VETERINARY EMERGENCY SERVICE AND POTENTIAL OCCUPATIONAL EXPOSURE TO BIOLOGICAL AGENT IN CLUJ COUNTY: BIOSAFETY RISK ASSESSMENT

Cosmin Peștean[1], Adrian I. Ardelean[2*], Uwe Mueller-Doblies[3], Dora Tokos[4]
[1]University of Agricultural Sciences and Veterinary Medicine Cluj-Napoca,
[2]Sanitary Veterinary and Food Safety Directorate Cluj, Romania; [3]MSD Animal Health;
*[3]Epibiosafe, United Kingdom; [4]Sanitary Veterinary and Food Safety Directorate Bistrița- Năsăud, Romania; *Corresponding author: ardelean.adrian-cj@ansvsa.ro*

Abstract. The veterinarian from the emergency service is part of the professional group exposed to biological agents harmful to the health. The main types of biological agent can be zoonotic and vector born diseases. The aim of this study is to asses the risk of exposure to them, using Fine & Kinney method, risk matrix, and Sandia Corporation tool. The results underline the fact that veterinarian from the emergency service could be moderate to low exposed at least one biological agent from group 3. The documentation, implementation, maintenance, and improvement of the biosafety requirement are necessary for assurance a healthy environment.

Keywords: biosafety, veterinary emergency service, risk, occupational health

INTRODUCTION

The veterinary emergency service presumes a very crowded environment where the people are not very self-care and become easy exposed to biological agents harmful to the health. Considering the specifics of this activity, the main types of biological agent can be zoonotic and vector born diseases. Regarding with the biological hazard in occupational health safety and security in veterinary emergency service is somehow neglected. The aim of this study is to asses the risk of exposure to biological agents for the people who work in veterinary emergency service or handled the animals.

MATERIAL AND METHOD

This study is based on using the risk assessment methodologies: Fine & Kinney method, risk matrix, and Sandia Corporation tool. The assessment was divided into following steps: identification of biological agent at risk in Cluj county and neighboring area; identification and defining of the main processes and workflow what involves biological agents; personnel involved; risk defining and measurement and the control mode evaluation and mitigation of exposer risk (0, 0). (CWA 15793:2008; ISO. IEC 31010:2009; ISO 31000:2009; Miller, 2012; Sheely, 2018; Caskey, 2010)

The veterinarians, staff and also animal care personnel are at substantial risk of occupational health illness caused by the biological agent who exceeds human health care. If the most frequent biological hazard for veterinarians was animal bites and scratches with or without accompanying infections, in the veterinary emergency services, occupational zoonosis was considered the most important occupational diseases in Europe. Other occupational health illnesses related to the biological agent are allergies, poisoning, and cancer, but also can be related to fetal illness. (Basinas, 2018; EPP TASHA, 2012; EFSA and ECDC, 2016).

The retrospective assessment was done inspired by the concept "The silent diagnosis", launched by Donald Rumsfeld we considered the group of hazards "known knowns" the

biological agent notified to be related with veterinary medicine personnel illness or who have a risk at, and their presence in Europe, Romania or Cluj county (0). Even in 2015 ECDC noted the following zoonosis cases: campylobacteriosis, salmonellosis, yersiniosis, Shiga toxin-producing *E. coli* (STEC) infections, listeriosis, tularaemia, echinococcosis, Q fever, brucellosis, trichinellosis, West Nile Fever, rabies, the presence of other hazards was not neglected, fallowing the group of hazards "known unknowns" the biological agent identifies to be a hazard for people who work in veterinary emergency services, but there are not evidence about their presence. (EFSA and ECDC, 2016).

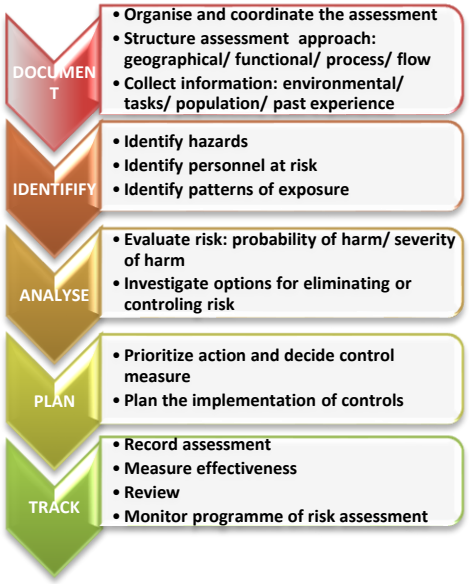

Fig. 1. The five steps to risk assessment

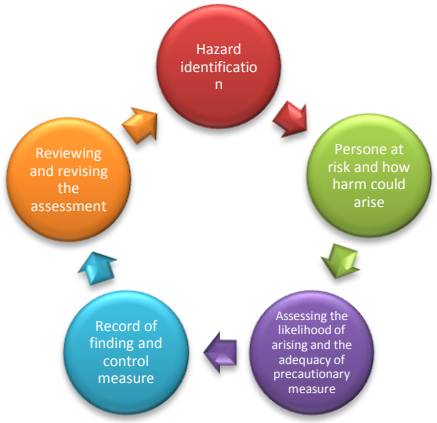

Fig. 2. The cycle in five steps to risk assessment

(EASHW, 2017; EC DG V, EIRSA, 1996; FEAP, 2017; Williams 2015; OIE, 2017)

In the risk assessment was applied Fine & Kinney method:

Risk (R) = Likelihood(L)*Exposure time(E)*Consequences(C) (Sheely, 2018)

For establish the personnel who are at risk, were documented and noted all the processes and the workflow in the emergency veterinary services of the USAMV Cluj-Napoca.

RESULTS AND DISCUSSIONS

During the last year in the emergency veterinary service of USAMV Cluj-Napoca were treated 4001 animals. After evaluation of the workflow, were noted that exposure can be achieved in: waiting room, by animal handling, animal examination, injection and venipuncture procedure, resuscitation, obstetrics, specimen handling, wound care and abcess treatment.

Table 1

The list of the zoonotic biological agents with potential risk for the veterinarian in Cluj county

Nr. crt.	US risk for veterinarians (* EU risk for people who work with animals)	EU zoonosis reported in 2015/ 100000 population	Romania zoonosis reported in 2016 nr. of cases	Romania, Cluj county- notified 2017 nr. of cases	Group	C	E	L	Risk
1	Anthrax *Bacillus anthracis*		7		3	15	1	3	**45**
2	Avian influenza Highly pathogenic avian influenza viruse				2	15	1	3	**45**
3	Bordetella *Bordetella bronchiseptica*				2	3	1	3	9
4	Brucellosis *Brucella melitensis, Brucella abortus, Brucella suis, Brucella canis* *	437	1		3	7	1	3	21
5	Campylobacteriosis *Campylobacter jejuni, Campylobacter spp* *	229213	892	111	2	3	1	3	9
6	Chlamydiosis *Chlamydophila abortus, Chlamydophila felis* *				2	3	1	3	9
7	Contagious pustular dermatitis (orf or contagious ecthyma) Parapoxvirus *				2	3	1	3	9
8	Dermatophytosis *Microsporum spp, (ringworm) Trichophyton spp, Epidermophyton spp* *				2	3	1	3	9
9	Escherichia coli infection *Escherichia coli* O157:H7 (and Shiga toxin producing *E. coli)* *	5901	4		2	7	1	3	21
10	Echinococcosis *Echinococcus granulosus, Echinococcus multilocularis*	872		1	3	7	1	3	21
11	Erysipeloid *Erysipelothrix rhusiopathiae*				2	3	1	3	9
12	Giardiasis *Giardia intestinalis (Giardia lamblia)*		13856	652	2	3	1	3	9
13	Influenza Influenza A virus		392		2	3	1	3	9
14	Leptospirosis *Leptospira spp* *		64	3	2	3	1	3	9
15	Listeriosis *Listeria monocytogenes*	2206		2	2	3	1	3	9
16	Lyme disease *Borrelia burgdorferi*		250	6	2	7	1	3	21
17	Mycobacteriosis (nontuberculous), *Mycobacterium avium complex, Mycobacterium marinum*				2	3	1	3	9
18	Q fever *Coxiella burnetii* *	833	3	3	3	7	1	3	21
19	Rabies Lyssavirus *	0	0		3	15	1	3	**45**
20	Salmonellosis *Salmonella spp* *	94625	1328	93	2	3	1	3	9
21	Toxoplasmosis *Toxoplasma gondii*			1	2	3	1	3	9
22	Tuberculosis, bovine *Mycobacterium bovis* *	170			3	15	1	3	**45**
23	Tularemia *Francisella tularensis* *	1079			3	7	1	3	21
24	West Nile fever West Nile virus	127	93	0	2	3	1	3	9
25	Yersiniosis *Yersinia enterocolitica*	7202	41	13	2	3	1	3	9

Group 1 biological agent means one that is unlikely to cause human disease;
Group 2 biological agent means one that can cause human disease and might be a hazard to workers; it is unlikely to spread to the community; there is usually effective prophylaxis or treatment available;
Group 3 biological agent means one that can cause severe human disease and present a serious hazard to workers; it may present a risk of spreading to the community, but there is usually effective prophylaxis or treatment available;
Group 4 biological agent means one that causes severe human disease and is a serious hazard to workers; it may present a high risk of spreading to the community; there is usually no effective prophylaxis or treatment available.

(Basinas, 2018; Cook, 2017; HG 1092/ 2006; INSP CNSCBT, 2017; MS DSP CLUJ, 2018; EPP TASHA, 2012; EFSA and ECDC, 2016; Sheely, 2018)

Other zoonotic biological agents with potential risk for the veterinarian: *Acariasis Sarcoptes scabiei, Notoedres cati* other species of mites; *Babesia microti* and other *Babesia spp*; *Bartonella henselae*, *Bartonella spp*; *Baylisascaris procyonis*; *Capnocytophaga canimorsus*, *Capnocytophaga cynodegmi*; *Cryptococcus neoformans*; *Cryptosporidium parvum*; *Dermatophilus congolensis*; *Dipylidium caninum*; *Ehrlichia* and *Anaplasma spp*; *Equine encephalomyelitis* western, eastern, and Venezuelan viruses - *Togaviridae*;

Hantaviruses; *Herpes B virus Macacine herpesvirus infection*; *Histoplasma capsulatum* ; Larval migrans: cutaneous (hookworm) *Ancylostoma spp*; Larval migrans: visceral, ocular, neuro (roundworm) *Toxocara canis*, *Toxocara cati*; *Leishmania spp*; Lymphocytic choriomeningitis Arenavirus (lymphocytic choriomeningitis virus); *Monkeypox Orthopoxvirus*; *Pasteurella multocida*; *Yersinia pestis*; Psittacosis (human), chlamydiosis (avian), *Chlamydophila psittaci*; Rat bite fever *Streptobacillus moniliformis*, *Spirillum minus*; *Rhodococcus equi*; *Rickettsia rickettsii*; *Sporothrix schenckii*; *Staphylococcus spp*; *Streptococcus spp*; *Trichinella spiralus Trichuris vulpis*, *Trichuris suis*, *Trichuris trichiura*, Vesicular stomatitis (EPP TASHA, 2012; HG 1092/ 2006).

The personnel at risk are veterinary doctors and students, staff and also the animal handlers. The major route of infection is contact (ingestion, cutaneous, percutaneous or mucous membrane exposure), aerosols, animal bites and scratches and by vector-borne agents (Miller, 2012).

For risk assessment were obtained the following results for the major biological agent who are identified as a hazard. Regarding the consequence of exposer were considered the very severe class for 15 noted Group A, sever class for 7 noted Group B and with important class for 3 noted Group C (Table 2).

Table 2

The matrix of the likelihood of exposure to zoonotic agents

	Consequence of exposure	Negligible	Minor	Moderate	Major	Catastrophic
Likelihood of exposure						
Improbable (once/ life)						
Remote (once/ a few years)						
Occasional (once/ year)			**GROUP C Score 9**	**GROUP B Score 21**	**GROUP A Score 45**	
Probable (once/ month)						
Frequent (once/ week)						

Adapted after Ardelean A.I., Tokos Dora, U. Mueller-Doblies, 2016

During calculation of the risk considering the presence of the hazards, were applied the values for likelihood unusual, but possible (L=3) and for exposure time, yearly (E=1). Because the group A and B have the risk values in the intervals 20-70, they need attention, by the other way the values for group C < 20 for the risk, classified like acceptable, they need also attention (Sheely, 2018). Framing to the matrix indicates the level of alert, which underlines the requirement of maintaining and improving the measures for the prevention of exposure at this agent. During this assessment, were considered that some hazards are underestimating like Crimean-Congo hemorrhagic fever and tick-borne encephalitis (Ardelean, 2016).

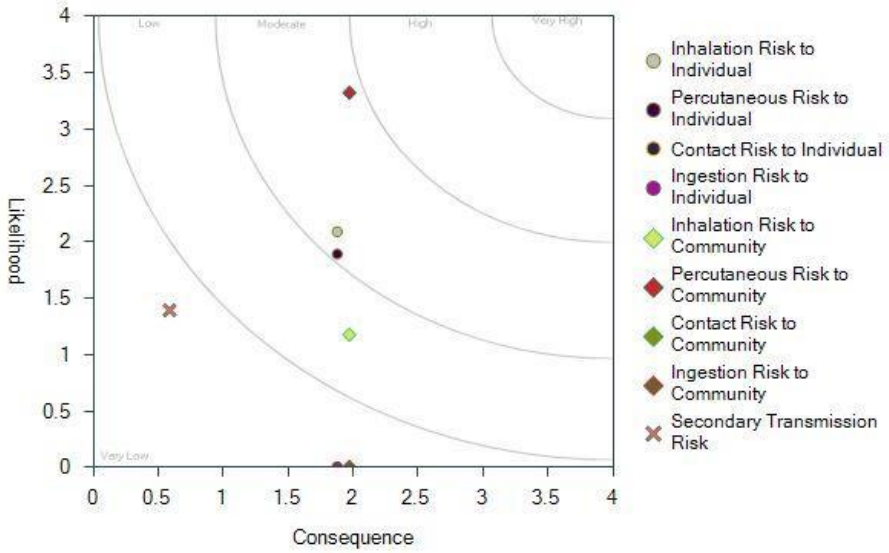

Fig. 3. Biosafety risk to individuals at rabies virus

After applying the risk matrix, were assessing the risk using the Sandia Corporation of United States Department of Energy's National Nuclear Security Administration tool using key indicators defined by CASKEY SUSAN, 2010 (0, 0).

For mitigation of exposure, risk presumes adequate configuration of the protection layers. The controls used to protect the people at risk are personal protective equipment (PPE) (including clothing, boots, facial shield, respiratory protective mask, two pairs of gloves) according to the level of risk, vaccination against rabies, antiseptic and disinfectant use; but also the assurance of proper training. The design and delimitation of the access in the facility with distinct spaces for animals considered suspect with infectious disease and limitation of the access inside can be used for control of the risk area. Regarding the fomite, adequate use and cleaning of the equipment and tools; cleaning and disinfection of the surfaces and fittings; optimum management of the waste including decontamination, represent another protection layers.

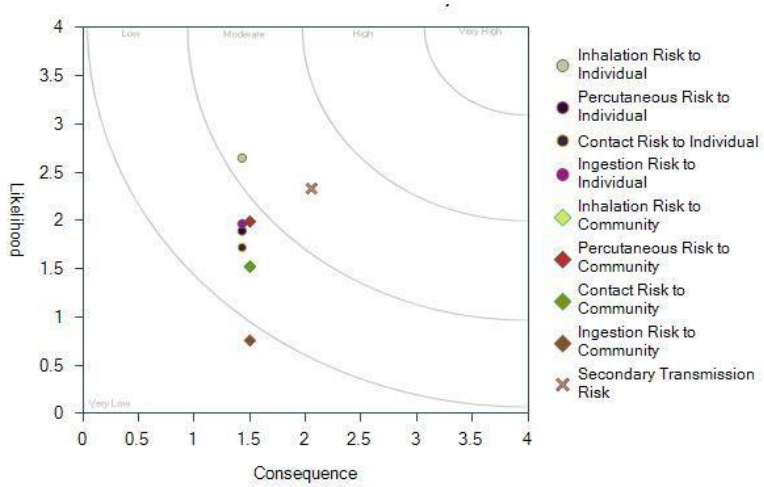

Fig. 4. Biosafety risk to individuals at *Mycobacterium bovis*

The results obtained underline the fact that the personnel at the veterinary emergency service can be at risk at least one biologic agent from group 3. The mitigation of risk exposure presumes the continuous involving of the top management in developing and implementation of the politics regarding biosafety, systematic training of the personnel, assuring the adequate PPE and other measures for controls the risk. This assessment is eloquent also regarding the importance to be up to the date of the emergency procedure and responsibilities, for recovery measures and mitigation of the effects of exposer like the control plan, the documentation and reporting, and the emergency response equipment and facilities (Miller, 2012).

CONCLUSION

Biosafety risk assessment is necessary for each facility to establish the right politics, procedure, and management. The quantitative risk assessment proves to be a necessary tool in biosafety. The risk of exposer at zoonosis for veterinary emergency service from Cluj county is moderate to low but is present at a few highly pathogenic biologic agent like rabies virus, *M. bovis*, and others. Other can be underestimated but still be a hazard like Crimean-Congo hemorrhagic fever and tick-borne encephalitis.

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