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The incidence rate of bacterial food poisonings in the Lublin province in the years 1976–1998

After World War II an increase in foodborne infections was observed. The infections resulted from the contamination of food by biological and chemical agents. In our country a constantly growing number of food poisonings is also visible. The researchers believe that this phenomenon is caused by the changes in food production and storage, meal preparation and dietary habits. The proportion of meals consumed outside home, i.e. in restaurants, bars, canteens, schools, trains, etc. is becoming increasingly higher compared to home meals. Moreover, the higher number of people travelling long distances due to the development of mass tourism and migration is relevant. Additionally, food import from the developing countries where sanitary conditions are far from satisfactory is a contributory factor. Beside water and air, food is one of the most important carriers through which biological and chemical substances contaminating our environment are transmitted to the human organism. Considering all this, the individual countries, including Poland founded the institutions and legal systems ensuring the safety of food and its production.

MATERIAL AND METHODS

The examination period covered 23 years, i.e. the period when the Lublin province existed, from its foundation in 1976 on the strength of the government decision concerning the administrative division of the country into 49 provinces up to 1998 when another administrative reform was introduced. Hence the period was limited out of necessity by two governmental decisions about the territorial functioning of the Lublin province. The data about the incidence of chemical food poisonings were obtained from the Regional Unit for Control of Epidemics and Hygiene Promotion in Lublin, which, among other tasks, compiled the statistics of food poisonings in the Lublin province. It should be pointed out that although the majority of mass food poisonings were registered, the majority of individual cases was not included in the statistical data as the patients with mild disorders did not report themselves to the physician and most physicians did not notify the Regional Unit for Control of Epidemics and Hygiene Promotion about single cases of food poisonings. The real number of poisonings was undoubtedly higher than the number of registered cases.

RESULTS

The incidence rate of bacterial food poisonings in the Lublin province between 1976–1998 is presented in Table 1. The total number of bacterial food poisonings registered in the Lublin province in the years 1976-1998 was 15,093 cases, which accounted for about 1% of all registered cases of infectious diseases. The highest number of cases was caused by *Salmonella*, i.e. 12,927, which consti-

Table 1. The quantitative and percentage compilation of bacterial food poisonings in the Lublin province between 1976 and 1998

No	Kind of poisoning	Number of registered cases	% of cases
1	*Salmonella* food poisonings	12,917	85.6
2	*Staphylococcus* food poisonings	86	0.6
3	Other and indefinable food poisonings	275	1.8
4	*Clostridium botulinum* poisonings	1,820	12.0
Total		15,093	100

-tuted 85.6% of all bacterial food poisonings. The *Salmonella* infections were followed by other bacterial poisonings and those of unknown etiology, which caused 1,820 cases, i.e. 12% of all poisonings. Staphylococcal enterotoxin resulted in 1.8% of infections – 275 cases detected during 23 years. The smallest number of poisonings was caused by botulinum toxin – 86 cases were registered, which accounted for 0.6% of all bacterial food poisonings observed.

Table 2. The incidence rate of food poisonings in the Lublin province in the years 1976–1998 (1:100,000)

Year	Population	*Salmonella* food poisonings		*Clostridium* food poisonings		Other and indefinable food poisonings		Staphylococcal food poisonings	
		absolute number	incidence rate	absolute number	incidence rate	absolute number	incidence rate	absolute number	incidence rate
1976	890,725	13	1.4	2	0.2	39	4.4	-	-
1977	902,195	-	-	-	-	32	3.5	-	-
1978	912,127	22	2.4	1	0.1	-	-	-	-
1979	919,414	-	-	2	0.2	-	-	-	-
1980	930,120	25	2.7	-	-	14	1.5	-	-
1981	939,446	209	22.2	7	0.7	37	3.9	-	-
1982	949,124	133	14.0	13	1.4	1	0.1	23	2.4
1983	959,664	117	12.2	10	1.0	86	9.0	56	5.8
1984	972,221	559	57.5	14	1.4	347	35.7	-	-
1985	973,900	560	57.5	5	0.5	160	16.4	-	-
1986	988,335	219	22.2	4	0.4	68	6.9	-	-
1987	994,093	315	31.7	4	0.4	192	19.3	-	-
1988	1,002,996	612	61.0	-	-	214	21.3	29	2.9
1989	1,008,413	1,265	125.4	5	0.5	85	8.4	12	1.2
1990	1,008,413	1,451	143.9	-	-	167	16.6	105	10.3
1991	1,016,592	1,015	99.8	2	0.2	91	9.0	-	-
1992	1,022,153	971	95.0	1	0.1	44	4.3	50	4.9
1993	1,022,321	717	70.1	3	0.3	42	4.1	-	-
1994	1,024,784	988	96.4	1	0.1	53	5.2	-	-
1995	1,025,800	1,174	114.5	1	0.1	70	6.8	-	-
1996	1,026,847	803	78.2	4	0.4	9	0.9	-	-
1997	1,027,895	695	67.6	5	0.5	25	2.4	-	-
1998	1,027,703	1,052	102.4	2	0.2	39	3.8	-	-

A detailed compilation of registered food poisonings in the Lublin province between 1976–1998 is presented in Table 2. Till 1980 the incidence rate of *Salmonella* infections was relatively low and did not exceed 3; in 1977 and 1979 no such cases were notified. After 1980 the incidence rate began to increase rapidly and in 1990 was found to be 143.9, i.e. 1,451 cases. In the 90's the extent of these food poisonings was very big, the highest number of cases was observed in 1995 with 1,174 persons infected (incidence rate 114.5).

A detailed distribution of *Salmonella* food poisonings is presented in Figure 1.

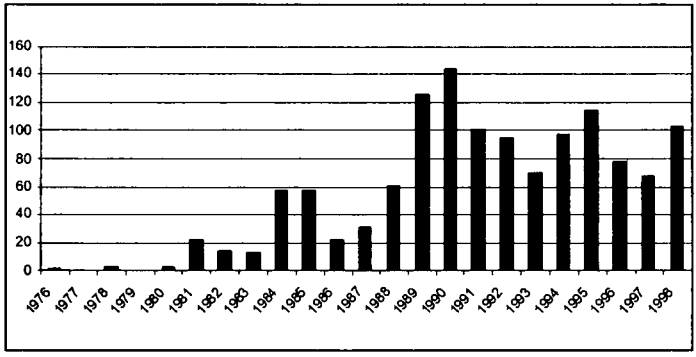

Fig. 1. The incidence rate of *Salmonella* food poisonings in the years 1976–1998

Comparing the number of food poisonings in the whole country with that observed in the Lublin province, numerous similarities can be found. Since 1982, *Salmonella enteritidis* has taken the lead in the whole country. In 1995 this microorganism caused 90% of bacterial food poisonings. The recent studies carried out by sanitary-epidemiological units demonstrated that the highest number of poisoning foci was associated with the consumption of foodstuffs containing thermally untreated eggs and with undetected carrier state cases. The above causes of food poisonings were also observed in the countries with high food hygiene, production and distribution, e.g. USA, Holland, Canada, Germany.

Between 1976 and 1998, the incidence rate of *Clostridium botulinum* infections did not exceed 1.5. The highest number of cases was registered in 1982 and 1984 (1.4) while no such cases were observed in 1972, 1980, 1988 and 1990. After 1990 a continuous decrease in the incidence of *Clostridium botulinum* infections was observed in the Lublin province as well as in the whole country. At present, these kinds of infections constitute about 1% of all food poisonings and show the declining tendency, which is visible in the number of cases in 1990 and 1996 – 27 and 7, respectively. The incidence rate of *Clostridium botulinum* poisonings is illustrated in Figure 2.

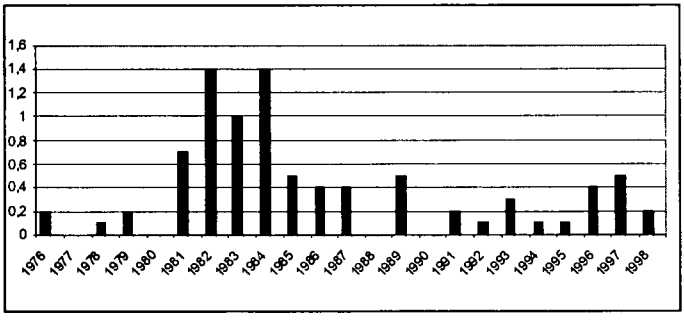

Fig. 2. The incidence rate of *Clostridium botulinum* food poisonings in the years 1976–1998

Between 1976 and 1998 the staphylococcal enterotoxin was an etiological agent of 1.8% of bacterial food poisonings in the Lublin province. The highest number of infections was found in 1990 – 105 cases (incidence rate 10.3). On the turn of the 23-year examination period, during 17 years no cases of *Staphylococcus aureus* infection were observed. Between 1990–1996 in Poland staphylococci caused about 4% of infections with the decreasing tendency (1606 cases in 1990 and 194 in 1994). A similar decrease characterizes the Lublin province, particularly that between 1993–1998 no staphylococcal poisonings were registered. The distribution of staphylococcal food poisonings is illustrated in Figure 3.

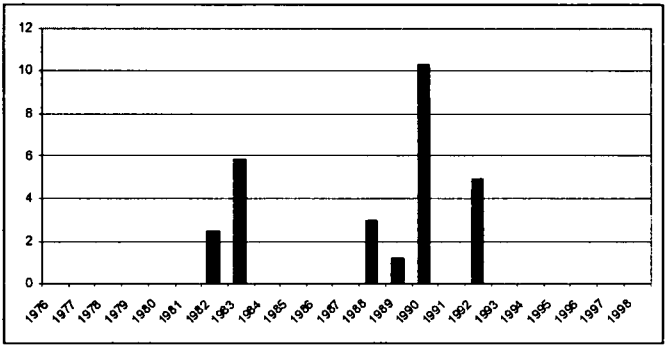

Fig. 3. The incidence rate of *Staphylococcus aureus* food poisonings in the years 1976–1998

The other food poisonings and those of unknown etiology accounted for 12% of the total number of bacterial food poisonings. Between 1978 and 1979 such cases were not registered in the Lublin province. The highest number was found in 1984 – 347 cases (incidence rate 35.7); in the next years declining tendencies were observed. The distribution is illustrated in Figure 4.

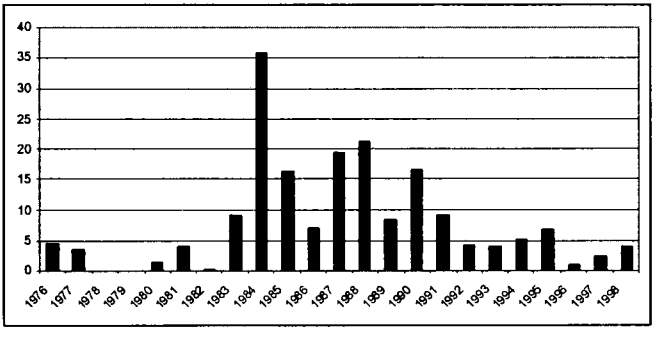

Fig. 4. The incidence rate of food poisonings caused by other microorganisms and those of unknown etiology in the years 1976–1998

The analysis of exemplifying bacterial food poisonings in closed mass nutrition institutions in 1990 as an illustration of the above discussed issues. Food poisonings in closed mass nutrition institutions account for a significant percentage of epidemic foci affecting a large number of the population. In 1990, 10 food poisoning foci occurred in such institutions in the Lublin province (Table 3) and as a result 340 individuals were infected, including 173 adults and 167 children.

Table 3. Foci of mass food poisonings in closed mass nutrition institutions in the Lublin province in 1990

No	Institution	Incidence			Kind of poisoning		
		total	including		*Salmonella enteritidis*	*Escherichia coli*	increased peroxide level
			adults	children			
1	School in Puławy	25	22	3	-	25	-
2	Educational centre in Mełgiew	42	7	35	42	-	-
3	Training centre in Lublin	38	38	-	38	-	-
4	School in Świdnik	11	-	-	-	-	11
5	Kindergarten in Puławy	137	31	106	137	-	-
6	Kindergarten in Kraśnik	13	1	12	13	-	-
7	Sanatorium A in Nałęczów	25	25	-	25	-	-
8	Sanatorium B in Nałęczów	33	33	-	-	33	-
9	Educational centre in Niemce	5	5	-	5	-	-
10	Centre in Milejów	11	-	11	11	-	-
Total		340	173	167	271	58	11
% of infections					79.7	17.1	3.2

The majority of the infection cases (6 cases – 246 individuals) was caused by meals prepared using eggs infected with *Salmonella enteritidis* (cream cake, self-made milk chocolates, egg paste) and infected brawn (1 case – 25 individuals). Two cases of food poisonings (58 persons) were caused by the increased number of *Escherichia coli* in the mayonnaise used to prepare vegetable salads and in the chicken jelly. Acute gastro-intestinal disorders were also observed after the consumption of halva produced in the USSR (1 case – 11 individuals), in which a high level of peroxide was demonstrated with positive Kreis' test.

The closed mass nutrition institutions in which food poisonings occurred were mainly: educational centres (6 – 266 individuals, including 156 children), sanatoria for adults (2- 58 persons) and cultural and administrative centres (2 – 16 persons, including 11 children). Due to their severe course, food poisonings caused by *Salmonella enteritidis*, increased level of *Escherichia coli* and peroxide with positive Kreis' test contributed to hospitalization of a large number of patients – 214. Many hospitalized patients were children – 92, i.e. 42.9% of all hospitalized cases.

The closed mass nutrition institutions in which food poisonings were observed were subjected to extensive sanitary evaluation which, in most cases, enabled to determine the direct causes of acute gastro-intestinal disorders. The inspections of the sanitary conditions and epidemiological examinations revealed numerous improprieties concerning the way of storing food products in refrigerators (lack of segregation) – meat, meat products, poultry, fat were often stored together. The eggs which were the main source of *Salmonella enteritidis* infections were kept in the vicinity of other foodstuffs used for direct consumption – meat products, dairy products.

Furthermore, the preparation of eggs was improper, i.e. improper washing, lack of separate washing units; instead eggs were washed in accidental places in the direct vicinity of other food processing procedures, irregular use of egg disinfectants, incompliance with the rules of short-term par-boiling of eggs; improper washing of the equipment and utensils.

An important factor promoting the growth of microorganisms in food products is the ambient temperature near the human body temperature (36.6°C) which provides optimal conditions for the growth of pathogens inducing food poisonings. The effects of temperature on the incidence of food poisonings is largely visible in their seasonality. The majority of food poisonings registered in the

Lublin province in 1990 in closed mass nutrition institutions occurred in spring-summer months (6 cases in terms II and III); the incidence in these months is also the highest one (259 individuals) for the total number of 340 infections.

The closed mass nutrition institutions with food poisonings were characterized by the functionality of their units. In the pre-poisoning period, all of them, according to the sanitary evaluation sheet, had positive scores, which would indicate that the staff irregularly followed the sanitary-hygienic rules required. Moreover, the inspections showed that the institutions were improperly equipped with washing preparations and disinfectants for sanitary and social rooms although the amounts of them in the store-rooms were sufficient.

In the period examined, one case of food poisoning was registered in the school in Świdnik (11 infections) caused by the ingestion of halva imported from the East, which contained a substantial level of peroxide with positive Kreis' test. The above example suggests that the food import may pose a serious epidemiological problem. This is related to mass import of products with exceeded expiry dates and lacking the National Sanitary Inspection attestation.

CONCLUSIONS

The statistical analysis of food poisonings registered by the Regional Unit for the Control of Epidemics and Hygiene Promotion in Lublin carried out between 1976 and 1998 shows that:

1. The most common cause of bacterial food poisonings is *Salmonella*, mainly *Salmonella enteritidis* and one of the basic carriers is the food prepared from animal materials, mostly thermally untreated eggs.

2. The incidence of *Salmonella* infections is continuously growing while the number of *Staphylococcus aureus* and *Clostridium botulinum* infections is decreasing.

3. The main causes of bacterial food poisonings in the Lublin province between 1976 and 1998 include: improper sanitary rules, inappropriate food processing and storage, unsuitable rooms for food production, consumption of food products past the expiry date.

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SUMMARY

The aim of the paper was to analyse the bacterial poisonings in the Lublin province in the years 1976–1998. The analysis was based on the archive materials of the Regional Unit for Control of Epidemics and Hygiene Promotion in Lublin. To illustrate the discussed issues the exemplifying bacterial food poisonings in closed mass nutrition institutions in 1990 were examined. The studies revealed that the bacterial food poisonings were most frequently caused by *Salmonella enteritidis* and one of the basic carriers was the food prepared from animal-derived materials. The incidence of *Salmonella*

infections is constantly growing while that of *Staphylococcus aureus* and *Clostridium botulinum* infections is decreasing. In 1990 closed mass nutrition institutions in which the poisonings occurred had positive pre-infection sanitary scores, according to the hygiene classification sheet, which suggests that their staff followed the sanitary and hygienic regulations on an irregular basis.

Wskaźnik zatruć pokarmowych o etiologii bakteryjnej na terenie województwa lubelskiego w latach 1976–1998

Celem pracy była analiza zatruć o etiologii bakteryjnej na terenie województwa lubelskiego w latach 1976–1998. Problem zasadniczy pracy starano się rozwiązać opierając się na analizie materiałów archiwalnych Wojewódzkiej Stacji Sanitarno-Epidemiologicznej w Lublinie oraz na wywiadach i rozmowach z pracownikami WSSE i TSSE. Jako ilustracji do rozważań dokonano analizy przykładowych bakteryjnych zatruć pokarmowych w obiektach żywienia zbiorowego zamkniętego w roku 1990. W wyniku badań stwierdzono, że najczęstszą przyczyną bakteryjnych zatruć pokarmowych są pałeczki *Salmonella*, głównie *Salmonella enteritidis*, a jednym z podstawowych nośników jest żywność przygotowywana na bazie surowców pochodzenia zwierzęcego. Liczba zachorowań wywołanych salmonelami ciągle wzrasta, maleją natomiast zachorowania wywołane przez *Staphylococcus aureus* oraz *Clostridium botulinum*. W r. 1990 obiekty żywienia zbiorowego zamkniętego, w których wystąpiły zatrucia w okresie poprzedzającym, otrzymywały według arkusza klasyfikacyjnego oceny pozytywne, co wskazuje na niesystematyczne stosowanie się personelu do obowiązujących przepisów sanitarno-higienicznych.