

MANAGING A DISASTER IN THE VETERINARY FIELD

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Abstract

Research studies worldwide show that due to different factors as climate change, poverty, urbanization, etc., there is a tendency of increasing the frequency and severity of both natural and man-made disasters. As the occurrence of natural disasters is a consequence of various preconditions, this work focuses on biological hazards which lead to epidemics and pandemics (including epizootics and panzootics). An analysis is made of legislative and official documents such as recommendations, strategies, regulations, etc. (from the international, European and Bulgarian legislative framework) with emphasis on reducing risks in the veterinary field in Bulgaria. Some suggestions are given for improvement of the systems for risk and disaster management of veterinary activities in the country.

Key words: natural disasters, biological hazards, risk communication, veterinary medicine

INTRODUCTION

Disasters often follow natural hazards. The severity of a disaster situation depends on the impact it gives to the society and environment. The “Disaster Risk Reduction” concept is developed in order to reduce the risks of such phenomena through the implementation of systematic measures for analysis and reduction of the factors that lead to disaster occurrence. Among these we could point out the following: reducing exposure to hazards; reducing the vulnerability of people and their property; enhancing preparedness and early warning of abnormal situations, etc.

According to the terminology of the Centre for Research on the Epidemiology of Disasters (CRED) which manages the international disaster database (Emergency Events Database EM-DAT), risk could be each situation that leads to a probability of occurrence of a potentially hazardous phenomenon at a certain place and time (EM-DAT, 2015). EM-DAT classifies the risks as natural and technological (man-made). The natural ones include geophysical, hydrological and climatological events and biological hazards. Examples on natural disasters of biological origin given by the UN Office for Disaster Risk Reduction (DRR) are epidemics, contagious diseases of animals and plants, calamities and parasitic diseases (UNISDR, 2014).

Given the existence of certain factors as climate change, unregulated urbanization, poverty, etc., it is expected worldwide that disasters will increase in severity, frequency and complexity. In the scientific field many studies are focused on the impact the disasters have on the society in order to better understand and manage the hazardous situations and reduce the probability of future events. Such analysis with emphasis on the natural disasters of biological origin (epidemics, including epizootics) make Knutsson et al. (2012) who identify the gaps in the system for preparedness and early warning after the eradication of an outbreak of anthrax in cattle. The management of different crisis situations that have occurred as a consequence of highly pathogenic animal diseases (including zoonoses) as avian influenza, foot-and-mouth disease, etc., appears to be subject of investigation of some other authors - Capua (2006), Bickerstaff et al. (2006), Brunet & Houbaert (2007).

Regarding the experience of other countries and the existence of certain guidelines for disaster risk reduction globally, we focused our scientific interest on the current status of the systems for crisis management in the veterinary field in Bulgaria.

AIM AND OBJECTIVES

With the present work we tried to investigate the policies of the United Nations (UN), World Organization for Animal Health (OIE), Food and Agriculture Organization (FAO), European Union (EU) and the Republic of Bulgaria, regulating the implementation of “Disaster Risk Reduction” concept. We aimed at determining the mechanisms for disaster and crisis management in the veterinary sphere. The study focused on defining possible ways of increasing the information and preparedness of the veterinary professionals in order to improve the sustainability of the sector “veterinary medicine” in disaster situations.

For the purpose of the study we set the following tasks:

- To analyze the tendencies in the occurrence of natural disasters of biological origin (epidemics, pandemics) globally;
- To define the mechanisms of management of the veterinary activities in disaster and crisis situations, implemented at national, European and global level;
- To identify possible ways for improving the preparedness and risk communication, concerning crisis events in the veterinary field.

MATERIALS AND METHODS

For the purpose of the study, we investigated official documents from the international, European and Bulgarian legislation, with concern with different aspects for disaster protection. We determined also the distribution of natural disasters of biological origin at global level, deriving data from the EM-DAT disaster database. Detailed analysis in the trends of zoonoses prevalence in Europe was made, investigating official reports of the European Commission and EFSA.

All data gathered were processed in Excel and presented in diagrams and tables.

RESULTS AND DISCUSSION

1. Trends in the occurrence of natural disasters of biological origin

According to the Centre for Research on the Epidemiology of Disasters – CRED (EM-DAT, 2015) for the period 1900-2015 a significant number of events as epidemics and pandemics has occurred worldwide that have affected and caused the death of thousands of people. In order to be classified as disasters in the EM-DAT database, the hazardous situations have to carry the following characteristics:

- 10 or more people reported killed;
- 100 people reported affected;
- A call for international assistance;
- Declaration of a state of emergency.

The distribution of the reported events by continents (Fig. 1) shows that most affected by such biological disasters appear to be the population of Africa, followed by the habitants of Asia, probably due to reasons as overpopulation, low rate of social and economic development in some countries, poor infrastructure (including access to medical care in some regions), etc. Data also show that Europe could be defined as the continent with a significantly lower share of registered epidemic disasters (only Oceania appears to be a territory with the lowest number of events, probably due to the isolation of the continent and the less intensive exchange of goods, compared to the other continents in the earlier stage of time, together with low density of population and its territorial dispersion). More detailed analysis of the biological disasters, originated by animal diseases, is made by Ackerman & Giroux (2006). The authors investigate historically the emergence and outbreaks of epidemics in North

America, due to diseases as anthrax, Brucellosis, West Nile fever, avian influenza. Focused on the natural disasters of biological origin in Asia, with emphasis on some zoonotic disease, Ozawa et al. (2006) discuss the registered in Japan and Korea outbreaks of anthrax, highly pathogenic avian influenza, etc. They also outline some measures in order to prevent the zoonoses to be used as weapons for bioterrorism. Similar are the studies of Davies (2006), who analyses the risk of emergence of epidemics caused by the Rift Valley Fever in Saudi Arabia.

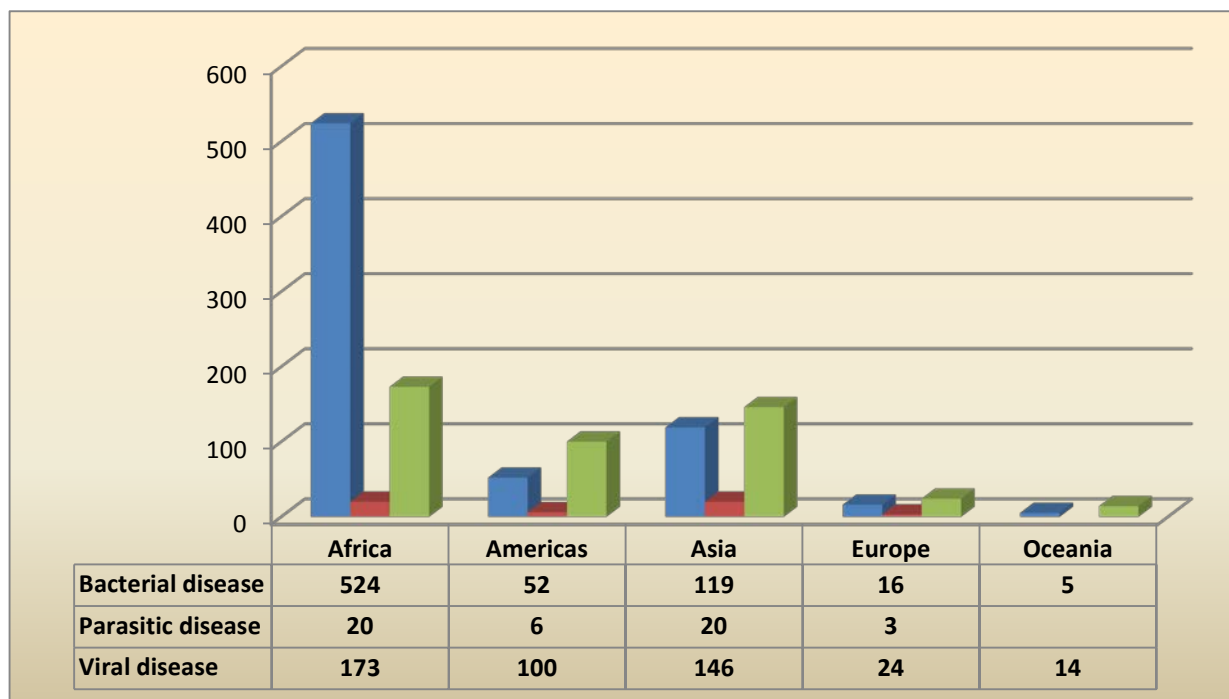


Fig. 1. Distribution of natural disasters of biological origin by continents and subtype for 1900-2015.

In accordance with the findings of the cited authors, our analyses also show that for the investigated period prevalent among the natural disasters of biological origin are the epidemics caused by bacterial diseases, followed by the viral ones, with the lowest proportion of parasitic events (Fig. 1).

We believe that the subtype classification of natural disasters based on the characteristics of the causing biological agent, could be detailed even more, as historically a lot of events threatening the public health (both human and animal health) have aroused from poisoning. Reporting human intoxications (caused by toxins produced by contagious agents in animals) will enhance and improve the collaboration and communication between veterinarians and medical officers and besides that – improvement of the measures for public health protection, even from potential bioterrorism acts. Similar opinion express Garland & Bailey (2006) who discuss the possible ways of penetration in the organism, clinical signs and differential diagnoses of human intoxications due to trichothecenes, staphylococcal enterotoxin B, botulinum toxins, saxitoxin and some others. In a similar direction is the study of Bodin (1998) who analyzes the powerful destructive effect of enterotoxin A, produced by *Clostridium difficile*, being an opportunistic zoonotic agent.

Analyzing the disaster epidemics in Europe, we detected an increase in the zoonotic cases during the last decades (Fig. 2). Whatever the nature of the causing agent was (bacterial, parasitic, viral agents), within the EU member states from 1999 to 2013 a trend for increase in the human cases was registered with 1,08 – from 290 487 to 314 430 cases (European Commission, 2010, 2012; EFSA, 2005, 2013; 2014).



Fig. 2. Confirmed human cases of zoonoses in EU, 1999-2013

Data analysis shows that for 5 from totally 13 reported zoonotic diseases, human cases due to Campylobacteriosis have increased 1,8 times; VTEC infections in humans have increased 2,5 times; Listeriosis in humans – an increase of 2,6 times; Echinococcosis – an increase of 1,4 times; cases of Trichinellosis – up to 4,5 times (Table 1) (European Commission, 2010, 2012; EFSA, 2005, 2013; 2014).

Table 1. Trends in the prevalence of some zoonoses in humans (Campylobacteriosis, VTEC infections, Listeriosis, Echinococcosis, Trichinellosis, Tularaemia) in EU, 1999-2013

	Campylobacteriosis	VTEC infections	Listeriosis	Echinococcosis	Trichinellosis	Tularaemia
1999	120462	N/A	667	555	48	N/A
2000	131527	N/A	586	306	67	N/A
2001	156231	N/A	872	688	53	N/A
2002	147095	N/A	844	306	48	N/A
2003	135217	2401	1046	450	97	N/A
2004	183961	4143	1267	343	270	N/A
2005	197363	3314	1439	320	175	N/A
2006	175561	4916	1583	458	231	N/A
2007	200507	2905	1554	834	779	N/A
2008	190566	3159	1381	981	670	N/A
2009	198252	3573	1645	790	748	N/A
2010	212064	4000	1601	750	223	807
2011	220209	9485	1476	781	268	N/A

2012	214268	5671	1642	N/A	301	N/A
2013	214779	6043	1763	794	217	279

More favourable appear to be the tendencies detected in the prevalence of some other zoonoses as: zoonotic Salmonellosis (cases decreased 2 times); Brucellosis (a decrease of 10,9 times) and Tuberculosis caused by *M. bovis* (a decrease of 1,2 times), with a trend of reduction in the registered cases in humans in EU (Table 2). These results are just some of the effects from the EU co-financed animal disease eradication and monitoring programmes, with measures taken for their prevention and reducing the risk of emergence of contagious diseases in animals (European Commission, 2010, 2012; EFSA, 2005, 2013; 2014).

Table 2. Trends in the prevalence of some zoonoses in humans (Salmonellosis, Brucellosis, Rabies, Yersiniosis, Q-fever, West Nile fever, TB caused by *M. bovis*) in EU, 1999-2013

	Salmonellosis	Brucellosis	TB caused by M. bovis	Yersiniosis	Q-fever	West Nile fever	Rabies
1999	164696	3900	159	N/A	N/A	N/A	N/A
2000	161672	2858	150	7949	N/A	N/A	N/A
2001	151415	1777	62	10941	N/A	N/A	1
2002	143736	2386	56	10807	N/A	N/A	1
2003	140020	1092	58	10086	N/A	N/A	1
2004	192703	1337	86	10381	N/A	N/A	2
2005	176395	1218	119	9630	N/A	N/A	4
2006	160649	1033	N/A	8979	N/A	N/A	N/A
2007	151995	542	120	8792	N/A	N/A	3
2008	131468	619	107	8346	1594	N/A	4
2009	108614	401	115	7595	N/A	N/A	1
2010	99020	356	133	6776	1414	N/A	2
2011	95548	330	132	7017	N/A	N/A	1
2012	91034	328	125	N/A	643	232	2
2013	82694	357	134	6471	648	250	1

According to the European legislation (Annex I – Decision 2009/470/EC) co-financing of national expenditures of Member States for control and monitoring of specific animal diseases (including zoonoses) is provided for the following diseases (European Commission, 2009):

- Bovine tuberculosis
- Bovine brucellosis
- Ovine and caprine brucellosis (*B. melitensis*)
- Bluetongue in endemic or high risk areas

- African swine fever
- Swine vesicular disease
- Classical swine fever
- Avian influenza
- Rabies
- Transmissible spongiform encephalopathies (TSE)
- Salmonellosis (zoonotic salmonella)

Regarding the tendencies in the prevalence of some of these diseases (which we analyzed with emphasis on the reported cases in humans) and the consequences they have on the public health, international trade and related spheres, other authors have also focused on the measures for control of animal diseases as a part of the mechanisms for management of crisis of biological origin. Bendali (2006) highlights the benefits from the programmes for epidemiological surveillance in Sub-Saharan Africa, while Jutzi & Domenech (2007) discuss the measures for control and eradication of outbreaks of highly pathogenic avian influenza H5N1. Alexandre (2000) makes an epidemiological analysis too, with emphasis on the zoonoses, reported in Brazil. At the same time, in Bulgaria, Draganov et al. (2000) study the aspects of control of certain microbial zoonoses in the country at earlier stage of time (1980-1996), aiming at determination of the effectiveness of the epidemiological measures for reduction the risk of emergence of the investigated diseases. Detailed analysis on the control of Echinococcosis in Bulgaria is made by Boeva-Bangyosova (1999).

2. Management of the veterinary activities in disaster and crisis situations

Given that the impact of the epidemic disasters (including zoonoses and food-borne diseases) covers every sphere within the society, for the purpose of its effective control, overcoming, recovery and future prevention, a certain system have to be put in operation for joint collaboration between all competent structures. This could be achieved only through development and implementation of adequate policies for disaster management.

Adequate common framework for the management, control, communication and prevention of disasters (both natural and technological, incidental and intentional) is currently set by legislative documents from the international, European and Bulgarian legislation (Table 3).

Table 3. Guidelines for development, implementation, control and improvement of measures for disaster management

Legislative basis	Document
International legislation	Yokohama Strategy and Plan of Action for a Safer World: guidelines for natural disaster prevention, preparedness and mitigation
	Hyogo Framework for Action 2005 – 2015: Building the Resilience of nations and Communities
European legislation	Directive 96/82/EC on the control of major-accident hazards involving dangerous substance
	Directive 2007/60/EC of the European Parliament and Of the Council of 23 October 2007 on the assessment and management of flood risks
	Directive 2008/114/EC of 8 December 2008 on the identification and designation of European critical infrastructures and the assessment of the need to improve their protection

	Decision No 1313/2013/EU of the European Parliament and of the Council of 17 December 2013 on a Union Civil Protection Mechanism
	Memorandum of Understanding on the Institutional Framework of the Disaster Preparedness and Prevention Initiative for South Eastern Europe (DPPI SEE)
Bulgarian legislation	Disaster Protection Law 2012
	Strategy for Disaster Risk Reduction 2014-2020
	National Programme for Disaster Protection 2014 – 2018

Some of the presented in the table documents are obligatory and concern the implementation of certain measures as development of mechanism for civil protection, identification and evaluation of critical infrastructures, etc. (European Commission, 1996, 2007, 2008; European Union, 2013; IDNDR, 2000; UNISDR, 2015). Other part of the documents regulates the operation or improvement of already adopted mechanisms, focused on prevention and disaster risk reduction (Bulgaria, 2012, 2014, 2015; DPPI, 2013). All these guidelines and recommendations consider disasters as a whole or at least by certain type/subtype. Detailed instructions, however, on natural disasters of biological origin caused by animal diseases, are not determined and are provided for development and/or implementation by the competent authorities of each country.

At global level for the purpose of prevention of biological disasters, both natural and man-made, there should be made an improvement of the existing systems for monitoring and response in compliance with the recommendations of the Global Framework for the Progressive Control of Transboundary Animal Diseases – GF-TADs (Vallat et al., 2006), developed by OIE and FAO. This framework is just one of the guidelines for prevention of hazardous for the society events, caused by disease outbreaks contagious for humans and animals. The implementation of the developed standards, however, depends on the political willingness as national level and also on the capacity and resources of the veterinary authorities.

Regarding Bulgaria, the biological hazards of animal origin, threatening the public health, appear to be subject of control and management by the Ministry of Agriculture and Food (MAF) in particular by the Bulgarian Food Safety Agency (BFSA). Within BFSA operate structures which are responsible for the prevention and control of biological hazards (BFSA, 2015) :

- General Directorate “Coordination and Control”– control and coordination of the activities of the regional food safety directorates (RFSD). Its main functions are collection and assessment of information in order to prevent, eradicate or reduce to an acceptable level the risk to human health throughout the whole food chain. Other tasks are the coordination of the activities between other state institutions for the purpose of control and eradication of zoonoses, extremely dangerous infections and other crisis situations that cause risks to the human health.
- Directorate “Animal Health and Welfare and Feed Control”- preparation of the state prophylaxis programme together with the list of the contagious animal diseases and the programmes for surveillance and eradication of animal diseases. This Directorate methodically manages and controls the activities of the RFSDs, concerning all the measures for prevention and eradication of animal diseases and protection of people from zoonoses. This Unit notifies also the European Commission and the competent authorities of the Member States about the registered animal diseases through the computer system for emergency notification ADNS (Animal Disease Notification System).
- Directorate “Food Control and Border Control”- participates in the elaboration of legislative documents concerning the control of food safety. If necessary carries out together with other competent bodies or separately investigations on food safety. The Directorate takes part in the development of criteria for risk assessment and controls their adequate implementation.

- Risk Assessment Centre – assessment and communication to the European Food Safety Authority (EFSA) of risks concerning food safety, human health, animal health and welfare, additives in food and feed, genetically modified organisms, dietetic products, allergens, materials into contact with food, biological hazards, contaminants, etc.
- National Diagnostic Research Veterinary Medical Institute (NDRVMI) – operates with modern screening methods for microbiology and chemical safety, proving the availability of mycotoxins, pesticides, etc. Within its structure NDRVMI includes 22 national reference laboratories on animal health and safety of raw materials and foodstuffs of animal origin.

Although the existing structures and operating mechanisms for identification, communication and control of biological hazards in order to prevent their occurrence and escalation into biological disasters, there still exists risk of such crises.

3. Preparedness and risk management of crises in the veterinary field

The occurrence of disasters is always accompanied by panic among the population. When disasters arise from animal disease outbreaks (zoonoses, zoonotic, acts of bioterrorism, etc.) then the consequences for the society spread through the national economics, international trade, etc. The effective management of such events is shared responsibility of all state institutions.

An example on developed multi-level approach during crises is given by Anelli (2006). The author describes the development of a unified system for disaster management in the United States of America, incorporated in all government bodies. This system is implemented as an element of the National Response Plan and also in the relevant procedures of the US Department of Agriculture, which strengthens and expands the capacity of the government to respond in situation of crisis (defining the nature of the event, development of adequate measures for response reaction, rapid recovery after the event).

Similar to that example and in compliance with the defined European legal framework, in Bulgaria has been developed and implemented Unified Rescue System, in accordance with the National Programme for Disaster Protection. The responsible competent authorities that are in charge of the control of all measures for disaster risk reduction appear to be all ministries, with an emphasis on their joint coordinated actions. In case of a crisis, caused by biological agents of animal origin, fundamental role plays the Ministry of Agriculture and Food with its veterinary administration within BFSA. Regarding the annually approved national and corresponding regional and municipal plans for disaster protection, at regional level the management of biological hazards is assigned to the joint coordinated and coherent collaboration of local structures as hospitals, health departments, regional food safety directorates, agriculture services, emergency centres, etc., including voluntary organizations. On the other hand, all these units appear to be at the same time critical infrastructures for this type of disaster (biological hazards, both accidental and intentional). Within the regional plans for disaster protection, in the part concerning the protection of humans, animals and plants from biological contamination (for example the plan for Haskovo region) (Bulgaria, 2013) there are no detailed definitions of veterinary units as critical infrastructures. Respectively, there are no detailed provisions on resources, necessary for reduction of risks of biological contamination, for example vaccines for extremely dangerous infections. Attempts for such provisions makes Clements (2009) who analyses the spatial and spatio-temporal risk assessment and resource planning for the purpose of managing the risk of viral zoonoses.

Besides the legally regulated measures for fight with biological agents causing contagious diseases in animals and humans, of great importance also are the personal perceptions of veterinarians, animal owners and society as a whole. In a study Zingg & Siegrist (2012) investigate the attitudes of these three stakeholder groups with regard to the two main mechanisms of disease eradication – vaccination or culling. Their personal perceptions of the level of risk (according to the professional experience and qualification of each group) significantly influence the preference of one of the mechanisms, and at the same time influence the risk communication and development of crisis management strategies in cases of emerged outbreaks.

We believe that the adequate perception of risk of biological disasters and its relevant communication to all stakeholders (veterinary professionals and non-professionals) must be defined as one of the main tasks for disaster risk reduction in the country. Similar opinion supports Pearson (2006) who analyzes the public perceptions of the threat of epidemics in humans, animals and plants and the contamination of the food chain due to acts of bioterrorism. The author emphasizes the necessity of improving the system for clear risk communication with determining the community groups that have to be involved in this process.

Regarding the specificity of the biological hazards arising from contagious agents in animals and their toxins, it is worth to develop and regularly update technological cards for the main types of hazards (similar to the OIE disease cards) and disseminate them to all veterinary and other health officers and the society as a whole. Possible way of effective dissemination of such information could be different types of training among the communities in risk. Pritchard (2011) also supports training initiatives as he focuses on the openness and public awareness of the measures for control and prevention of zoonoses on farms.

CONCLUSION

The results of the study show that regarding the natural disasters of biological origin, worldwide the greatest share is given to the epidemics caused by bacterial diseases. Investigating the situation in Europe we determined that the epidemic outbreaks among the population due to zoonotic diseases have increased 1,08 times.

In Bulgaria the competent authorities have developed and implemented system for notification and response in case of disaster and crisis situations, operating in compliance with the main guidelines at global and European level. The biological events caused by contagious agents in animals (zoonoses) are also subject to communication, prevention and control by the state institutions – Ministry of Agriculture and Food, Bulgarian Food Safety Agency and its structural units.

Regarding the annually adopted plans for civil protection from disasters in the country, our study determined that in the part concerning the protection of humans, animals and plants from biological contamination these plans should be revised and updated:

- Elaboration of a model for consolidation of the operating health services (human and veterinary units) into unified system for response to biological hazards from animal origin at national and regional level – including identification of critical infrastructures and resource planning;
- Development of a system for identification of stakeholder groups in risk within the society and their training in contagious diseases, common for animals and humans, that might spread (accidentally or intentionally) into crises and disasters.

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