Acta Alimentaria, Vol. 32 (2), pp. 119–123 (2003)

Editorial

FOODBORNE INFECTIONS AND BACTERIAL INTOXICATIONS – A NEW-OLD CHALLENGE FOR FOOD SCIENCE AND MEDICINE

In the second half of last century the quick development of food processing technology, hygienic and epidemiological issues and therapeutic possibilities, as well as measures in food safety raised hope of significantly diminishing (or in some cases eliminating) foodborne infections and bacterial intoxications (further on: foodborne diseases). However, it is not the fact, the professionals of food manufacturing, trade and medical service are facing out day in day these problems.

The broad spectrum of foodborne pathogens has been changing. The importance of some "classical" pathogens decreased, and at the same time new ones have emerged. Among different countries, the comparison of infections and intoxications caused by food transmitted pathogens and bacterial toxins seems fairly difficult, because the registration of incidences is diverse in various countries; in certain ones the identification is missing, whether the cases are transmitted by food or not. Furthermore, some countries report the total number of diseases including sporadic and outbreak cases, while others only the latter. In addition, the epidemic properties of foodborne diseases have a great variability from illness to illness and from incidence to incidence. Certain pathological conditions appear mainly (but not always) as sporadic cases, the other ones preferably as outbreaks. And last but at not least, the number of cases depends on number of persons who ingested the incriminated food. If it happens in a small family, no large outbreak will occur, but the same microbe and food may cause a huge epidemic in mass catering.

Despite of changes worldwide, the salmonellosis is placed first[1]. The risk of salmonellosis is relatively low in developed countries, but very high in developing regions. The food trade and in certain cases the short travel time from remote lands include the permanent risk of introducing infection into countries of more favourable situation not just in case of salmonellosis. In several European countries such as Germany, Austria, Estonia, Switzerland the incidence of salmonellosis increased from the second half of the 1980s and had a peak about 1991–1992. The number of cases/100 000 inhabitants (in the following: *inh.*) was 150–250 as against the earlier 50 or less. From these years a decrease is shown. At the same time, in other countries, e.g. in the United Kingdom, Russian Federation, Cyprus the morbidity rate remained approximately at the same level. It is an important phenomenon that the share of *S. enteritidis* among the *Salmonella* serotypes has tremendously increased (500% to over 2000%!) at the turning-point of 1980s to 1990s in North America and also in Europe but not for example in England/Wales, Austria and France. The dissemination of *S. enteritidis* strains began in the early 1980s through egg laying and broiler flocks.

[1] SCHLUNDT, J. (2002): New directions in a foodborne disease prevention. *Int. J. Fd Microbiol.*, *78*, 3–17.

0139-3006/2003/$ 20.00

The microbes colonise in the ovarian tissue of hens and they infect the eggs without any pathological symptoms or changes in hens or eggs. Now it is the most common serotype worldwide but Australia and New Zealand have been left untouched. This experience suggests that live animals and infected foodstuff are needed for their spread and a strong control of these factors may have kept the strains out. There is another interesting fact: the continuous growth of cases caused by *Campylobacter jejuni* since 1985. It is not perfectly clear whether it is the sequel of new, improved isolation and identification methods or a real increase. According to the WHO experts, the true number of campylobacteriosis seems underestimated because of lack in diagnostic procedures. The next pathogens showing pandemic tendency are *Yersinia enterocolitica* strains of serogroups O3 and O9. They appeared first in Europe, Japan in the early 1970s, then in North America in the late 1980s. The pigs infected by *Y. enterocolitica* are sources of yersiniosis, the transmission of which to humans is provided by ingestion or contact with raw or improperly cooked pork and pork products.

In the United States a number of foodborne pathogens has emerged in the last 30 years, particularly in the last 25 years[2]. Their list in succession of decreasing number of cases caused by them is as follows: Norwalk-like viruses, *Campylobacter* spp., enterohaemorrhagic *E. coli* (*EHEC*, of which *E. coli O157:H7* is the most well-known item) and other Shiga-toxin producing *E. coli*, *Yersinia enterocolitica*, enterotoxigenic *E. coli* (*ETEC*), astrovirus, rotavirus, *Cryptosporidium parvum*, *Cyclospora cayetanensis*, noncholera vibrio, *Listeria monocytogenes*, toxigenic *Vibrio cholerae*, *Vibrio vulnificus*, prions.

We have to underline the importance of foodborne virus infections, the diagnosis of which has improved in the last decades and will probably improve quickly in the future. The human pathogenicity and foodborne or waterborne spreads have been proven in certain genera of *calicivirus* family (Norwalk-like viruses, NLVs, also called "round-structured viruses", RSVs, Sapporo-like viruses, SLVs), rotavirus, astrovirus, hepatitis A virus and hepatitis E virus. In 1999, in the USA, the share of NLVs in the total incidence transmitted by food amounted to 66.6%. Viruses caused 6% of foodborne outbreaks in England and Wales.

We have to mention the parasitoses spread by food, however, their significance is not high in developed countries, although they may occur.

In addition to the changes in range and rank of foodborne pathogens, other significant modifications have been observed in their antimicrobial sensibility or resistance, which is a not totally new problem, though of increasing importance essentially influencing the epidemiological efficiency, the fight against foodborne infections. The use of antibiotics in animal husbandry for therapeutic or growth promoting purposes involves serious consequences. For example, the application of fluoroquinolone for chicken flock can elicit 100% resistance in *C. jejuni* strains within some days, therapy in cattle with cephalosporins may produce *Salmonella* strains resistant to ceftriaxone, long-term use of dalfopristin/quinupristin in chicken results in

[2] TAUXE, R. V. (2002): Emerging foodborne pathogens. *Int. J. Fd Microbiol*., *78*, 31–41.

resistance of human *Enterococcus* spp. to these antibiotics through eating chicken meat. In the United States 11% of *Salmonella* spp. and 14% of *Campylobacter* strains isolated from humans are resistant to five or more antibiotics. The experts emphasise the necessity of proper use of antibiotics in agriculture in the interest of public health.

There is a characteristic approach to certain microbes involving hazard, particularly in vulnerable population groups. *Listeria monocytogenes* infections threaten, first of all, the pregnant women, elderly and immuno-compromised subjects. *V. vulnificus* proliferate in persons with compromised liver function or iron overload. The prudent public health measures including information and education of at-risk people provide efficient prevention.

Regarding the prion disease, namely the new variant of Creutzfeldt-Jacob disease, (vCJD) up to the present, no definitive conclusions were provided regarding the link between bovine spongiform encephalopathy (BSE, also called "mad cow disease") and the human vCJD. Earlier, scientists believed that transmission of BSE to humans is impossible, similarly to scrapie. First cases of a CJD-like illness broke out in the United Kingdom and later in other European countries in line with BSE epidemic. On the basis of autopsies of young victims suffered in severe damage of the central nervous system, the medical professionals revealed that the brain lesions are like classic CJD but not the same ones. However, the lesions in the brain of infected cattle are strikingly similar. The means of transmission to humans is not at all cleared up. It is possible that the ingestion of brain and spinal cord from ill cattle is the most hazardous. Another fact is that the incubation of vCJD is much shorter than that of CJD.

What kind of conditions did exist in the Central European countries at the end of last century, regarding foodborne diseases? In 1997 and 1998 in Poland the number of foodborne outbreaks was 305 and 364, the morbidity rate 14.6 and 19.8/*inh.*, respectively. The overwhelming majority of the events was caused by bacteria and among them by salmonellas. *Salmonella* spp. were the causative agents in 85.5% and 78.9% of outbreaks or in 80.0% and 78.2% of cases, respectively. The incriminated food was prepared mostly in private households and kindergarten, school catering. Regarding the role of different foods in the transmission of causative agents, the most important vehicles are the cakes, cream, ice cream, followed by mayonnaise and different meals with eggs. Also in the Czech Republic the salmonellosis seems to be the most important foodborne disease. Over 90% of the salmonellosis were transmitted by food. The campylobacteriosis is the second most frequent zoonosis. Its morbidity rate was the lowest in 1993 (21/*inh.*) and the highest in 1997 (37/*inh.*) The morbidity rate of foodborne intoxication of bacterial origin fluctuated between 3.2 (1997) and 8.9 (1993). In Slovakia the incidence of salmonellosis is increasing. In 1975 the morbidity rate was somewhat below 100/*inh.*, in 1985 about 120, in 1998 400 and in 1999 it was over 350. The campylobacteriosis is ranked second after the salmonellosis. In Austria the morbidity rate was 22.9/*inh.* in 1986, in 1992 137.3, in 1993 123.6 and in 1998 123.4. There was a peak in 1992 and 1993 followed by a decrease in the next two years, though since 1993 a slight increase is observed. Among the causative agents the salmonellas takes first place and *Campylobacter* the second with a significant increasing tendency.

98–99% of *Salmonella* outbreaks come from households. Poultry meat, hen's eggs, food containing eggs are the most important sources of human infections. The serotypes *S. enteritidis* and *S. typhimurium* were the most frequently isolated salmonellas. The total number of foodborne diseases in Croatia decreased from 1993 up to 1996 but since 1997 it is approximately on the same level. The share of cases caused by *Salmonella* spp. fluctuated between 44.2% and 64.5%, respectively. Egg cream cakes and other egg products accounted for the major share of incriminated food, thus eggs play role in 33.2% of outbreaks. With respect to places where incriminated foods were acquired, eaten or contaminated, the major risks were represented either by households (41.3%, 1993–1999) or by mass catering establishments (13.4%). In Slovenia between 1990 and 1999 the frequency of outbreaks fluctuated between 22 (1997) and 33/year (1992), without a definite trend, and the morbidity rate varied between 44.2/*inh.* (1999) and 142.6 (1991). In 1997 the main causative microorganisms were *B. cereus*, coronaviruses (that cause first of all diseases in respiratory tract), *S. aureus*, in 1998 *S. pyogenes*, *S. aureus* and *Salmonella* spp., in 1999 *Salmonella* spp. and *B. cereus*. The features are different from that experienced in other Central European countries. The most frequent places where foods were contaminated or eaten include the food and hospitality industry and the households. The most recurrent foods as transmitting factors in outbreaks expanded from the poultry meat through minced meat to the confectionery products.

In Hungary the number of foodborne incidences and cases fluctuated year by year since 1985 without a definite tendency; but between 1993 and 1996 (even considering the number of incidences till 2001) there has been an increasing trend. In 1996 a tremendous peak is shown because of a big outbreak of salmonellosis occurred in a school-catering establishment, which caused 5243 illnesses. The morbidity rate varied from 29.0/*inh.* (1992) to 102.6 (1996), the most frequent value was 45–50/*inh.* The lethality of foodborne infections and bacterial intoxication is fairly low, 0.16%. The *Salmonella* spp. seem to be the most important causative agents. The causative role of *Campylobacter* spp. is increasing. In the last few years several outbreaks of verified viral origin occurred. Recently, foodborne calicivirus infections have been reported in Hungary. As regards incriminated foods eggs, egg-containing meals, different kinds of meat, cold plates, confectionery products play an outstanding role.

We may not leave out of consideration that the incidence of foodborne diseases rather differs from one another in the Central European countries, though morbidity rate seems to be fairly similar in the same country in various successive years. This phenomenon is caused by certain factors: i) the divergences in the principles and practice of reporting and registration as mentioned above; ii) the divergences in the epidemiological investigations and evaluations (e.g. when a gastrointestinal illness is regarded as foodborne); iii) the efficacy of reporting system. This is why the comparison of exact number of incidences, cases, etc. must be carried out with the highest caution among Central European countries and among European countries, in general. However, we may conclude that the condition of foodborne diseases in Central Europe looks not to be worse and nor better then in other parts of our continent. It means that we have similar engagements for their prevention, for improvement of food safety.

What to do next? A WHO document endorsed by the Executive Board in January 2002 includes the main areas:

Surveillance of foodborne diseases. It means strengthening the surveillance system, food contamination monitoring programmes, harmonisation, moreover the standardisation of reporting and evaluation system, understanding food as risk factor, and improving microbial diagnostic methods.

Improving risk assessments. Tools should be developed for appropriate risk assessment as basis for international directives, guidelines, and national food regulations all over Europe.

Risk communication. The results of risk analyses should be made available for producers and consumers. WHO will facilitate the elaboration of methods for providing discussion in all parts of food production and consumption chain.

Safety of new technologies. A holistic approach is needed for safe production, trade and use of foods derived from new technologies. At the same time, the re-examination of technologies used also at present seems to be essential. Safety considerations, health benefits, environmental effects and other consequences of genetically modified foods must be investigated and validated. An interactive communication regarding benefits, risks of new technologies should be coupled to that.

Public health role in Codex standards. There is a real requirement for a greater involvement of public health sector in the development of Codex Alimentarius standards, guidelines and recommendations.

International co-operation and capacity building. WHO will be involved in international food safety issues, promote the development of regional strategies. This activity will be focused on agricultural producers in data collection, risk assessment. In developing (and to a lesser degree developed) countries the food safety should be prioritised in public health.

Beyond doubt, a very strong collaboration among agriculturists, food industrialists, food dealers, public health experts and all professionals involved in food science is needed to overcome the well-known but existing difficulties and the novel, emerging issues of foodborne diseases on the basis of further concerted research and enlargement of food safety activity.

GY. BIRÓ*

* h7639bir@helka.iif.hu