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## Food safety and risks

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conference paper

### Summary

Food safety relies on early warning identification of dangers and risks. Early warning information regarding microbiological contamination and correlation between food and pathogen is important in a complex system of predicting food infections and intoxications. Reports from disease control centers from different countries give accent on the same microbiological risks as sources of diseases from different food matrices. The most common microbiological contaminants still are: *Salmonella* spp., *Campylobacter* spp., *Listeria monocytogenes*, *Escherichia coli*, *Yersinia enterocolitica*. In resolving these issues, we need to emphasize new trends in EU legislation regarding responsibility for production quality and food safety guarantees by the FBOs themselves.

**Key words:** food safety, microbiological contamination, risks

### Introduction

By recognizing great dangers in microbiological contamination of food, World Health Assembly and Codex Alimentarius Commission asked for founding of an international expert body by WHO (World Health Organization) and FAO (Food and Agriculture Organization of the United Nations) for the purpose of protecting consumers' health. In that way, WHO and FAO become the founders of the development of health safety approach of risk - based food assessment. The approach has been named generally risk analysis and it consists of a process containing three components: 1. risk assessment; 2. risk management and 3. risk communication.

Basic terms related to risk analysis are **food**, which is defined in accordance with the Food Act (Official Gazette No. 46/07) as every substance which is technologically processed, half processed or raw, intended for consumption, including drinks, chewing gums and other substances used in production, preparation or treatment, but not including cosmetics, tobacco and substances used in terms of drugs. Then, there is **hazard** which is described by a biological,

chemical or physical agent or characteristic of food which can have an unfavorable effect on consumer's health. And finally, there is **risk** which is represented by the function of possibility of an unfavorable effect and the size of effect which has a hazard in food as its consequence.

### Risk analysis

Risk analysis is a new system which consists of few statements already mentioned. Thereby **risk assessment** is a process based on a scientific assessment of the known and potential unfavorable effects to health which derive from the exposure to hazards from food (CAC, 1999). Due to diversity of possibly harmful factors to organisms, risk analysis developed itself to specific analyses depending on the fact whether causative agents are microbiological or chemical, and there appear even narrower classifications within them. So, different analyses are conducted depending on whether causative agents are viruses, bacteria, parasites, molds, mycotoxins, etc. (BASSET et al., 2012). The same applies to chemical analysis if the causative agents are pesticides, additives and other hazards. Special analyses are conducted for GM food,

new food, etc. The methodology of risk analysis is constantly improved, it's becoming narrowly specialized, and many methodologies vary from case to case. The step "monitoring and review", which is the basic aim of food safety, is based on the relation pathogen - food and it should serve the function of prevention, i.e. removing and decreasing risks from food for the purpose of human health protection. Since the politics of food safety should be based on the approach of universality, the responsibility for food safety is put upon producers by implementing the HACCP system, which is a system of good production and hygiene practice, quality system and total quality management (TQM).

**Risk management** is based on recognition and assessment of efficacy and feasibility and it is concentrated on risk reduction, depending on relative industrial standards.

**Risk communication** is performed via transparent and consistent informing of the public, by taking into account the creation of trust by the consumers and preventing the feeling of panic (FAO/WHO, 2006; 2007; 2009).

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The degree of food safety is sought to be improved by using all the mechanisms which are available to responsible persons. After initial approach to amendments in acts and regulations which regulate health and food safety, as well as their harmonization, the emphasis lies on informing on potential risks and steps which are taken to decrease them. Implementation and including of provisions of the Food and Feed Law into national legislation is checked especially through the procedures of food inspection on site, inside and outside the European Union. As zero risk doesn't exist, applying strategy for food safety of the EU reduces risks to a minimum by modern standards for food and hygiene designed by the help of the most modern scientific findings. Food safety begins on the farm. Regulations are applied from farm to fork, regardless of the fact whether the food is produced in the European Union or it is imported from some other part of the world (ANON, 2004).

It is very important to know the food, pathogens or a situation which can lead to the appearance of disease and determine the significance of effects they have on human lives. These information are of great value in order to make right decisions on the manner of management and intervention which will be the most efficient in decreasing the appearance of diseases caused by food (LAMMERDING and FAZIL, 2000). Bacterial food poisonings are a consequence of consumption of food contaminated by bacteria and/or their toxins. Still, neither every consumption of such food results in infection or a disease, nor individuals within a certain population are equally sensitive to a certain pathogen. Therefore a risk of the appearance of the diseases caused by food is a combination of probability of exposure to pathogens in food, probability that the exposure will result in infection or intoxication



Diagram 1 Risk analysis (adjusted; National Food Institute; Technical University of Denmark)

and consequently leads to a disease of different severity. Hence a combination of food and pathogen is a very significant information in predicting individual diseases, even though the system is very complex and complicated due to the influence of many factors affecting food production and consumption. There are very few official and verified data on these factors.

Reports of the EFSA (2012) on zoonoses transmitted by food and recorded epidemics in the EU for the year 2010 say that campylobacteriosis is on the rise and that trend has been repeated for five years in a row. The finding of *Campylobacter* spp. is again the most represented in chicken meat. The number of reported cases of salmonellosis in the EU has been decreasing continuously in statistically significant values since 2006. It is assumed that the reason for that is the application of new programs of salmonella control in poultry farming. So far bacteria can only be determined in meat and poultry products. Also, the report lists that frequency of listeriosis in humans is unchanged in comparison to previous years. There has been noted an increase in the number of ailments in people caused by verotoxin *Escherichia coli* (VTEC) in

comparison to previous years, and most cases were caused by serogroup O157. Bacteria are most often isolated from cattle and beef. *Yersinia* in humans has been in a decrease since 2006. *Yersinia enterocolitica* is most often isolated from pork. An increase in the number of ailments in humans caused by *Mycobacterium bovis* in comparison to the year of 2007 is worrying, and prevalence of bovine tuberculosis is in the increase in the EU. Brucellosis in humans and animals (cattle, sheep and goats) decreases continuously. Also trichinosis in humans is in a decrease, and the parasite is determined in pigs increasingly rare, and more frequently in wildlife. The number of cases of echinococcosis in humans is in a decrease in the year of 2010. Q fever records a downward trend. Epidemics caused by food were noted in the same number as in the previous year. Salmonella is the most frequent causative agent of epidemics, followed by viruses and campylobacter. As the main transmitter of the pathogen there are listed eggs and egg products, casseroles, vegetables and juices. The meaning of zoonoses in public health does not depend on the frequency itself in the population, but also severity of

a disease and the number of deaths are also important factors which determine the significance of the disease. For example, despite a relatively small number of cases caused by VTEC, *L. monocytogenes* bacteria or parasites in comparison with the number of people becoming ill of campylobacteriosis and salmonellosis are considered significant due to connectivity of the disease with high mortality rate (EFSA, 2012).

According to the information by EFSA (2012) in the year of 2010 there were recorded 5262 disease outbreaks in 24 member countries of the EU. In that process 43473 persons became ill, 4695 were hospitalized and 25 of them died. According to these official indicators there is no progress in comparison to the year 2009. The cause of a disease was known in 69% of the cases (with differences in different countries from 21.2% to 100%). In more than 75% of recorded epidemics, their causative agent was determined only in 13 countries.

There were recorded 15 death cases connected with a certain causative agent in Europe in 2010. Nine of them were caused by consumption of food contaminated with *Salmonella* spp., four of them with *Listeria monocytogenes*, one with toxins of the bacteria *Clostridium botulinum*, and one with toxins produced by fungi. These cases were confirmed ("strong evidence foodborne outbreak"). In the remaining ten death cases the causative agent was partially confirmed ("weak evidence foodborne outbreak"), seven of them were related to salmonellas, one was related to mycotoxins, and two to other causative agents. There was also determined a death case where a causative agent was a norovirus (report of a country which is not a EU member).

In the year 2010, the highest number of confirmed cases of diseases and epidemics in the EU was related

to food of animal origin. As in the previous years, eggs and egg products were the most frequent transmitters of diseases and caused 22.1% of diseases, followed by cooked dishes (13.9%), vegetables, juices (8.7%) and crabs, bivalve and their products (8.5%). 6.3% of the disease samples belonged to fish and its products, 6% to poultry products as well as other kinds of chopped meat and its products, followed by pork with 4.9%, beef 3.3% and cheeses with 2.3%.

The share of diseases transmitted by vegetables and juices increased in comparison to previous years. Important information say that as much as 38.7% of confirmed diseases are related to consumption of food prepared in households, and 30.8% to restaurants and other facilities of outdoor nutrition. Eggs and egg products are still connected to bacteria of *Salmonella* genus, and the highest number of diseases was sampled due to consumption of eggs contaminated with *S. Enteritidis* (66.9% of confirmed diseases). *Staphylococcus aureus* was confirmed in eggs only in one case. Cooked dishes (meat, vegetables, sauces) were even in 97 cases causative agents of epidemics, whereby *Salmonella* spp. (43.3%), calcivirus (19.6%), toxins *S. aureus* (9.3%) and *Bacillus* spp. (9.3%) were confirmed as pathogens. Bacterial poisonings are connected with shellfish and biotoxins, but also to calciviruses. Fish contained histamine even in 30 cases. Pork meat is connected with salmonella again, but also with *Clostridium* spp.

According to official data, diseases caused by food in our country are in decline (salmonellosis, other etiology). The number of people suffering from Q fever, echinococcosis decreased, but trichinellosis is in a mild growth in comparison to the year 2007 (ANON, 2011). Researches indicate to the detection of salmonella, *E. coli* O26 and *E. coli* O55 in fresh milk (MEDVID, 2011; MEDVID et al., 2011;

ŠKVORC, 2011), salmonella and *E. coli* in cottage cheese produced from unpasteurized milk (ZDOLEC et al., 2007; ŠKVORC, 2011), *L. monocytogenes* in dairy products (MARKOV et al., 2009). *Campylobacter jejuni* and *Campylobacter coli* (Granić et al., 2009), *Salmonella* spp., *L. monocytogenes* and *S. aureus* (KOZACINSKI et al., 2006) can be determined in poultry meat. These kinds of food represent a potential risk of infection, i.e. a health risk for consumers.

Producers are responsible for the production of safe food. Legal obligations, standards and guidebooks always and again return to the premise that managing a safe food includes different systems of quality assurance, especially HACCP and prerequisite programs, but also an optimal risk management through the chain of food supply (CAC, 1999). Generally, food industry assesses safety at the production of a new product already, as well as during the use of production processes or producer specifications. In that way scientific findings are intertwined with practical experiences of all entities included in the process of food production, including trading companies, legislative bodies, scientific institutes, etc. Traditionally, food industry is included in assessment of risk exposure and it's been the initiator of events in that area for several decades. On the other hand, governing bodies and the academic community have made a significant progress in the stage of risk characterization. As the food industry is not included in or it's not qualified for all stages of risk analysis, it is not clear if the industry can or should it adopt the approach of risk analysis as the procedure used for assessing food safety.

#### Conclusion

Without a doubt, the system of risk analysis is no longer some "fashion" or "new food hygiene". It is now a scientifically based imperative which

## Nahrungssicherheit und Risiken

## Zusammenfassung

Die Nahrungssicherheit gründet auf rechtzeitigem Erkennen der Gefahren und der Risiken. Genauso ist eine rechtzeitige und geprüfte Information über die mikrobiologische Verschmutzung sowie die Verbundenheit von Pathogenen und Nahrung eine sehr wichtige Angabe im komplexen System des Voraussehens von alimentaren Infektionen und Intoxikationen. Die Berichte verschiedener Zentren für Krankheitskontrollen aus verschiedenen Ländern heben dieselben Noxen hervor, die Krankheiten nach der Konsumation verschiedener Nahrung verursachen. In diesen Verschmutzungen sind auch weiterhin am häufigsten: *Salmonella* spp., *Campylobacter* spp., *Listeria monocytogenes*, *Escherichia coli*, *Yersinia enterocolitica*. Bei der Lösung der Fragen hinsichtlich Nahrungssicherheit werden neue Trends hervorgehoben, die sich auf die Verantwortung der Subjekte in der Nahrungsherstellung beziehen, und die die EU Legislative im Sinne der Nahrungsherstellung und Garantie der Nahrungssicherheit vorschreibt.

**Schlüsselwörter:** Nahrungssicherheit, mikrobiologische Verschmutzung, Risiken

## Sicurezza alimentare e rischi

## Sommario

Per una sicurezza alimentare vera e propria bisogna riconoscere presto pericoli e rischi. Lo stesso vale per un'informazione controllata e data abbastanza presto, dell'inquinamento microbiologico e del legame tra i patogeni e gli alimentari, che rappresenta molto importante dato nel sistema complesso delle infezioni alimentari e delle intossicazioni. I rapporti dei centri per il controllo delle malattie da vari paesi accentuano la stessa causa delle malattie dopo il consumo di vari tipi del cibo. In quell'inquinamento i primi posti occupano ancora *Salmonella* spp., *Campylobacter* spp., *Listeria monocytogenes*, *Escherichia coli*, *Yersinia enterocolitica*. Trattando gli argomenti della sicurezza alimentare bisogna sottolineare anche i nuovi trend della responsabilità dei soggetti nella produzione alimentare, a cui bisogna corrispondere nell'ambito di legislazione di Unione europea, la produzione e la garanzia della sicurezza alimentare comprese.

**Parole chiave:** sicurezza alimentare, inquinamento microbiologico, rischi

appeared on the basis of sociological and political needs in the EU. Strategy of the system keeps developing, along with the proposition to the member countries and those who are in some kind of a relation to the EU, to apply the proposed guidelines. In the system itself of risk analysis there is discerned a certain freedom of the member countries, but with a careful horizontal control and monitoring in order for a vertical approach to be purposeful. With all that, it should be noted that one shouldn't fall into a linguistic trap and identify risk analysis with the risk analysis within the HACCP system. Furthermore, what can be felt is strengthening of a comprehensive combination of epidemiology and veterinary medicine, especially veterinary inspection and veterinary public health as segments of public health within the EU.

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## Biopolym

## DODACI STOČNOJ HRANI

- značajnije smanjuje isparavanje amonijaka
- značajnije smanjuje uginuće stoke i peradi
- pospješuje stvaranje mikroklime
- poboljšava iskoristivost hrane
- daje kvalitetan gnoj i gnojnicu
- smanjuje upotrebu antibiotika

## BIO-ALGEEEN G-40

## PRIRODNI PROIZVOD ZA OBRADU GNOJNICA, SEPTIČKIH JAMA I KOMPOSTIRANJE

- reducira neugodne mirise
- održava gnojnicu u tekućem stanju i homogenizira je
- ubrzava proces kompostiranja
- stabilizira hranjive sastojke za prirahnu bilja
- stvara u tlu komplekse glina-humus

Bio-algeen i Biopolym proizvedeni su od smeđe morske alge. Služe za prirahnu bilja, životinja i kao poboljšivači tla. Koriste se u ekološkoj i konvencionalnoj proizvodnji.

Sadrže oko 30% bjelančevina, visok sadržaj vitamina, preko 70 elemenata u tragovima, aminokiselina, alginskih kiselina i huminskih kiselina.

Potpuno su neškodljivi za ljude, životinje, biljke i okoliš, te imaju ekološke certifikate Europske unije.



## INDIREKTNJI UČINCI NA UZGOJ ŽIVOTINJA I DIREKTNJI UČINCI NA IZMET

Loše higijenske prilike smještaja životinja općenito pogoduju razvoju dišnih infekcija, virusne etiologije uz komplikacije upala pluća sa sekundarnim bakterijskim infekcijama (*P. multocida*, ac. bronchopneumonije, mikoplazma itd.).

Samo liječenje ne može zamijeniti obveznu primjenu higijenskih mjera u prostorijama gdje obitavaju životinje i to 60–70% čime se postižu bolji klimatski uvjeti u prostoriji što rezultira boljom konverzijom hrane, skraćenjem trajanja tova, manjim postotkom uginuća, manjim utroškom mljekova 30–40% po životinji.

Pri primjeni ovih proizvoda u prvom redu postiže se smanjenje koncentracije amonijaka i ostalih štetnih plinova u prostorijama gdje obitavaju životinje i to 60–70% čime se postižu bolji klimatski uvjeti u prostoriji što rezultira boljom konverzijom hrane, skraćenjem trajanja tova, manjim postotkom uginuća, manjim utroškom mljekova 30–40% po životinji.

nji. Ovi proizvodi omogućuju i da gnojnica bude u tekućem stanju, uklanjaju neugodne mirise i olakšavaju čišćenje prostorija jer se izmet ne lijepe za pod.

Pri praznjenju lagune nije potreban mikser za razbijanje kore jer je gnojnica već u tekućem stanju i ne širi neugodne mirise. Hranjivi sastojci gnojnice, prije svega amonijak, fosfor i kalij ostaju očuvani, a nitrat koji se kasnije stvara u tlu održava se u takvom stanju da ga biljke mogu iskoristiti. Tretirana gnojnica obogaćena je dušikom stoga je smanjena potreba za dušičnim gnojivima, a zemljane površine tretirane ovom gnojnicom daju 30–40% veći i kvalitetniji urod posijane kulture na tom zemljištu.

Bio-algeen i Biopolym proizvodi omogućuju kvalitetnu proizvodnju, pozitivne ekonomske efekte i s aspekta ekologije, održivi razvoj. ■

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