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A Retrospective Study on the Comparison of Outbreaks of Food Poisoning for Food Hygiene in Korea and Japan

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ABSTRACT—Retrospective study on the comparison of outbreaks of food poisoning for food hygiene in Korea and Japan. The average value of morbidity rate by year in Korea during the period of 1971 to 1992 was 2.9 per 100,000 population, and that of Japan was 29.1. The mean value of mortality rates in case of food poisoning by year in Korea was 2.33%, and that of Japan was 0.07%. When compared the rates of morbidity and mortality between Korea and Japan during the same period, the morbidity rates of Japan were much higher than those of Korea ($p<0.01$). However, mortality rate of patients in Korea were much higher then those of Japan ($p<0.01$). Resulting from comparative observation of food poisoning by preparing facilities between Korea and Japan. The highest list the places where the outbreaks occurred was home-made foods accounted for 48.8% of the total cases in Korea and that of Japan was restaurants accounted for 33.0%. Causative foods in Korea, the most common incrimination vehicles were seafood, meat and animal products and grain and vegetables, including mushroom. However, in the case of the common incrimination vehicles Japan were unknown and other foods, seafood, vegetables and meat and animal products etc.. Food poisoning of pathogenic substance in Korea were 60.9% of bacterial food poisoning of the total cases showing that Vibrio species, Salmonella spp., Staphylococcus spp., pathogenic E. coli, Clostridium spp. and other spp. were 33.3%, 26.2%, 16.3%, 5.3%, 0.4% and 18.5%, respectively. On the other hand, in Japan, major causes were Vibrio spp. (45.7%), Staphylococcus spp. (23.7%), Salmonella spp. (16.8%), pathogenic E. coli (3.8%), Clostridium spp. (0.2%) and other spp. (9.6%).

Key words ☐ Comparative of food poisoning between Korea and Japan, Morbidity and Mortality Rates, Facilities, Causes, Pathogens

INTRODUCTION

During the past half century great change have taken place in man's mode of life). This has brought about new methods of processing and preparing foods (Lee & Lee, 1994). The modern age of invention has brought with it specialization in industry, and the individuals is no longer called upon to produce his own food. With modern transportation and refrigeration, fresh fruits and vegetables are grown in favorable areas and shipped, either canned or fresh, to distant market. While the expression "food poisoning" is generally applied to any disease caused by food, a more appropriate rubric is "foodborne disease" (Werner, 1986). The surveillance of foodborne disease have increased in importance following the centralization of food production, the increase in communal eating, and the development of international trade and tourism (W.H.O., 1956 ; Fairweater, 1986). Using food as an example, it must be stressed that the industry endeavors to ensure that its products are safe, carring out both biological and chemical tests before marketing. Responsibility for the safety and wholesomeness of food has been moved away from the individual to industrialists and governments, creating a potential for large scale outbreaks of foodborne diseases. While foodborne diseases are a world-wide problem, the expert committee on environmental sanitation consider that WHO can play an increasingly important role, and can move into a position of international leadership, in the field of food hygiene. Several steps can be taken, which fall within the existing polices and patterns of activities of the

organization (W.H.O.,1956).

Foodborne and waterborne disease surveillance has traditionally served three objects, such as disease control, knowledge of disease causation and administrative guidance, respectively (C.D.C.,1974).

It is our intention to make a retrospective study on the comparison of outbreaks of food poisoning for food hygiene between Korea and Japan, such as morbidity rates from outbreaks of food poisoning, cases fatality of mortality rates in relation to preparing facilities, various causative agents and the food poisoning source during the period of 1971 to 1992.

MATERIAL AND METHODS

Material

The statistical raw data of outbreaks of food poisoning in Korea and Japan were from the Yearbook of Health and Social Statistics (1971-1994), and Statistical Yearbook of Acute Infectious Disease (from 1971 to up to now), Ministry of Health and Social Affairs of Korea, and the Statistics of Food Poisoning Japan 1993, Statistics and Information Department, Minister's Secretariat, Ministry of Health and Welfare, Japan, and the Yearbook of Japanese Health and Welfare Statistics Association (1981-1993).

Methods

Outbreaks of food poisoning were classified according to the International Classification of Disease, the morbidity rate per 100,000 population, case fatality of mortality rate in % were estimated by criteria developed by WHO (WHO : ICD,1990).

Estimation and statistical analyses of raw data were used for comparisons between the two groups of Korea and Japan. If the test was significant, comparisons were done according to vital-statistical methods, and all data analyzed by "NEWTECH PC" with a statistical program package.

RESULTS AND DISCUSSION

Chronological Observation of Morbidity and Mortality Rates on Outbreaks of Food Poisoning in Korea and Japan

The exact toll of foodborne illiness. There is, however, a terrific cost in lost man hours, human suffering, medical bills, and sometimes death (Vester, 1965). The surveillance of foodborne diseases has traditionally armied at disease control through identification and removal of contaminated products from the commercial market, identification and correction of improper food handling practices both in commercial establishment and in the home, and the identification and treatment of cases and carriers of foodborne disease (Werner, 1986).

The reporting of foodborne diseases in Korea began about 50 years ago when districts and territorial health officers under the Ministry of Health and Social Affairs, concerned about the high morbidity and caused by various infectious gastro-enteritis, recommended that cases of enteric fever be investigated and reported. Their purpose was to obtain information about the role of food and water in outbreaks of intestinal illness as the basis for sound public health action (N.I.H.,1993).

Table 1 and Fig.1, give a summarized of food poisoning outbreaks and morbidity rate per 100,000 population by fiscal year in Korea from 1971 to 1992, varied from 0.83 to 19.75 (average, 2.9), and the highest morbidity rate was 19.75 of 1977. In Japan, varied from 18.5 to 40.4 (average, 29.1), and the highest morbidity rate was 40.4 of 1975 during the same period. When compared the morbidity rates between Korea and Japan, the rate in Japan were much higher than those of Korea ($p<0.01$). On the other hand, the chronologically observation on the mortality rate as a percentage of total patients of food poisoning by year in Korea from 1971 to 1992, varied from 0.14 to 5.55% (average 2.33%), and the highest mortality rate was 5.55% of 1972. In Japan), reported mortality rates varied from 0.01 to 0.19% (average 0.07%) during the same period, and the highest mortality rate was 0.19% of 1974. Thus, the reported mortality rates in Korea were much higher than those of Japan ($p<0.01$).

It is important when an outbreak of food poisoning occurs that it be immediately investigated if the true cause is to be established. Small outbreaks of gastrointestinal upsets occurring in the family are usually not reported. In general, no recognition is given the event, and the family physician is seldom summoned.

In the Unites States, as well in past, due to the variation in quality of foodborne disease investigation and different

Table 1. Chronological observation on the morbidity and mortality rate of outbreaks of food poisoning in Korea and Japan from 1971 to 1992

Years	<Korea>				<Japan>			
	Cases	Patients	M.R. per 100,000	Mortality %	Cases	Patients	M.R. per 100,000	Mortality %
1971	35	601	1.83	2.61	1,118	30,731	29.3	0.15
'72	62	901	2.96	5.55	1,405	37,216	35.0	0.10
'73	32	321	0.94	4.98	1,201	36,832	33.9	0.11
'74	47	727	2.10	4.40	1,202	25,986	23.6	0.19
'75	39	578	1.64	4.67	1,783	45,277	40.4	0.12
'76	26	440	1.23	4.77	831	20,933	18.5	0.12
'77	28	7,190	19.75	0.14	1,276	33,188	29.1	0.09
'78	38	1,093	2.96	2.56	1,271	30,547	26.5	0.13
'79	32	625	1.67	2.56	1,168	30,161	26.0	0.07
1980	24	834	2.19	0.72	1,001	32,737	28.0	0.07
'81	30	523	1.35	3.44	1,108	30,027	25.5	0.04
'82	49	1,010	2.57	1.39	923	35,536	29.9	0.03
'83	33	983	2.46	0.51	1,095	37,023	31.0	0.04
'84	24	334	0.83	4.19	1,047	33,084	27.5	0.06
'85	65	2,176	5.33	0.41	1,117	44,102	36.4	0.03
'86	36	833	2.02	1.08	899	35,556	29.2	0.02
'87	37	540	1.30	1.48	840	25,368	20.7	0.02
'88	31	1,041	2.48	0.58	724	41,439	33.7	0.02
'89	40	889	2.10	2.48	927	36,470	29.6	0.03
1990	32	618	1.44	1.62	926	37,561	30.4	0.01
'91	42	844	1.95	1.19	782	39,745	32.0	0.02
'92	44	1,189	2.70	0.42	557	29,790	23.9	0.02

Remark: M.R.; Morbidity rate per 100,000, Mortality Rate in %. Average value of morbidity rates per 100,000 in Korea and Japan were 2.9 and 29.1, and that of mortality rate were 2.33% and 0.07%, respectively.

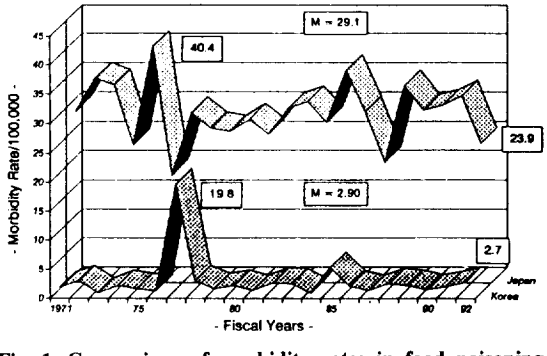

Fig. 1. Comparison of morbidity rates in food poisoning between Korea and Japan

reporting by the state and local health department, still there are limitation on the data presentation (C.D.C., 1974; 1991).

Food Poisoning by Preparing Facilities

The wide variety of food available to public today, pals the fact that the point of production may be far removed from the place of final consumption, considerable complicates the problem of controlling food poisoning. On the other hand, a great deal of protection is afforded by the general food supply through the activities of prefectures and provincial food inspection public health agencies, whose vigilance prevents the sales of adulterated and improper food that might otherwise enter the channels of trade.

The location where the food responsible for the outbreaks was improperly handled is shown in Table 2 and Fig. 2.

Table 2. Comparative observation of food poisoning by preparing facilities between Korea and Japan from 1981 to 1992

Facility	<Korea>			<Japan>		
	Case of Outbreaks	No. of Patients	No. of Deaths	Case of Outbreaks	No. of Patients	No. of Deaths
Home	226(48.8)[a]	3,767(34.3)	94(72.3)	1,835(16.7)	8,052(1.9)	71(60.2)
Restaurant	53(11.4)	763(6.9)	16(12.3)	3,630(33.0)[b]	122,855(28.9)	13(11.0)
Hotel	20(4.3)	598(5.5)	0	1,317(12.0)[a]	61,777(14.5)	0
Business place	85(18.4)[b]	4,432(40.4)	3(2.6)	330(3.0)	9,768(2.3)	4(3.4)
School	15(3.2)	717(6.5)	0	417(3.0)	81,593(19.2)	2(1.7)
Food-Store	5(1.1)	36(0.3)	0	289(2.6)	4,493(1.0)	2(1.7)
Other's	54(11.7)	593(5.4)	15(11.6)	1,708(15.5)	115,235(27.1)	22(18.6)
Unknown	5(1.1)	74(0.7)	2(1.5)	1,479(13.4)	21,937(5.2)	4(3.4)
Total	463	10,980	130	11,005	425,710	118

Distribution Rate(%) in Parenthesis, Statistical Analysis: X^2-test, a: $p<0.05$, b: $p<0.01$

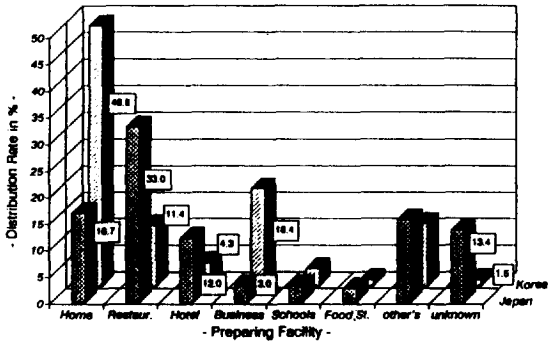

Fig. 2. Comparison on outbreak cases of food poisoning by preparing facilities.

Food service establishments are locations where food is prepared for homes and public consumption, etc., restaurants, hotel, business-place, schools or institutions, food store and other's etc. Table 2 shows the place where the outbreaks occurred from 1981 to 1992. In Korea, approximately half of all food poisoning cases (48.8%) occurred at home where home-made food was cause. The remained occurred in restaurants (11.4%), hotel (4.3%), business-place (18.4%), schools (3.2%), food-store (1.1%), other palace (11.7%) and unknown place (1.1%), respectively. Thus, over twelve-year period, the rate of food poisoning in restaurants and hotel accounted for 33.0% and 12.0%, respectively of all cases were much higher in Japan than in Korea. However, the rates of outbreaks in homes accounted for 16.7% was much lower in Japan than it was in Korea ($p<0.01$).

In the United State, Approximately two-thirds of all food poisoning outbreaks occurred in restaurants (34%) or in homes (30%). Ten percent of outbreaks took place in schools. All outbreaks for which etiology was known were attributed to a bacterial pathogens. Outbreaks in restaurants accounted for 38% of all foodborne disease cases, while outbreaks in homes and schools for 7% and 25%, respectively (C.D.C., 1973; 1974; 1991). The place of the outbreaks is defined as where the causative food was improperly handed. The expression "Food Processing Establishment" refers to the location where a food is prepared for market, while "Food Service Establishment" refers to a location where food is prepared for public consumption, .e. q., restaurants, cafeterias, caterer and institutions etc. (C.D. C.,1973).

On the other hand, over the period 1981-1992, the preparing facility with the highest mortality rates, expressed as a percent of food poisoning that resulted in facilities, were homes in both Korea and Japan. However, the rates of mortality in homes was much higher in Korea than it was in Japan (Fig. 3).

Food Poisoning by Causative Foods

In a relatively small outbreak, an effort should be made to question all who were exposed, whether ill or not, for symptoms and food consumption history. In order to iden-

tify the responsible foods, a method analogous to a cohort study design is commonly used. The implicated foods generally have the highest attack rates. More important, however, is that when rates for eaters and noneaters are compared, the implicated foods show the greatest differences in attack rates. The difference is called the "attributable risk", or the rate of disease which can be attributed to the food under consideration (Fairweather,1986; Werner,1986).

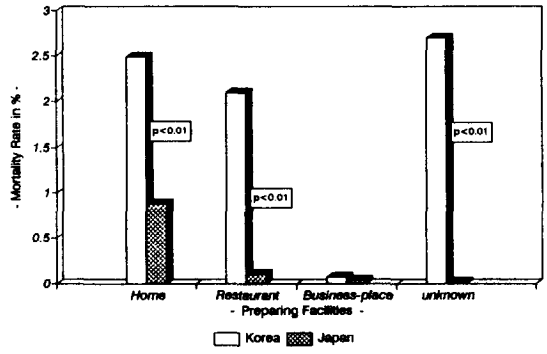

Fig. 3. Comparison of mortality rates is food poisoning by preparing facilities.

Table 3 and Fig. 4 lists vehicles of transmission by specific etiology. The most commonly incrimination vehicles in Korea were fish, including seafood (307%), meat and animal products (28.7%), grain and vegetables, including mushroom (16.8%), confections (2.6%), compound foods (16.4%), other foods (1.7%) and unknown foods (3.0%), respectively.

In Japan, most commonly vehicles were seafoods (22.2%), meat and animal products (4.0%), grain and vegetables, including mushroom (14.0%), confections (1.2%) and compound foods (9.6%), other foods (14.9%) and unknown foods (34.3%), respectively. Therefore, in half of the total outbreaks, the vehicle were unknown foods and other foods.

The major cause of food poisoning outbreaks in Korea were shellfish (8.9% of total outbreaks) and puffer-fish (5.

Table 3. Comparative observation of food poisoning by various causative food between Korea and Japan from 1981 to 1992

Causative Food	<Korea>			<Japan>		
	Case of Outbreaks	No. of Patients	No. of Deaths	Case of Outbreaks	No. of Patients	No. of Deaths
SEAFOODS	142(30.7)0[a]	2,254(20.5)	57(43.8)	2,440(22.2)	58,582(13.7)	74(62.7)
Shellfish	41	506	8	711	17,650	2
Pufferfish	24	79	26	335	528	69
Mackerel	9	409	1	-	-	-
Crab	11	122	2	-	-	-
Products	9	276	6	196	7,459	1
other's	48	862	14	1,198	32,945	2
ANIMAL Pr.	133(28.7)[b]	3,704(33.7)	17(13.1)	435(4.0)	33,016(7.8)	0
Meat & Pr.	123	3,269	16	258	13,450	0
Egg & Pr.	-	-	-	160	18,165	0
Milk & Pr.	10	435	1	17	1,401	0
VEGETABLES	78(16.8)	990(9.0)	43(33.1)	1,536(14.5)	32,715(7.7)	30(25.4)
Grain & Pr	27	485	4	837	17,445	2
Vegetables	14	280	3	146	12,855	13
Mushroom	37	225	36	553	2,415	15
CONFECTION	12(2.6)	320(2.9)	2(1.5)	129(1.2)	5,589(1.4)	0
COMPOUNDS	76(16.4)[a]	3,135(28.6)	4(3.1)	1,039(9.4)	54,418(12.8)	2(1.7)
OTHER'S	8(1.7)	138(1.4)	5(3.8)	1,635(14.9)	103,483(24.3)	4(3.4)
UNKNOWN	14(3.0)	427(3.9)	2(1.5)	3,791(34.3)	137,543(32.3)	8(6.8)

* Distribution rate(%) in parenthesis, Statistical Analysis: X^2-test, a: $p<0.05$, b: $p<0.01$

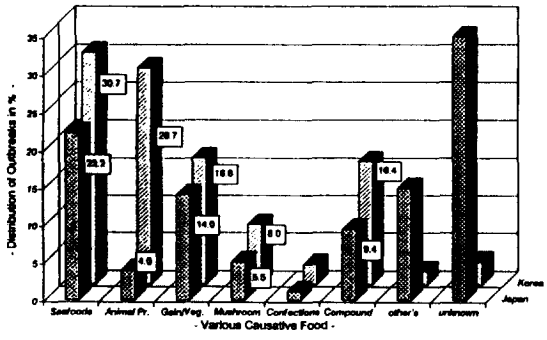

Fig. 4. Comparison of food poisoning by causative food between Korea and Japan.

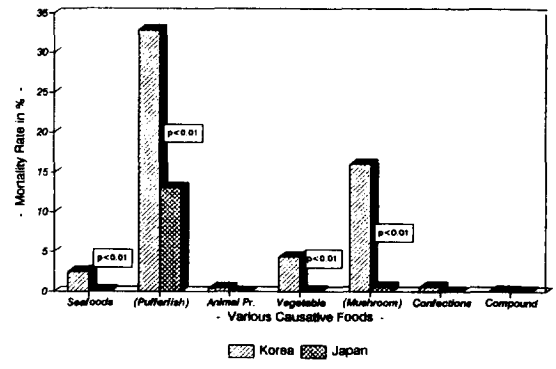

Fig. 5. Comparison of mortality rates is food poisoning by causative foods.

2%) among seafoods, and mushroom (8.0%) and grain products (5.8%) among vegetables. Thus, shellfish, puffers and mushrooms were more frequent causes of food poisoning in Korea. In Japan, the major cause of outbreaks were shellfish (6.5%) and puffers (3.0%) among seafoods, and grain products (7.6%) and mushroom (5.0%) among vegetables, respectively.

On the other hand, in Korea, of the 130 cases of total death from food poisoning that between 1981 to 1992, 43. 8% were caused by seafoods, 13.1% by meat and animal products, 33.1% by grain, vegetables and mushroom, 1.5% by confections, 3.1% by compound foods and 3.8% by other foods and 1.5% by unknown foods. In Japan, of the 118 cases of death from food poisoning during the same period, 62.7% by seafoods, 25.4% by grain, vegetables and mushroom, 1.7% by compound foods, 3.4% by other foods and 6.8% by unknown foods. However, meat and animal products was not determined fatal from the food poisoning.

When comparative observation on these data indicate that fatal (mortality rate in %) from the food poisoning by various causative foods in Korea was higher than in it was in Japan (Fig. 5).

Food Poisoning by Pathogenic Substance

Hazards associated with food and water can be classified into seven main types as follows; bacterial infections, bacterial toxins, viral infections, protozoan intestinal infections, parasitic diseases, plant and fungal hazards and chemical hazards (Fairweather, 1986).

Since the early 1980s, epidemics of food poisoning due to consumption of hen eggs contaminated with Salmonella cholera-suis server Enteritidis (S. enteritidis) have become a serious public health problem in many developed countries in Europe and United State (IASR, 1993).

In Korea, 282 or 60.8% of the food poisoning from 1981 to 1992 were due to bacteria, 78 or 16.8% of the cases were due to food toxoids and 103 or 22.2% were due to unknown causes (Table 4). In Japan, during the same period was 72.4% of food poisoning cases were due to bacteria, 9.9% were due to plant and animal foods toxoids and 17.6% were due to unknown causes. Therefore, distribution rate (%) of cases of food poisoning due to toxoids were a little more frequent in Korea than in Japan.

According to published data on foodborne diseases in 1981 in the United States, 568 outbreaks involving 14,432 cases were reported (C.D.C., 1983). of the 44% of these outbreaks that had an etiology, 74% were due to bacterial, 20% to chemicals, 3% to parasites, and 2% to viruses (Werner, 1986).

In Korea, from 1981 to 1992, 282 (60.9%) of 463 of total outbreaks had an etiology linked to bacterial as Salmonella species (26.2%), Staphylococcus spp. (16.3%), Clostridium spp. (0.4%), Vibrio spp. (33.3%), pathogenic Escherichia coli spp. (5.3%) and other species (18.5%) (Fig 6).

In the case of Japan, the majority of cases having a bacterial etiology were Vibrio spp. (45.7%), Staphylococcus spp. (23.7%), Salmonella spp. (16.8%), pathogenic Escherichia coli spp. (3.8%), Clostridium spp. (0.2%) and other species (9.8%), respectively. Thus cases attributed to Sal-

Table 4. Comparative observation of food poisoning by pathogenic substances between Korea and Japan from 1981 to 1992

Substance	<Korea>			<Japan>		
	Case of Outbreaks	No. of patient	No. of Death	Case of Outbreaks	No. of Patient	No. of Death
BACTERIA	282(60.9)	8,350(76.1)	31(23.9)	7,971(72.4)	353,731(83.1)	26(22.0)
Salmonellosis	74	2,321	6	1,337	72,035	6
Staphylococci	46	1,818	0	1,891	46,219	2
Clostridium	1	5	4	17	64	12
Vibriosis	94	1,603	19	3,646	103,780	4
E.coli(patho.)	15	1,532	0	299	45,552	2
Other's	52	1,071	2	781	82,081	0
TOXOIDS	78(16.8)	476(4.3)	77(59.2)	986(9.9)	5,131(1.2)	89(75.4)
Chemical	4	33	7	47	895	0
Plant	43	204	40	617	2,764	18
Animal	31	239	30	428	1,472	71
UNKNOWN	103(22.3)	2,154(19.6)	22(16.9)	1,942(17.6)	66,848(15.7)	3(2.5)
TOTAL	463	10,980	130	11,005	425,710	118

Distribution Rate(%) in Parenthesis.

monella spp. and pathogenic E. coli were much more frequent in Korea than in Japan, but cases attributed to Vibrio spp. and Staphylococcus spp. were much more common in Japan than in Korea.

The pathogens that Infectious Agents Surveillance Report (IASR) deal with, Salmonella organisms are isolated most frequently by prefectoral and municipal public health institutes. The isolations in 1991 numbered 5,550 or 38% of total isolations of pathogens reported (IASR, 1993). On the other hand, Salmonellosis and other foodborne zoonotic diseases remain an important public health problem in both developed and developing countries (Crawford,1986). In order to combat them it is necessary to avoid the contamination of foodstuffs and to adopt measures of decontamination. Collaboration between the public health and agricultural sectors is essential if these goals are to be attained (C.D.C., 1982)

Howells and Joynson (1975) first isolated coliforms from food-stuff, studied their antibiotic sensitivity and determined the transference of resistance. Suwankrughasn (1977) has reported, Five hundred and eighty nine samples of animal feed comprised 233 bone and meat based feed and 356 grain based feed. He was isolated 32 pathogenic E.

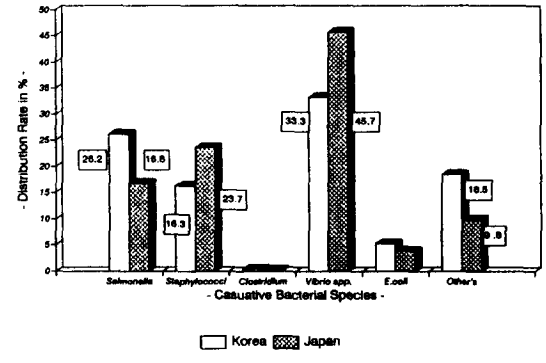

Fig. 6. Cases distribution of bacterial food poisoning in Korea and Japan.

coli comprised.

There are two types of E. coli which may give rise to diarrhea: (a) an invasive strain that primary isolates itself in the colon causing symptoms which are very similar to Shigella infections; (b) enterotoxic strain resulting in prostration and dehydration associated with watery stools. Meat packers are particularly vulnerable because of exposure to these strain of E. coli (Fairweather, 1986).

Finally, as the safety and keeping qualities of food related

to their microbial content, microbiological criteria have been proposed for many varieties of food (WHO, 1974). With the ever-growing need to monitor food and water with respect to contamination, it is essential that a multidisciplinary approach be adopted to ensure wholesomeness of the products. The prevention and reduction of biological and chemical contamination of foods be regularly accomplished by public health food sanitation authorities.

국문요약

한국과 일본에 있어서 식중독발생양상에 관하여 조사 비교하였든바 1971년도 부터 1992년도까지 사이 한국에서 식중독발생 이환율은 인구 매10만명당 년평균 2.9이었는데 비하여 일본측은 29.1이었고, 치명율은 한국이 년평균 2.33% 인데 비하여 일본측은 0.07%로서 이환율은 일본측이 높고, 치명율은 한국측이 유의하게 높았다. 식중독 발생장소로는 한국의 경우 가정에서 48.8%가 발생하여 가장 많은데 비하여 일본측은 식당에서 33.0% 발생되고 있었고, 원인식품으로는 한국의 경우 어패류, 식육 및 그 제품, 곡유와 버섯을 포함한 야채류 등의 순인데 비하여 일본측은 원인불명, 어패류, 야채 및 식육과 그 제품 등의 순서이었다. 식중독의 병원성인자로는 한국의 경우 세균성식중독이 전체의 60.9% 이었고 그 내용으로는 Vibrio spp. (33.3%), Salmonella spp. (26.2%), Staphylococcus spp. (16.3%), pathogenic E. coli (5.3%), Clostridium spp. (0.4%) 그리고 기타(18.5%)이었는데 비하여 일본측은 72.4%가 세균성 식중독의 원인이었고 여기에는 Vibrio spp. (45.7%), Staphylococcus spp. (23.7%), Salmonella spp. (16.8%), pathpgenic E. coli (3.8%), Clostridium spp. 0.2% 그리고 기타(9.6%) 등으로서 한국과는 다소의 차이가 있었으며, 이와 같은 이유는 식생활의 차이에서 오는 것으로 생각 된다.

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