Kanegafuchi	the State and Kanegafuchi
Amount of solatium <sup>a</sup>	0 yen	0 yen	639.2 m. yen

m. yen: Million yen.

<sup>a</sup>: Solatium paid by Kanegafuchi following the compromise recommended by the Supreme Court on March 20, 1987.

<sup>b</sup>: The "Welding Error Theory" was accepted by the Fukuoka High Court.

<sup>c</sup>: Prepared from the materials provided by Kanegafuchi.



Table 1. (Continued 1)

Trial	Kokura Third Group Suit	Kokura Fourth Group Suit	Kokura Fifth Group Suit
First instance:			
Date of filing	Oct. 12, 1981	July 29, 1985	Nov. 29, 1985
No. of plaintiffs	73	17	75
Redress claimed	1,765 m. yen	454.3 m. yen	1,995 m. yen
Defendants	Kanemi, Sannosuke Kato, (President of Kanemi) Kitakyushu City, the State and Kanegafuchi	Kanemi, Sannosuke Kato, (President of Kanemi) the State and Kanegafuchi	Kanemi, Sannosuke Kato, (President of (Kanemi) the State and Kanegafuchi
Date of conclusion of examination	Feb. 28, 1984		
Date of decision	Feb. 13, 1985		
Decision	Against Kanemi, Kanemi's president, the State and Kanegafuchi Damages affirmed: 371.7 m. yen		
Appeal:			
Appellant	the State and Kanegafuchi		
Date of conclusion of examination			
Date of decision			
Decision			
Final appeal (Appellant)			
Supreme Court:			
Jokoku appellant	Plaintiffs	Plaintiffs	Plaintiffs
Jokoku respondent	the State and Kanegafuchi	the State and Kanegafuchi	the State and Kanegafuchi
Amount of solatium <sup>a</sup>	0 yen	38 m. yen	127.5 m. yen

Table 1. (Continued 2)

Trial	Yusho Fukuoka Suit
<b>First instance:</b>	
Date of filing	Jan. 6, 1986
No. of plaintiffs	577
Redress claimed	11,765.6 m. yen
Defendants	Kanemi, Sannosuke Kato, (President of Kanemi) Kanegafuchi
Date of conclusion of examination	
Date of decision	
Decision	
<b>Appeal:</b>	
Appellant	
Date of conclusion of examination	
Date of decision	
Decision	
<b>Final appeal (Appellant)</b>	
<b>Supreme Court:</b>	
Jokoku appellant	Plaintiffs
Jokoku respondent	the State and Kanegafuchi
Amount of solatium <sup>a</sup>	963.5 m. yen