Iranian J Publ Health, Vol. 43, No. 7, Jul 2014, pp. 889-902

Review Article

Development a Comprehensive Food Safety System in Serbia- A Narrative Review Article

Vesela RADOVIĆ [1], Zoran KEKOVIĆ [2], Samir AGIĆ [3]

1. *Faculty of Applied Security, Educons University, Sremska Kamenica, Serbia*
2. *Faculty of Security Studies, University of Belgrade, Belgrade, Serbia*
3. *Protection and Rescue Sector, Ministry of Security Bosnia and Herzegovina, Bosnia and Herzegovina*

***Corresponding Author:** Email: vesela.radovic@educons.edu.rs

(Received 16 Mar 2014; accepted 19 Jun 2014)

Abstract

Background: Food safety issues are not a new issue in science, but due to the dynamic changes in the modern world it is as equally important as decades ago. The aim of the study was to address the efforts in the development of a comprehensive food safety system in Serbia, and make specific recommendations regarding the improvement of epidemiological investigation capacity as a useful tool which contributes to improving the public health by joint efforts of epidemiologists and law enforcement.

Methods: We used the methodology appropriate for social sciences.

Results: The findings show the current state-of-affairs in the area of food safety and health care system and present some most important weaknesses which have to be overcome. Policy makers need timely and reliable information so that they can make informed decisions to improve the population health in an ongoing process of seeking full membership in the European Union.

Conclusion: Serbia has to apply significant changes in practice because the current state-of-affairs in the area of food safety and health care system is not so favourable due to numerous both objective and subjective factors. Hence, the policy-makers must work on the development of epidemiological investigation capacities as a firm basis for greater efficiency and effectiveness. Epidemiologists would not stay alone in their work. Law enforcement as well as many other stakeholders should recognize their new role in the process of the development of epidemiological investigation capacity as a tool for the development of a comprehensive food safety system in Serbia.

Keywords: Public health, Food safety, Epidemiological investigation, Law enforcement, Food outbreak

Introduction

Food is one of the most important factors determining the rise of human civilization. Long ago psychologist Abraham Maslow introduced his concept of a hierarchy of needs. He claims that it is only after a community's basic needs are met that people can move on to developing safety and security (1). There are implications of recent global financial crises on financial and economic stability, and hence on food security because the global food system is very vulnerable. World Economic Forum Report 2013 stated: "Global food and nutrition security is a major global concern as the world prepares to feed a growing population on a dwindling resource base, in an era of increased volatility and uncertainty." Thus, measures to "improve food security have never been more urgently needed" (2).

The main task for every government starts to be how to provide sustainable and healthy food supply, and protect its population against foodborne

diseases. Marc Danzon stated that "one of the most important steps is the coordination of policy–making to ensure that the food policies of all sectors give the proper priority to public health" (3). Many organizations are involved in the area of providing food security since the World Food Conference in 1974 defined food security in terms of food supply-assuring availability and price stability of basic foodstuffs at the international and national level (4). Food safety and food security are two highly interrelated subjects with similar and common fields of activities in terms and references. The boundaries between theory and practice may sometimes be blurred, and there are also various definitions of terms-this all results in quite versatile terminology which may also sometimes be confusing. Food safety is concerned with all aspects**,** whether immediate or long-term, that may make food unsafe for the consumer**.** Therefore, safe foods or foodstuffs contain nothing that is hazardous or injurious (5). In many countries there exists some kind of "expert bodies" to avoid duplicating of efforts and decreasing unnecessary costs in the field of food security.

Therefore, since the safe food is a precondition for the protection and promotion of health, many organizations were and are involved in the efforts to mitigate the effects of foodborne illnesses on public health. The most influential is WHO. WHO works closely with the Food and Agriculture Organization of the United Nations (FAO), WHO for Animal Health (OIE), and other international organizations to address food safety issues along the entire food chain. The Department of Food Safety and Zoonoses (FOS) provides leadership in its efforts to lower the burden of diseases from food and animals across the globe (6). In 2004, WHO launched the International Food Safety Authorities Network (INFOSAN) as an early warning, communication and prevention system which enables rapid access to information during the food safety emergencies (7).

In the European Region there are a lot of documents that outline the addressed policies about food supplies, food safety and nutrition, and also about mobilization resources for the activities on poverty and health (8, 9). Across the ocean, in the USA the food safety legislation has recently been changed and that action initiated numerous discussions (10-12). In the United States of America (USA) there are a great number of federal, state, and local agencies which share responsibilities for regulating the safety of the food supply. The combined efforts of the food industry and government regulatory agencies are often credited with making the US food supply among the safest in the world, but despite all efforts the Centre for Disease Control and Prevention (CDC) reports that each year an estimated one in six Americans - a total of 48 million people - become sick from food borne illnesses through contaminated food (13). The USA 111th Congress passed comprehensive food safety legislation on December 2010, authorizing the additional appropriations and staff for the US Food and Drug Administration (FDA) future food safety activities pathogens (14).

The Republic of Serbia (RS) has experienced important changes on its way to reach full membership in the European Union. The impacts of global financial crisis made situation in the country more serious and its effects spilled over to the entire society. The number of poor and unemployed population has been increasing since then (15). Despite numerous efforts to provide adequate level of food safety the latest data have confirmed that legal framework is not the firm base for prevention of violations of current regulations in the area of food safety. Therefore, the urgent needs for changes are recognized among stakeholders and are expected after the new Government following the recent elections is established. The stakeholders involved in the implementation of actions are financed mainly from the State budget; the finances are divided among all organisational units and provide the required number of staff performing official controls and cover costs for the implementation of such controls. A small portion is provided by international sources through donations and different projects, mostly from the European Union.

Considering the above mentioned, the authors decided to analyze in this study how it is possible to improve the food safety system in Serbia and avoid suffering of population as well as the health

system obviously overwhelmed by numerous problems. Adapting to the additional threats to food safety requires an integrated food system approach which will make the food system less vulnerable to attacks. The authors proved their hypothesis that response to food outbreak could be more effective after carefully conducted examination of literature, reports and modern practice.

The purpose of this study is to address a current state in the food safety area in the Republic of Serbia and its inseparable connection with the public health. The methodology used in the study is the most appropriate for the social science. In the introduction the authors present the importance of food in human civilization, and the information needed for understanding the scope of the research problem. The second chapter is devoted to the organization of food safety system and health care in Serbia regarding the European regulations. The last chapter presents the authors' recommendation to the policy makers about the development of epidemiological investigation capacities as a tool for providing better food safety in Serbia. Among many other needs of innovation, there is one in particular to be highlighted and that is a change in conducting the epidemiological investigation by join efforts of both public health workforce and law enforcement in the food safety area.

The main objective of this study is to consider current state in the food safety system in Serbia. The additional objective is to present the need for improvement of epidemiological investigation in the food outbreak, which could be useful in the improvement of the system performances and these facts can be used to punish the violators. The study demonstrates an urgent need for the implementation of specific food safety policies in practice. Because the activities in the food security area in Serbia have been characterized by fragmented response, this approach will help to overcome and to develop joint activities which will be more successful. Strengthening food safety policies and health system at the same time will form solid basis for future adequate response to the risks in food safety area.

Methods

The authors use preparation methodology suitable for social sciences and the objectives of the study. The official publications of the relevant authorities in Serbia and from the European Union, and broader international community were examined. Relevant scientific literature was also searched from numerous libraries like Wageningen and in a few Serbian libraries and trough different websites. The documents were also collected from electronic sources: Literature Resource Centre like Go Gale Group, online research database EBSCO-Host, Academic OneFile, e Library, and printed material (books, journals, official documents). This research is related to the events and changes in the area of health, food safety and in social sphere which occurred in Serbia during the period 2008-2013.

Overview of Serbian food safety and health care system

Serbia is a part of South-Eastern Europe (SEE) and today it is an EU candidate country. To facilitate the process of legal approximation, the Serbian Parliament adopted the National Plan for the Adoption of the Acquis 2013-2016 (NPAA) (16). Therefore, *Acquis Communautaire* in Chapter 12 - Food Safety, Veterinary and Phytosanitary Policy has been transposed into Serbian national legislation.

Competencies in the field of food safety have been divided between the Ministry of Agriculture, Forestry and Water Management (MAFWM) and the Ministry of Health (MH). The similar organization is accepted in almost all countries in the region of West Balkans following the recommendation of the European Union (EU), Croatia, Macedonia, Montenegro etc. The Ministry of Internal and External Trade and Teleco-mmunication (MoTT) is responsible for the implementation of the Law on Standardization, and the Market Inspection department is responsible for inspecting food quality at the retail level. There are also a significant number of academic institutions' departments at universities which undertake re-

search contributing to the area of food safety. Hence, the influential organizations are also the Serbian Chamber of Commerce, and the National Statistical Office.

MAFWM is responsible for veterinary, phytosanitary and food safety policies (the safety of food of animal origin, composite food, food of plant origin and feed). The MAFWM supervises the legality of work through its four directorates: Veterinary Directorate; Plant Protection Directorate; General Inspectorate and Directorate for National Reference Laboratories (DNRL). The MAFWM is central competent authority responsible for the organizations of official control and for ensuring efficient and effective coordination among all authorities and their directorates responsible for carrying out official controls of food. Veterinary, phytosanitary and agricultural inspections are managed centrally but distributed territorially, so as to cover the entire territory of the RS. In the Autonomous Province of Vojvodina (APV), the tasks related to food safety that fall under the competency of the MH have been conferred to the Secretary of the Health of the Province.

The Flow diagram presenting the Serbian food safety system is given in Fig.1 and it is useful for understanding the responsibilities of different sectors, inspection units and other stakeholders. It is clear that due to numerous organisational units the communication among stakeholders is not always simple and easy to achieve, especially in the case of emergency.

The surveillance of foodborne diseases in the RS is a part of the Communicable Disease Information System.

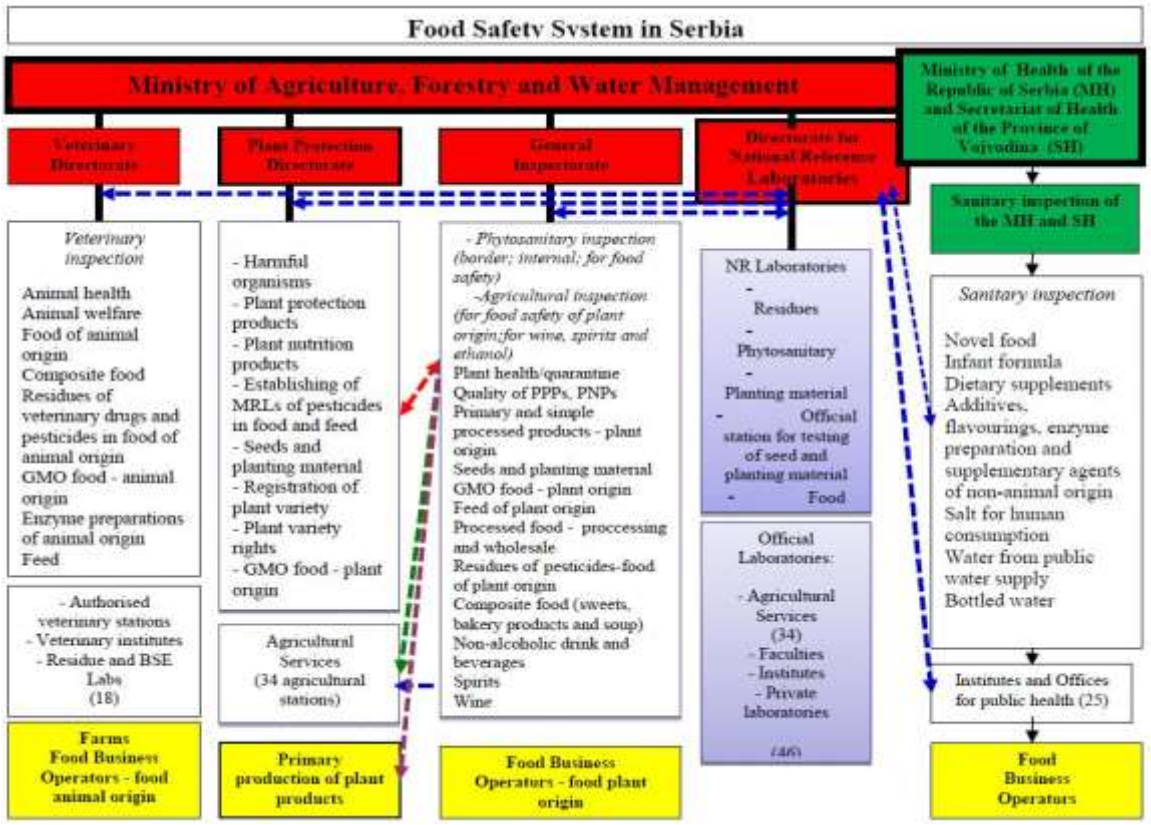

Fig. 1: Competence of authorities in charge of food safety, veterinary and phytosanitary policies (Source: Serbian Government, 2011)

The provisions for surveillance of foodborne diseases are based on the Law on Protection of Population from Communicable Diseases (17), under which the first contact physician is obliged to report an infectious disease or epidemic to the epidemiological service in charge. A national Communication Centre for surveillance is established, based on the European Centre for Disease Prevention and Control (ECDC) methodology, and capable to provide on-line communication in the case of pandemics in order to coordinate the national health care network and be in contact with the ECDC (18). This part is done by the Serbian National Institute of Public Health (SNIPH) and through the network of regional public health institutes.

Pursuant to the open competition conducted by the General Inspectorate, the authorities established a list of laboratories for laboratory tests in the field of food and feed safety and the implementation of monitoring programme. With entry into force of the Rulebook on general and specific requirements for food hygiene in all stages of production, processing and circulation governing the microbiological criteria for foodstuffs, as of 1 June 2011 all food testing laboratories will apply test methods in accordance with the EC (19). According to the Food Safety Law as from 2009 food business operators should implement Hazard Analysis and Critical Control Points (HACCP) principles in all establishments involved in the production of animal and non animal food.

The food safety system in Serbia is financed by the State budget. Serbia uses a lot of sources from international community for the purposes of food safety. Under the 2003 Community Assistance for Reconstruction, Development and Stability in the Balkans programme, technical assistance was provided to two ministries to strengthen the protection of food safety.

The Government of the RS is responsible for public health at all levels. The MH is the competent authority for the implementation of the public health. The health care system in Serbia is characterized by a well-developed network of health institutions, with predominantly state-owned health care facilities. Their work is financed from the budget of the government and the Republic Fund of Health Insurance (RFHI). Serbia allocated roughly the same percentage of its GDP to health care as the EU average (10.4% - Serbia; 9.5% EU average in 2010). However, in terms of total money allocated, Serbia allocates less than half of the EU average. Due to the economic crisis, public health expenditure is decreasing while private expenditure for health increases (20). Therefore, the Serbian health care system is facing serious problems due to political circumstances and financial constraints. Democratic change brought expectations for a better future of the health system, and the first recovery signs were visible thanks to enormous number of international donations (21).

In Serbia, the most important institution of public health is the National Institute of Public Health (SNIPH) – "Dr Milan Jovanović-Batut". The structural characteristics and the functioning of the SNIPH in Serbia are regulated by a separate Law on Public Health adopted in 2009 (22). The SNIPH is financed from the governmental budget and by the Republic Fund of Health Insurance (RHIF). In the recently published report - European Health Consumer Index (EHCI) -Serbian health system was listed as the last in the group of 35 EU countries (23). The public recognized the health care system in Serbia as the least efficient and the most corrupted and inefficient. Therefore, the Government and MH undertook many activities in order to improve the status of the health care system (24).

Many countries are applying different measures in the area of protection of their population from foodborne diseases. The Iranian Ministry of Health and Medical Education has developed a method for the disinfection of raw eaten fruits and vegetables (25). Serbia is developing the Rapid alert system for food and feed (RASFF) and in the last year the products from Serbia have been the subject of notifications in the European RASFF system, particularly related to fruit and vegetables and most recently (2013) related to norovirus contamination of frozen raspberries and aflatoxin contamination of maize. The products originating from Serbia have been the subject of 48 notifica-

tions from 2008–2013 due to the data presented on the RASFF portal database.

In 2013, the Serbian public focused on food outbreak in Smederevo, and aflatoxin affair in maize, and due to that in milk and other dairy products, etc. Each of these events caused a great odium in the public due to the mutual accusations between the competent authorities. The first event happened in the town of Smederevo during the famous tourist and business manifestation "Smederevo's autumn". The Institute of Public Health in Pozarevac announced the epidemic of diarrhea and gastroenteritis because according to the Smederevo General Hospital, in two days medical advice was sought by about 310 patients, including 220 children and 90 adults. They undertook the necessary measures: epidemiological investigation, curing, health education work and continual cooperation with sanitary and veterinary inspections of Podunavski County and the epidemic was recalled on 1st October. The Institute stated that the source of disease was not recognized but they "think there is no evidence of the connection between food poisoning and what was happening in Smederevo." They also witnessed that during the epidemic they took a small number of laboratory samples and could not have any clue about the route of the foodborne outbreak. This event would not be different from other similar food outbreaks for the public if after those statements the Mayor of Smederevo, Jasna Avramovic, did not get into the public and announced that there was: "No poisoning epidemic in Smederevo." She said that she would be forced to seek protection from court institutions over the media articles published dealing with the "alleged poisoning epidemic" in Smederevo despite the official statement of the Institute of Public Health in Pozarevac. She claimed that the term "poisoning epidemic" did not exist and presented the doubt that media titles were "politically motivated!"

Another event in Serbia which caused the great attention of the public was the presence of aflatoxin in milk in 2013. The Minister of Agriculture said in the course of the affair that the recent discovery of elevated aflatoxin concentration in milk "stunned his ministry." He stated that harmonization of Serbian standards with those in use in the EU was done without "enough understanding for reality and their enforceability" and due to that "these rules have brought major changes – the primary responsibility for food quality is on the producers, and the government takes on the role of a controller." The Trade Minister Rasim Ljajić also addressed the session to say that the financial damage from the aflatoxin crisis could cost Serbia between 100 and 125 million Euros.

From the reactions of the competent authorities in those events, it is clear that Serbian policy-makers are not familiar with the way of adequate risk communication. In Serbian society the risk communication is far from favourable and lags behind the modern risk approaches (26). In the last two years Serbia recorded numerous events where state stakeholders stayed "silent for a while," as in food outbreak in Smederevo, food outbreak in six elementary Belgrade schools and so on. The urgent action in the area of appropriate risk communication during the food outbreak, the improvement of surveillance, and established coordination between all stakeholders has to be an urgent future task for policy-makers. The only way to build trust between health care workers and the public is by delivering accurate and timely information, even if it might be scary.

The importance of the process of epidemiological investigation in the development of food safety system in the Republic of Serbia

In Serbia the public health community is in charge of conducting epidemiological investigations. Epidemiological investigations and public health surveillance include the ability to create, maintain, support, and strengthen surveillance and detection systems and epidemiological investigation processes, as well as to expand these systems and processes in response to the incidents of public health significance. The basic goals in these investigations are: to protect population; to stop spread of disease and, of course, to protect the health personnel.

One of the important actions in the USA is connected with work of the Office of Public Health Preparedness and Response/Centers for Disease

Control and Response (CDC). The CDC applied systematic approach to develop the public health preparedness capabilities. In March 2011, the CDC provided a guide according to which the state and local jurisdictions can be used to better organize their work, plan their priorities, and decide which capabilities they have the resources to build or sustain (27).

The capability of stakeholders in this action should consist of the ability to perform the following functions:

- Conduct public health surveillance and detection;
- Conduct public health and epidemiological investigations;
- Recommend and analyze monitoring action, and
- Improve public health surveillance and epidemiological investigation systems.

When the foodborne outbreak happens, the stakeholders in Serbia have to apply the scientific method of epidemiological investigation. In that process the epidemiologists use laboratory scientists, statisticians, physicians and other public health professionals to get to the root of health problems and outbreaks in a community. Hence, in Serbia the epidemiologists are not familiar with the broader application of joint investigations between epidemiologists and law enforcement in the investigation processes. In Serbia despite their regular medical education the epidemiologist have a little chance to gain some additional knowledge and skills necessary for conducting epidemiological investigations. They have just a few trainings which were provided as a part of some international projects. "Disease detectives-epidemiologists" have to conduct epidemiological investigations by combined use of diplomacy, logical thinking, problem-solving ability, quantitative skills, epidemiologic know-how, and judgment (28).

The first step in investigation is to quickly collect the accurate data. In other words, epidemiologists cannot afford to conduct an investigation that is "quick and dirty." They must conduct investigations that are "quick and clean" (29).

The authors of the study found that in Serbia the epidemiologists faced with numerous objective and subjective obstacles in their investigation. Serbia still does not have a reference laboratory which is able to conduct some specific analyses like in aflatoxin affair, or the detection of cyanobacterical toxins from algae in Vrutci Lake which caused the actual long-term interruption of water supply for 60,000 citizens in the town of Uzice. The objective of the European Commission project regarding DNRL in Batajnica to make it fully operational in order to be in line with the EU best practice and standards is still without success. The project titled Equipment and courier service supply and capacity building of Serbian National Referent Laboratories Directorate in food chain started by providing laboratories with the equipment during 2003, but that equipment was turned over to the official laboratories in the field of food safety, veterinary and phytosanitary controls. Serbia still does not have DNRL and that was the reason for seeking RIKELT collaboration in Netherlands (30).

In Serbian society it is well known that many food outbreaks may go undetected because of health habits of the population. Recent changes in the practice of the primary health care institutions are another reason for this behaviour of patients. Without previously making an appointment with their chosen physician, the patients are not able to go seek a medical examination except in case of emergency. This is obligatory and as this regulation is seen by the patients as complicated and enforced by the health institutions without any agreement with the patients, they do not go to the physician and take some alternative medicines, or go to private practice which is not so strict in the process of reporting the disease which might be caused by foodborne outbreak.

The most important task for the epidemiologists is to decide whether to investigate a possible outbreak. The decisions regarding where and how extensively to investigate a potential outbreak depend on a variety of factors. These usually include some factors related to the existing problem, some are related to the availability of staff and resources of a health department and some are related to

external concerns. Hence, public, political or legal concerns can also be a force behind the decision to conduct an investigation. In the case of aflatoxin in maize in Serbia it was obvious that some oppositional political parties seized the moment to gain advantage over their opponents and accused the government parties for announcing inaccurate information about the level of contamination in milk. This was a reason to send the collected samples to an independent reference laboratory in Wageningen – RIKILT which made the final report.

The most important public health reasons for investigation of an outbreak are to help guide disease prevention and control strategies. The importance of outbreak investigation could be seen from the following actions (31):

- Stop the current outbreak from spreading;
- Prevent future similar outbreaks;
- Provide scientific explanation of the event;
- Provide knowledge for the understanding of the disease process;
- React to and calm public and political concerns, and
- Train epidemiologists.

The recommendation to the future epidemiological investigations is that sometimes when the epidemiology does not fit the usual or natural patterns of transmission, the investigators should think about the intentional modes of transmission. In the USA after 2001 terrorism and onwards, bioterrorism is recognized as a new and increasing threat to the Americans and this requires the different approaches in the protection of public health of the population. The new approach requires law enforcement, other public safety organizations, and public health agencies to work together (32). To foster the improved understanding of the investigative goals and methodology, and strengthen interdisciplinary collaborative effectiveness in response to future attacks involving biological agents, in the spring of 2002 the Public Health Law Program of the US CDC in partnership with other agencies and organizations undertook the development of a module for the joint training of law enforcement and public health officials (33). The field investigations of disease outbreaks is the element of public health which is recognized in the USA as one that will most resemble law enforcement investigations because of the types of information collected and the means by which they are collected. How this collaboration could be useful for any country is proven in a case in Dallas, Oregon. The investigators of an outbreak of salmonellosis were stumped when they were able to implicate salad bars in several local restaurants, but could not identify any common ingredients or distribution system. A year later, a member of a local cult admitted that the cult had intentionally contaminated the salads bars with Salmonella organisms (34).

The next improvement in the epidemiological investigation in Serbia could be engagement of private investigators or specific places in public health departments which use specific kind of epidemiological investigations, so called "food sleuths". One of the famous cases was when the CDC's disease detective Casey Barton Behravesh helped track the source of a 2010 outbreak of Salmonella infections that sickened more than 270 people in more than 40 states. The resourceful use of unconventional data helped the CDC and its partners across the country quickly identify the source of the problem and stop the outbreak.

In an investigation of a food outbreak, the health department may be able to allay population fears by documenting that the outbreak was the result of an inadvertent or naturally occurring exposure. Every stakeholder must establish a communication plan. The need for communicating with the public health and clinical community has long been acknowledged in Serbia, but the need for communicating quickly and effectively with the elected officials and the public became obvious in 2013 during the affair with aflatoxin in milk and dairy products.

The Law on Food Safety stipulates the adoption of the Crisis Management Programme and crisis management plan in the field of food and feed safety in the event of direct or indirect risks to human health, animal health or the environment, the causes of which are the food or feed and the occurrence of which could not be foreseen, pre-

vented, eliminated or abated to the acceptable level. The Programme has to be adopted by the Government, and it governs precisely the following:

- The type of situation in which direct or indirect risk to human health caused by food or feed exists;
- The measures that have to be implemented without delay once it is established that food or feed is posing a serious threat to humans or animals, either directly or indirectly through the environment;
- The crisis management procedures which include the principle of transparency and communication;
- The plan of exercises and simulations for crisis management purposes.

Pursuant to the Programme, the Minister of Agriculture shall adopt, with the consent of the minister responsible for public health, a special crisis management plan depending on the types of risks and shall form a crisis team to implement the special plan, but in the affair of aflatoxin both the officials and the public recognized that this program was not established.

The positive practice from the USA, where depending on the type of outbreak the number of involved agencies may be quite large, is not recognized in Serbia. Apart from the epidemiologists, it is not known in the public that anyone else was in charge to conduct epidemiological investigation. It would be useful if Serbian policy-makers recognized that the staffs from different agencies have different perspectives, approaches, and priorities that must be useful in any kind of outbreak. For example, whereas the public health investigation may focus on identifying a pathogen, the source and mode of transmission, a criminal investigation is likely to focus on finding the perpetrator who has to be punished at the conclusion of the investigation. The Criminal Law in Serbia has changed recently and the greatest change for the stakeholders in the future will be the new kind of prosecutors' investigation. As for the opinion of experts, its implementation in practice is questionable because of a lot of uncertainties.

Among all goals which should be achieved in the process of an epidemiological investigation of foodborne outbreak, one is particularly important for the population and the interested parties: to maximize resources and facilitate communication and interaction among public health officials and law enforcement in Serbia following the practice from the developed countries.

Results and discussion

The study results confirmed that the area of food safety and the current state-of-affairs of the health care system in Serbia have a lot of room for improvement. Decision- and policy-makers have to take urgent steps to develop the policies in which public health will be in the centre of decisions in food safety area. Serbian Government with competent authorities and in collaboration with the international community, mostly with the EU, works permanently on developing the new approaches in the area of food safety and accelerating the public health response to foodborne illnesses at the local, regional and national level. The actual legislation in the area of food and food safety area is not adequate and needs to be more precise in the area of obligations of stakeholders because of food safety challenges that "persist in today's complex, dynamic and global food system" (35).

After the examination of relevant documents from various sources, it is interesting to compare the similarities between Serbia and some European countries in the area of food safety system improvement. First of all, there is a need to highlight the continuous need to change the system if it proves inefficient in any part. The USA had already done it, as well as the United Kingdom (UK). The Food Safety and Hygiene (England) Regulations came into effect on 31 December 2013. These Regulations revoke and re-enact the Food Hygiene (England) Regulations 2006 (and amendments) and certain provisions of the General Food Regulations 2004. The Secretary of State has been designated for the purposes of that section in relation to measures relating to food

(including drink), including the primary production of food and measures in the veterinary and phytosanitary fields for the protection of public health. The chief changes will have to do with enforcement action taken against those who contravene the Regulations, including the powers of courts (36). Serbia should take the same path, do the same and have power to punish violators of legal framework regarding the food safety area.

Another important issue similar to the current state regarding the number of referent laboratories and samples also came from the UK. Leading food expert Professor Chris Elliott has warned that the 'integrity of the food supply chain' is being endangered by budget cuts. The warnings come after the number of public analyst laboratories has been reduced from 15 to 11 in the last three years while Trading Standards Officers (TSO) are facing a 40 percent cut in funding. The Department for Environment Food and Rural Affairs (DEFRA) claimed that the budget is spent in "action to prevent food crime, including increasing unannounced inspections of meat cutting plants and boosting funding to £2 million to support local authorities' food sampling programmes" (37).

The project concerning food safety in less developed countries could not be performed without help of the international community. The currently ongoing project in the area of food safety in Belarus which started in 2010 is supported with funds from the Austrian Ministry of Finance. The main goal of the project is to increase the competitiveness of Belarus food producers by improving their food safety practices (38). In 2013, Georgia Food Safety Improvement Project was completed, which started in 2010 supported also with funds from the Austrian Ministry of Finance and BP and its Oil and Gas Partners. The project was designed to improve food safety practices among Georgian food producers, build local food safety capacity, and harmonize national food safety legislation with the requirements of the European Union (39).

There are still not enough such activities in Serbia due to current state at borders regarding the improvement of import food safety. Therefore, it is important to learn from the experiences of other countries which are presented in the articles from the United States, Latin America, Europe, and Asia about a variety of regulatory approaches to food safety around the world (40).

The collaboration which in general enormously contributes to security in the entire food supply chain from farm to table in Western Balkans was performed through various specific projects with significant number of countries like Slovenia, Greece, Bosnia and Herzegovina, FYR Macedonia, and Serbia.

Despite all obstacles recognized in Serbia, it is important to address that the European Commission progress report 2012 reported little progress with regard to general food safety principles. Hence, even though some progress is detected, there is still a need to move forward to a better operational level in practice to prevent and protect Serbian population from foodborne diseases. Serbia does not have the required human, material and financial resources, and in current macroeconomic conditions it is not able to execute the previous plans in the expected scope. Therefore, the authors detected the main issues which have to be solved in the future. They are:

- The Directorate for National Reference Laboratory (DNRL) has to be fully operational in terms of performing laboratory testing. It is unbelievable that even though it was established in 2009, and presented expectations that it would be complete at the beginning of 2011, Serbia had to ask for the results from foreign laboratories in 2013;
- Rapid Communication and Alert System for Food and Feed (RASFF) still does not exist in Serbia and it is not possible to share any information at either national or international level even though the Rulebook on the establishment and organization of the rapid alert system for food and feed has been published (41);
- Serbia imports a lot of goods but at some cross border points the Trade

control and expert system (TRACES) has not been established;

- In almost all documents there are no any signs of coordination between health care communities and other authorities. Therefore, there are no established official task forces for communication and information exchange on a regular basis for food safety;
- The Crisis Management Programme and crisis management plan in the field of food and feed safety in the event of direct or indirect risks to human health, animal health or the environment have to be established at the national level;
- The external services are not included in the education program within agriculture community;
- The risk analysis and the implementation of HACCP which started in the past should be improved significantly in the future;
- Health care workers work in isolation in the course of an epidemiological investigation and do not collaborate with the law enforcement, and
- Academic community has to be more proactive in the improvement of current courses and creation of studying programs which will follow the practice of foreign institutions.

Faster response to foodborne outbreaks in Serbia will be provided only if all authorities start to work more effectively. Budget shortfalls have to be overcome and financial means have to provide for the use of the best methods in public health laboratories to quickly identify, characterize, and improve integration of foodborne illness surveillance systems as well as to expand data sharing among the health professionals and other stakeholders from non health sectors. In this process, the law enforcement has to be recognized as an important factor in epidemiological investigations. In the future, Serbia has to avoid the obvious interweaving of policy-making with inspection and epidemiological work. It is time to change a habit of bureaucratic work which delays response to outbreak and causes the permanent lack of coordination among different ministries, the institutes of public health and the local authorities. Hence, the transparency and professionalism should be recognized as the first step which would build trust between the public and food safety and health system authorities.

Conclusion

In the last few years Serbian population started to seek answers to many questions due to the increasing evidence about food outbreaks presented in mass media. Therefore, the protection against foodborne risks starts to be of paramount interest in the public health care system. Serbian policy-makers have to follow the actions from the developed countries and work on the food safety modernization. The health care system is the first one to deal with the consequences of foodborne outbreaks. Hence, in that difficult task it also has to apply different approaches in epidemiological investigations in some cases. The role of epidemiologists is to change and as Dr. Mark Klebanoff stated sometimes they have to apply "shoe leather epidemiology" and get out of their high tech, or less high tech laboratories asking people thoughtful questions and getting the answers what is going around and find the root of disease (42). In epidemiological investigations, public health and law enforcements agencies could ensure that in cases of intentional food poisoning the perpetrators will be punished at the scientific conclusion of the investigation and respecting the legislation. Similar intention has been recognized in Germany during the *E. coli* crisis where the need was addressed to establish one "central authority similar to a national investigative police agency that is capable to observe and act across state borders" (43). In the end, all authorities must have in mind what Obolensky addressed in his study: "Human beings rely on food for sustenance and nutrition, and our health and well-being is dependent on the vitality of the food we consume." Hence, improving the food safety system will increase the effectiveness

of coordination and cooperation, communication and reporting between all organisational units and stakeholders, as well as communication with the public regarding food safety.

Ethical considerations

Ethical issues (Including plagiarism, Informed Consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

Acknowledgments

Authors are grateful to the professional help of editorial staff during the process of publishing this study.

References

1. Maslow A (1954). *Motivation and personality*. 3rd ed. Harper, New York, USA, pp:18
2. World Economic Forum. (2013). Achieving the New Vision for Agriculture: New Models for Action. WEF, Geneva, Switzerland.
3. World Health Organization (WHO) and WHO Regional Office for Europe. (2002). Food and health in Europe: a new basis for action. Copenhagen, Denmark.
4. Food and Agriculture Organization of the United Nations (FAO). (2006). FAO Policy brief Issue 2. 2006. Available from: *ftp://ftp.fao.org/es/ESA/policybriefs/pb_02.pdf*
5. Hasanpour M.H.Sh (2006). The Role of the Institute of Standards and Industrial Research of Iran Food Safety. In: *Food Safety and Foodborne Disease Surveillance Systems: Proceedings of an Iranian-American Workshop*. Eds, Schweitzer G., Reza Zali M., and Jackson G. 1St ed. National Research Council. The National Academies Press. Washington, DC, pp.22-27.
6. Radovic V (2012). The Mitigation of the Agro-Terrorism Threat to the Republic of Serbia, In: *Managing the Consequences of Terrorist Acts - Efficiency and Coordination Challenges*. Eds, D. Čaleta, Paul Shemella. Institute for Corporative Security Studies - ICS, Ljubljana, Slovenia, and Centre for Civil Military Relations, Naval Postgraduate Scholl Monterey, USA, pp. 199-213.
7. World Health Organization (WHO). (2013). The International Food Safety Authorities Network (INFOSAN). Available from: *http://www.who.int/foodsafety/fs_management/infosan/en*
8. Kaluski DN (2009). Strengthening food safety and nutrition policies and services in south Eastern Europe. WHO Regional Office for Europe, Copenhagen, Denmark. Available from: http://www.euro.who.int/__data/assets/pdf_file/0006/99897/E92650.pdf
9. World Health Organization (WHO). (2008). WHO European action plan for food and nutrition policy 2007-2012. Available from: *http://www.euro.who.int/__data/assets/pdf_file/0017/74402/E91153.pdf*.
10. Kondo W (2013). US unveil overdue food safety standards. *Canadian Medical Association Journal* 185.2 page E109.
11. Obolensky N (2012). The Food Safety Modernization Act of 2011: too little, too broad, too bad. *Roger Williams University Law review* No 87. 887-931. Available from: *http://go.galegroup.com/ps/i.do?id=GALE%7CA313722592&v=2.1&u=ussdc&it=r&p=AONE&sw=w&asid=8b02b64771480cd814a68b9327621b29*
12. Eads K, and Zwagerman J (2011). In focus: examining the new FDA Food Safety Modernization Act. 33 Hamline J. Pub. L. & Pol'y. pp. 123-164. Available from: *http://go.galegroup.com/ps/i.do?id=GALE%7CA303371484&v=2.1&u=ussdc&it=r&p=AONE&sw=w&asid=aca81960d813f57e9feaafec9b83d644*
13. U.S. Department of Health and Human Services, Centers for Disease Control and Prevention. (2011). Estimates of Foodborne Illness in the United States. Available from: *http://www.cdc.gov/ foodborneburden/2011-foodborne-estimates.html*
14. The Food and Drug Agency of the United States of America. (2013). FDA Food Safety Modernization Act. Public Law 111-353. Available from: http://www.fda.gov/foo-d/guidancer-egulation/fsma/ucm247548.htm
15. Economic indicators in Serbia. (2013). Available from: *http://www.indexmundi.com/serbia/economy_profile.html*

16. Serbia European Integration Office (SEIO). (2013). *National plan for the adoption of the acquis 2013 – 2016 (NPAA).* Available from: *http://www.seio.gov.rs/upload/documents/nacionalna_dokumenta/npaa13_16.pdf*
17. Law on Protection of Population from Communicable Diseases, Official Gazette of RS, No. 125/04.
18. European Parliament and of the European council (2004). Regulation (EC) No 851/2004 on establishing a European center for disease prevention and control. Official Journal of the European Union L 142/1. Available from: *http://www.ecdc.europa.eu/en/aboutus/key%20documents/0404_kd_regulation_establishing_ecdc.pdf*
19. European commission (2005). *Regulation (EC) No 2073/2005 on microbiological criteria for food stuffs.* Official Journal of the European Union L 338/1. Available from: *http://eu-europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2005:338:0001:0026:EN:PDF*
20. Bjegovic-Mikanovic V, McGuinn J, Petrovic D (2013). Public Health Situation in Serbia. European Parliament Directorate-General for Internal policies Policy Department: A: Economic and Scientific policy, Belgium. Available from: *http://www.europarl.europa.eu/RegData/etudes/note/join/2013/507487/IPOL-ENVI_NT(2013)507487_EN.pdf*
21. Radovic V, Vitale K, Tchounwou PB (2012). Health facilities safety in natural disasters: experiences and challenges from Southeast Europe. *Int J Environ Res Public Health*, 9 (5):1677-1686.
22. Law on Public Health, Official Gazette of RS, No. 72/09.
23. Euro Health Consumer index (EHCI). (2013). Serbian health system got the last place in the group of 35 EU countries entirety (21). Available from: *http://www.healthpowerhouse.com/files/ehci-2013/ehci-2013-report.pdf.*
24. Radovic V (2012). Climate Change and Adoption Strategies: A Report from the Republic of Serbia. In: *National Security and Human Health Implications of Climate Change*. Eds, HSJ Fernando, ZB Klaic, JL McCully. Springer Publishing, NATO Science for Peace and Security: Series C Environmental Security, Dordreht, Netherlands, pp. 95-102.
25. Yarahmadi M, Yunesin M, Pourmand MR, Shahsavani A, Mubedi I. Nomanpour B, Naddati K (2012). Evaluation the Efficiency of Lettuce Disinfection According to the Official Protocol in Iran. *Iranian J Publ Health,* 41 (3): 95-103.
26. Radović V, Ćurčić Lj (2012). The Opportunities of Crises and Emergency Risk Communication in Activities of Serbian Public Health Workforce in Emergencies. *Iranian J Publ Health*, 41 (10): 15-23.
27. US Department of Health and Human Services and Centers for Disease Control and Prevention Public Health Preparedness Capabilities (2011). *Nation Standards for State and Local Planning.* Available from: *http://www.cdc.gov/phpr/capabilities*
28. Centres for Disease Control and Prevention. (2006). *Self-Study Course SS1978 - Lesson 6.* Available from: *http://www.cdc.gov/osels/scientific_edu/ss1978/Lesson6/index.html*
29. Palmer SR (1989). Epidemiology in search of infectious diseases: methods in outbreak investigation. *J of Epidemiology and Comm Health* 43(4): 311–314.
30. RIKILT. Available from: *http://www.wageningen-ur.nl/en/Expertise-Services/Research-Institutes/rikilt.htm*
31. Kanchanaraksa S (2008). Epidemiologic Investigation. John Hopkins Bloomberg School of Public Health Section D Investigating an Outbreak pp 46. Available from: *http://ocw.jhsph.edu/courses/fundepi/PDFs/Lecture2.pdf*
32. The Federal Bureau of Investigation, Centers for Disease Control and Prevention, and the Department of Justice. (2011). *Criminal and Epidemiological Investigation Handbook.* USA. Available from: *http://www.fbi.gov/about-us/investigate/terrorism/wmd/criminal-and-epidemiological-investigation-handbook*
33. Department of Health and Human Services, Centers for Disease Control and Prevention (2002). Forensic Epidemiology: Training for Law Enforcement and Public Health Officials on Investigative Responses to Bioterrorism. Available from: *http://www.cdc.gov/phlp/docs/forensic_epidemiology/coursemgrguide.pdf*
34. Török TJ, Tauxe RV, Wise RP, Livengood JR, Sokolow R, Mauvais S, Birkness KA, Skeels MR, Horan JM, Foster LR (1997). A large community outbreak of salmonellosis caused by intentional contamination of restaurant salad bars. *JAMA* 278(5):389–395. Available from:

http://jama.jamanetwork.com/article.aspx?articleid=4178

35. US Food and Drug Administration. (2013). New FDA Food Safety Rules Proposed-Food Safety Modernization Act. Available from: *http://www.beginningfarmers.org/new-fda-food-safety-rules-proposed-food-safety-modernization-act/*
36. The Secretary of State (2013). The Food Safety and Hygiene (England) Regulation. The United Kingdom of the Great Britain. Available from: *http://www.legislation.gov.uk/uksi/2013/2996/made/data.pdf*
37. Regulatory Information and Management Systems-RIAMS (2014). Food Safety Cuts Could Put Public at Risk. Available from: *http://www.riams.org/2014/03/17/food-safety-cuts-could-put-public-at-risk/*
38. World Bank Group. International Finance Corporation. (2010). Improving Food Safety in Belarus. Available from: *http://www.ifc.org/wps/wcm/connect/region__ext_content/regions/europe+middle+east+and+north+africa/ifc+in+europe+and+central+asia/countries/improving+food+safety+in+belarus*
39. World Bank Group. International Finance Corporation. (2010). Improving Food Safety in Belarus. Available from: *http://www.ifc.org/wps/wcm/connect/region__ext_content/regions/europe+middle+east+and+north+africa/ifc+in+europe+and+central+asia/countries/improving+food+safety+in+georgia*
40. Kennedy Sh. (2012). Emerging global food system risks and potential solutions. In: *Improving Import Food Safety*. Eds, Ellefson W, Zach L, Sullivan D. 1st ed, Wiley-Blackwell, USA, pp 3-20 Available from: http*://media.wiley.com/product_data/excerpt/74/08138087/0813808774-330.pdf*
41. Rulebook on the establishment and organization of the rapid alert system for food and feed Official Gazette of RS, No. 62/13.
42. Asher D (2003). *Epidemiologists: Life Tracking Deadly Disease*. 1st ed. Rosen Publishing Group Inc, New York, USA. Pp 9.
43. Zimmermann D. (2012). Germany struggles to strengthen food safety after deadly E. Coli crises. *Food Quality Safety Magazine*. April/May 2012. Available from: http://www.food-quality.com/details/article/1721893/Germany_Struggles_to_Strengthen_Food_Safety_after_Deadly_E__coli_Crisis.html?tzcheck=1