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Original scientific paper

ROLE AND DEVELOPMENT DIRECTION OF VETERINARY LABORATORIES IN BOSNIA AND HERZEGOVINA RELATED TO THE ACCREDITATION SYSTEM**

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Abstract: Veterinary laboratories include laboratories dealing with veterinary diagnostics and food safety studies. These are laboratories that carry out diagnostic tests in veterinary medicine, regarding to bacteriological, serological, virological, parasitological, chemical, biochemical, physical, pathological and radiological tests. These laboratories are also engaged in testing food, feed and drinking water, as well as tests in order to assess the microbiological purity of equipment, devices, appliances, working surfaces, work clothes and workers' hands in production and marketing in facilities and means of transport that come in contact with food, in which there is a risk of the occurrence and spread of an infectious disease.
The aim of the study is to determine the role and directions of the development of veterinary laboratories in B&H in relation to the accreditation system. In this way, we are getting an insight into the condition and significance of veterinary laboratories in food and animal health control in order to protect the health of animals and humans.
In Bosnia and Herzegovina, eight veterinary laboratories are accredited, three in Republic of Srpska and five in Federation of B&H. All eight (100%) accredited test methods in the field of food testing, while six (75%) accredited test methods in the field of veterinary diagnostics.
The participation of accredited veterinary laboratories in the total number of accredited laboratories for food in the Republic of Srpska is 37.50%, in the Federation B&H it is 23.80%, while at the level of B&H it is 27.60%. Accredited veterinary laboratories in B&H have accredited tests in 10 technical sub-areas of food testing, and in seven sub-areas their participation in the total number of accredited laboratories for food in B&H amounts to 50% or more. The participation of accredited veterinary laboratories in the microbiological examination of feed and surface swabs is 80%. Physico-chemical testing of feed, testing of residues and contaminants in food and testing of radionuclide activity in food and feeds in B&H are performed exclusively by accredited veterinary laboratories (100%).
Accredited veterinary laboratories in B&H have accredited a total of 41 different test methods in seven technical sub-areas in the field of veterinary diagnostics. 30 different test methods were accredited in the RS (73.20%), while 31 test methods (75.60%) were accredited in the Federation of B&H. In accredited veterinary laboratories in B&H, test methods for the diagnosis of the causitive agents of 25 different animal diseases were accredited, of which 19 in the Republic of Srpska (63,30%), and 20 in the Federation of B&H (66,70%). The technical sub-area of serological testing

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was accredited by all accredited veterinary laboratories, and the participation of serological testing methods in the total number of accredited test methods in the field of veterinary diagnostics in the Republic of Srpska is 53.30%, in the Federation of B&H 64.50%, and in B&H 53.70%.
Keywords: laboratory, food, veterinary diagnostic, accreditation

INTRODUCTION

Veterinary Laboratories include laboratories dealing with veterinary diagnostics and food safety (Law, 2000; Law, 2002a; Law, 2004; Law, 2017a; Law, 2017b).These are the laboratories that perform diagnostic tests for infectious diseases, the detection of harmful substances residues in animals and products of animal origin, water and feed, testing of health and hygiene correctness and quality of food, feed and other tests (Law, 2002a), ie bacteriological, viral, parasitological, chemical, biochemical, physical, pathological and radiological examinations in veterinary activities, testing the health safety of food of animal origin and feed (Zako, 2017). These laboratories are also involved in testing food, feeds and drinking water (Law, 2004; Law, 2017b; Rulebook, 2009; Rulebook, 2011a; Rulebook, 2011b; Rulebook, 2011v; Rulebook, 2011g; Rulebook, 2012b; Rulebook, 2012a; Rulebook, 2012v; Rulebook, 2013a; Rulebook, 2013b; Rulebook, 2013v, Rulebook, 2014b; Rulebook, 2015a; Rulebook, 2015b; Rulebook, 2015v; Rulebook, 2016). In addition to these tests, they also carry out tests to assess the microbiological purity of the equipment, devices, appliances, work surfaces, work clothes and hand of workers in production and traffic in food contact facilities and vehicles where there is a risk of occurrence and spread of infectious disease (Rulebook 2014a).

Veterinary laboratories must acredited the methods used in their work (Law, 2004; Law, 2017a; Law, 2017b; Rulebook, 2010; Rulebook, 2014a; Decision, 2009), in accordance with the standard BAS EN ISO/IEC 17025 (BAS, 2006). In accordance with the Veterinary Law (Law, 2002; Law, 2002a; Law, 2017a), the Food Law (Law, 2004; Law, 2017b) and other legislations, testings in the field of veterinary diagnostics and food safety are carried out by authorized veterinary laboratories in state (SO) and private ownership (PO), in both Entities, the Republic of Srpska (RS) and the Federation of Bosnia and Herzegovina (FB&H). No Veterinary Diagnostic Laboratory has been accredited in Brčko District of B&H (BD).

Accreditation of the conformity assessment body in Bosnia and Herzegovina (B&H) is carried out by the Institute for Accreditation of B&H (BATA) (Law, 2001). BATA is responsible for developing, implementing and maintaining B&H Accreditation System (ASB&H), implementing the accreditation and supervision procedure of the conformity assessment body, representing B&H in European and international organizations for accreditation, organizing and implementing specialist staff training in the field of accreditation, and developing and establishing information system on accredited assignments and on documents in the area of accreditation. Accreditation is a document which proves the competence to perform certain tasks in the field of conformity assessment. (Law, 2002b). Accreditation involves a formal acknowledgment that a conformity assessment body is competent to carry out conformity assessment activities in accordance with internationally accepted rules. Conformity assessment is any activity through which it is directly or indirectly determined whether the relevant requirements are met. Conformity assessment body is an independent laboratory, a certification body, an inspection body or another body that participates in the conformity assessment procedure and which may be governing body, legal or natural person. The accreditation procedure determines the competence of legal and natural persons who can

represent, in whole or in part, the conformity assessment body in relation to the requirements of B&H, European and international standards or documents of European and international accreditation organizations. BATA sets the criteria for the approval and maintenance of accreditation that must be met by the Compliance Assessment Bodies (CAB), as well as the process of accreditation and financing of the accreditation system (BATA, 2017d). Laboratory accreditation ensures confidence in the results of laboratory tests, and is carried out according to the standard BAS EN ISO/IEC 17025 (BAS, 2006). Within the ASB&H, test laboratories, calibration laboratories, medical laboratories, inspection bodies, product certification bodies, certification bodies and certification bodies for the management system can be accredited.

Veterinary laboratories, in accordance with the authorizations and depending on the needs of the state, society and service users as well as their own assessments and development plans, accredited the test methods, which are based on certain specificities in the technical areas and sub-areas of accreditation (BATA, 2017dj). Technical areas represent wider areas formed on the basis of specific areas of examination, type or group of samples, professions or occupations, conditions, sizes, procedures, etc. Technical sub-areas are narrower areas, sub-disciplines, within technical areas, which define specific tests or types of tests. The aim of the study is to determine the role and directions of the development of veterinary laboratories in B&H in relation to the accreditation system. In this way, we will get an insight into the status and importance of veterinary laboratories in the chain of food control and animal health, in order to protect the health of animals and humans.

MATERIAL AND METHODS

Material

Annexes to accreditation of accredited testing laboratories in B&H downloaded from the BATA website (BATA, 2018d) was used as testing material.

Laboratories from the territory of Republic of Srpska (RS):

I State Ownership (SO)
1. Public institution Veterinary Institute of the Republic of Srpska "Dr Vaso Butozan", Banja Luka (BATA, 2018b)

II Private Ownership (PO)
1. Veterinary Institute "Teolab", Bijeljina (BATA, 2018g)
2. Slaven d.o.o. Veterinary Institute, Banja Luka (BATA, 2017b)

Laboratories from the territory of the Federation of Bosnia and Herzegovina (FB&H):

I State Ownership
1. Public institution "Veterinary Institute" Bihać, Bihać (BATA, 2017a)
2. Veterinary Faculty of the University of Sarajevo, Sarajevo (BATA, 2018b)
3. Public institution "Veterinary Institute of Tuzla Canton", Tuzla (BATA, 2017b)
4. KJP Veterinary Station d.o.o., Sarajevo (BATA, 2018a)
5. Public institution Veterinary Institute HNK/Ž Mostar (BATA, 2017g)

Laboratories are shown according to the registered name and head office of the legal entity, without specifying their regional locations and organizational units that are accredited.

Methods

We used descriptive statistical parameters as basic statistical methods in our research and in the statistical analysis of the obtained results.

These parameters enable the description and interpretation of the obtained results. The results of the research are presented in tabular and graphical form. Statistical analysis of the

results was done in the Microsoft Office Excel statistical package.

RESULTS AND DISCUSSION

There are eight veterinary laboratories (AVLs) accredited in B&H, three in RS and five in FB&H, while there is no AVL in the Brčko District (BD) (Table 1). Of these, one AVL is an educational and scientific institution (faculty) (7), five are public institutions (BATA, 2017a; BATA, 2017v, BATA, 2017g; BATA 2018a; BATA, 2018b), all six in SO (75%) , while the remaining two AVLs in PO (25%) are organized as bureaus (BATA, 2017b; BATA, 2018g).Among the public institutions, one is specialized and scientific institution, organized as a veterinary institute (BATA, 2018b), three are organized as veterinary bureaus (BATA, 2017a; BATA, 2017v; BATA, 2017g), and one as a veterinary station (BATA, 2018a). Of the total of eight AVLs, all eight (100%) accredited test methods in food testing (BATA, 2017a; BATA, 2017b; BATA, 2017v; BATA, 2017g; BATA, 2018a; BATA, 2018b, 2018g).

Table 1. shows the percentage of AVL participation in the total number of accredited Food Laboratories (AFL) in B&H.

Table 1. Participation of AVL in AFL in B&H

Location	**%**
Republic of Srpska	37,50
Federation B&H	23,80
Brčko District B&H	0
Total B&H	**27,60**

The participation of AVLs in the total number of AFLs in RS is 37.50%, in FB&H it is 23.80%, while at the level of B&H it is 27.60%.

Chart 1. shows the participation of AVLs in the total number of AFLs in B&H by ownership.

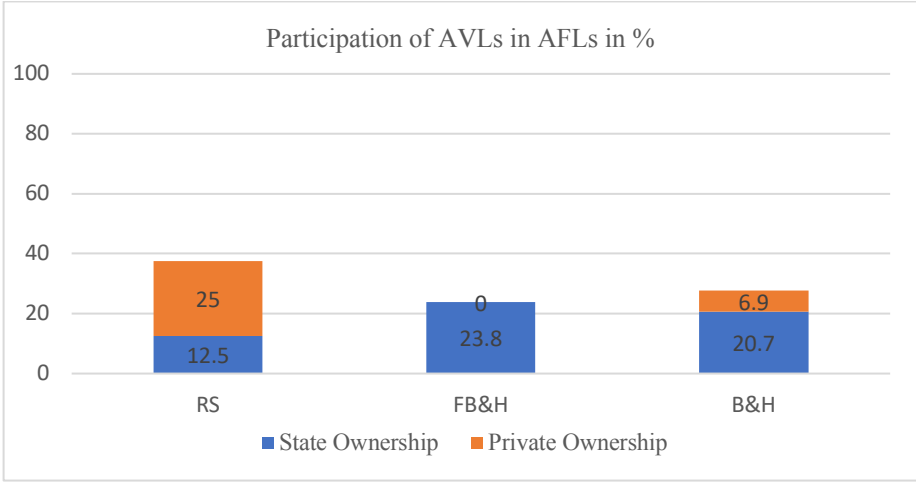


Chart 1. Participation of AVLs in AFLs in B&H by ownership

The participation of AVLs in SO in the total number of AFLs in RS is 12.50%, and in PO 25% (SO ratio to PO is 1: 2) The participation of AVLs in SO in the total number of AFLs in FB&H is 23.80%, while there is no AVL in the PO. At the B&H level the participation of AVLs in SO in the total number of AFLs amounts to 20.70% and 6.90% of them are in PO. Based on these data it can be concluded that in FB&H, AVLs in PO do not perform laboratory tests of food safety controls that are of public interest to human health. Contrary to this, in RS, there is a significant participation of AVLs in PO, making up a quarter of AFLs in RS.

Chart 2. shows the percentage of AVLs in B&H in relation to areas of accreditation in the field of food testing.

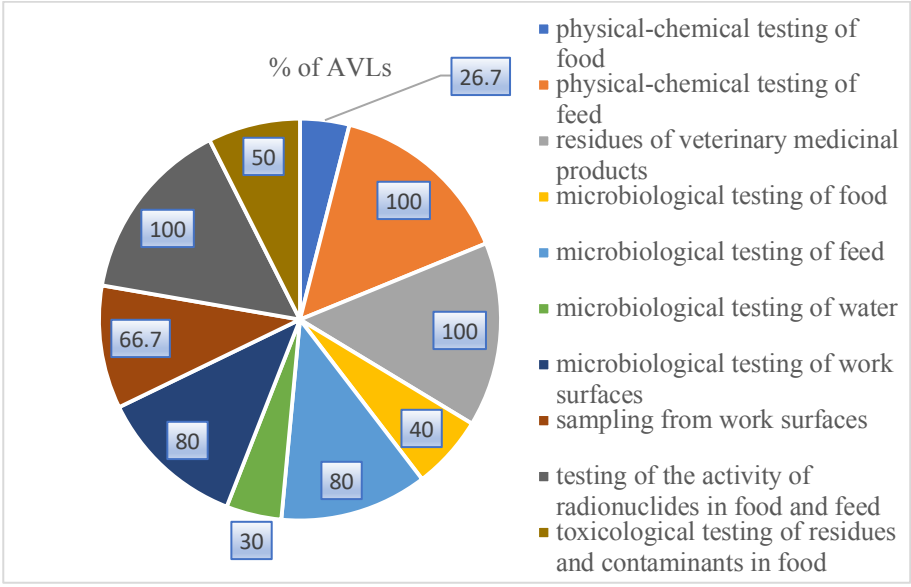


Chart 2. Representation of AVLs in B&H in relation to areas of accreditation in the field of food testing

AVLs in B&H accredited testing methods in 10 technical sub-areas of testing in food testing (out of a total of 13 at ALH level in B&H), and in seven sub-areas, the participation of AVLs in relation to the total number of AFLs in B&H amounts to 50% or more. Particularly significant involvement of AVLs in microbiological testing of feed and swabs of surfaces is 80%, while physical-chemical testing of feed, toxicological testing of residues and contaminants in food and testing of radionuclides in food and feeds in B&H are performed exclusively by AVLs (100 %). By analyzing the scope of accreditation of AFLs (BATA, 2017a; BATA, 2017b; BATA, 2017v; BATA, 2017g; BATA, 2018a; BATA, 2018b; BATA, 2018v; BATA, 2018g), none of the AVL in B&H accredited all test methods for testing of all physico-chemical parameters in food, feed and water or regarding toxicological testing of residues and contaminants in food, as well as residues of veterinary medicinal products, which are prescribed by law regulations (Rulebook, 2009; Rulebook, 2010; Rulebook, 2011a; Rulebook, 2111b; Rulebook, 2011v; Rulebook, 2011; Rulebook, 2013a; Rulebook, 2013v; Rulebook, 2014b; Rulebook, 2015a; Rulebook, 2015b; Rulebook, 2015v; Rulebook, 2016). When it comes to

microbiological food testing at the level of B&H, only two AVLs, one from the RS (BATA, 2018b) and one from the FB&H (BATA, 2017a) fully accredited the test methods in accordance with the requirements of regulation (Guide, 2013; Rulebook, 2013b; Rulebook 2012b; Rulebook, 2011b), which equals 25% of AVLs and 6.90% of AFLs in B&H.

These are the only two laboratories that have fully accredited test methods in accordance with the requirements of regulation. Microbiological testing of feed in accordance with the requirements of regulation (Rulebook, 2012b) has been accredited by 87.50% AVLs, which is 24.10% of AFLs in B&H. Microbiological testing of water in accordance with the requirements of regulation (Rulebook, 2010; Rulebook 2015a), as well as surface swab testing (Guide, 2013; Rulebook, 2014a), has been accredited by 37,50% AVLs, which is 10,30% of AFLs in B&H.

Table 2. shows AVLs in B&H in relation to the number of accredited test methods (ATMs), areas and sub-areas of accreditation in the field of food testing.

Table 2. AVLs in B&H in relation to the number of ATMs, areas and sub-areas of accreditation in the field of food testing

Name of the laboratory	Accredited methods	Areas of accreditation	Sub-areas of accreditation
PI Veterinary Institute "Dr Vaso Butozan" Banja Luka (BATA, 2018b)	141	3	8
Veterinary Institute "Teolab" Bijeljina (BATA, 2018g)	9	2	3
Slaven d.o.o. Veterinary Institute Banja Luka (BATA, 2017b)	20	2	4
PI Veterinary Institute Bihać (BATA, 2017a)	72	4	7
Veterinary Faculty of the University of Sarajevo, Sarajevo (BATA, 2018v)	19	4	6
PI "Veterinary Institute of Tuzla Canton" Tuzla (BATA, 2017v)	41	3	6
KJP Veterinary Station d.o.o. Sarajevo (BATA, 2018a)	10	1	2
"Public institution Veterinary Institute" HNK/Ž Mostar (BATA, 2017g)	14	1	2

AVLs in B&H have accredited 326 testing methods in the field of food testing, with their number ranging from 9 to 141 per laboratory. The number of technical sub-areas of accreditation per laboratory ranges from two to eight.

Chart 3. shows the mutual representation of AVLs in B&H in relation to the total number of ATMs in the field of food testing accredited by these laboratories.

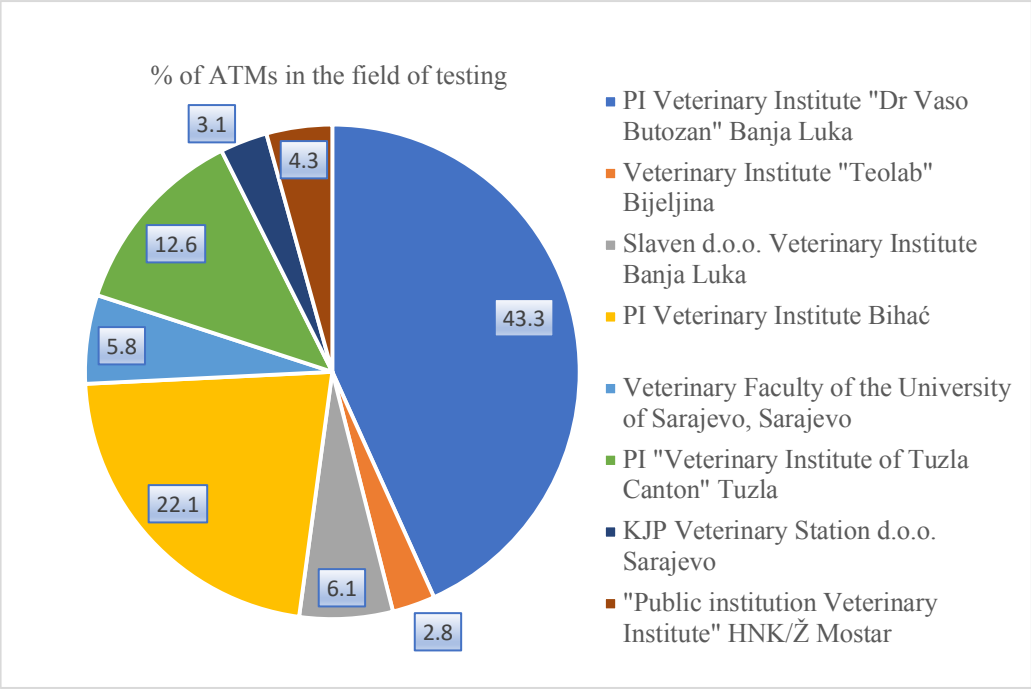


Chart 3. Mutual representation of AVLs in B&H in relation to the total number of ATMs in the field of food testing

Individual AVL participation in B&H compared to this number of ATMs in the field of food testing ranges from 2.80 to 43.30%, with 62.50% AVLs having number of ATMs less than 10% compared to the total number of methods that these laboratories accredited. Only one AVL (12.50%) in B&H has over 40% ATMs compared to the total number of methods accredited by these laboratories (BATA, 2018b). Of the eight AVLs, only six (75%) accredited test methods in the field of veterinary diagnostics (BATA, 2017a; BATA, 2017b; BATA, 2017v; BATA, 2018b; BATA, 2018v; BATA, 2018g).

Table 3. shows AVLs in B&H in relation to the number of ATMs, areas and sub-areas of accreditation in the field of veterinary diagnostics.

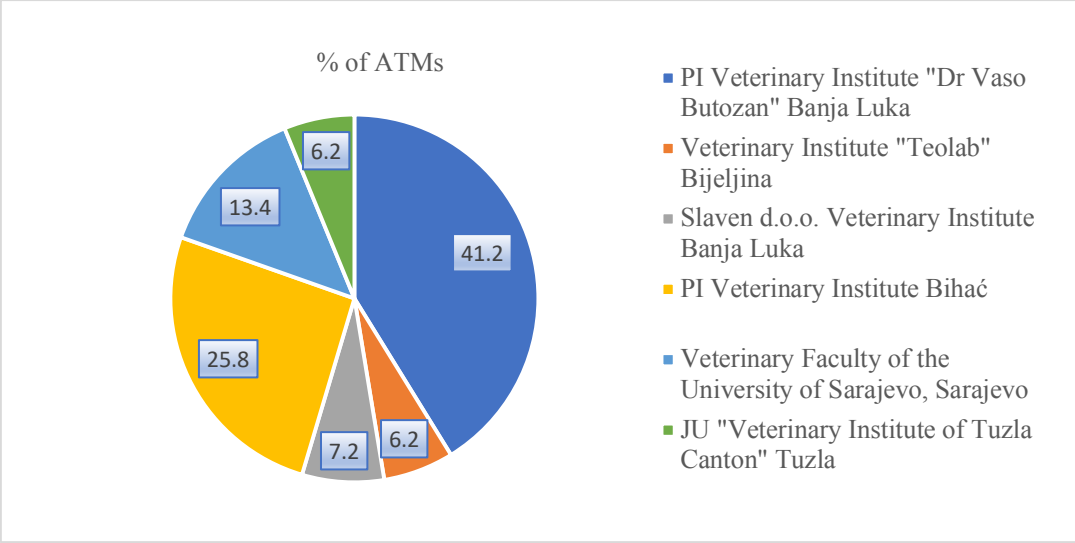
Table 3. AVLs in B&H in relation to the number of accredited methods, areas and sub-areas of accreditation in the field of veterinary diagnostics

Name of the laboratory	Accredited methods	Areas of accreditation	Sub-areas of accreditation
PI Veterinary Institute "Dr Vaso Butozan" Banja Luka (BATA, 2018b)	40	2	6
Veterinary Institute "Teolab" Bijeljina (BATA, 2018g)	6	1	1
Slaven d.o.o. Veterinary Institute Banja Luka	7	2	2

(BATA, 2017b)			
PI Veterinary Institute Bihać (BATA, 2017a)	25	1	3
Veterinary Faculty of the University of Sarajevo, Sarajevo (BATA, 2018v)	13	1	6
JU "Veterinary Institute of Tuzla Canton" Tuzla (BATA, 2017v)	6	1	2

AVLs in B&H have accredited 97 AIM in the field of veterinary diagnostics, in a total of seven technical sub-areas, with ATMs ranging from 6 to 40 per AVL. The number of technical sub-areas of accreditation per laboratory ranges from one to six.

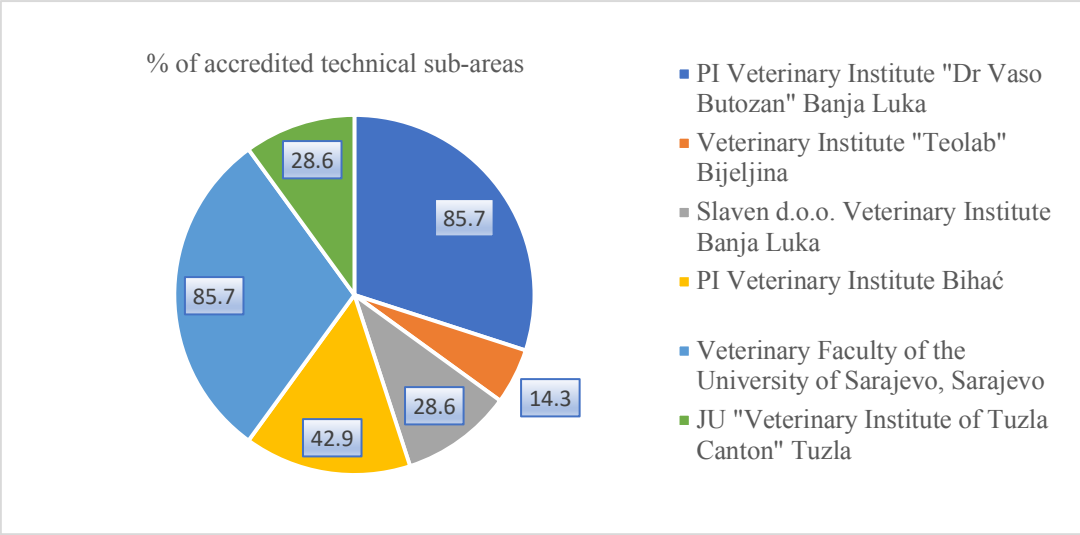
Graph 4. shows the proportional representation of AVLs in B&H in relation to the total number of ATMs in the field of veterinary diagnostics accredited by these laboratories.



Graph 4. Mutual representation of AVLs in B&H in relation to the total number of ATMs in the field of veterinary diagnostics.

The individual participation of AVLs in B&H in relation to this number of ATM in the field of veterinary diagnostics ranges from 6.20 to 41.20%, with 50% of AVLs having number of ATMs less than 10% compared to the total number of ATMs. Only one AVL (16.70%) in B&H has over 40% ATMs in relation to the total number of ATMs accredited by these laboratories (BATA, 2018b).

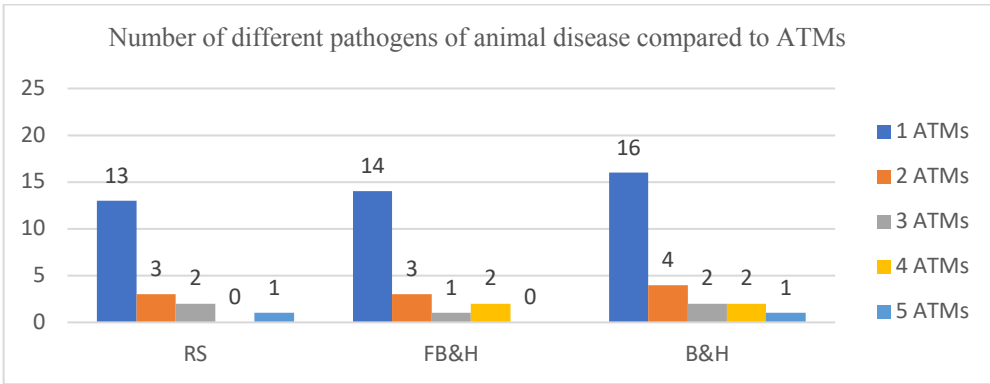
Graph 5. shows the proportional representation of AVLs in B&H in relation to the number of technical sub-areas in the field of veterinary diagnostics in which these laboratories have accredited the test methods.



Graph 5. Mutual representation of ALVs in B&H in relation to the percent of technical sub-areas in the field of veterinary diagnostics

The individual participation of AVLs in B&H in relation to the number of technical sub-areas in the field of veterinary diagnostics ranges from 14.30 to 85.70%, with only 33.30% of AVLs which accredited test methods in over 50% of technical sub-areas (BATA, 2018b; BATA, 2018v). A total of 41 different test methods in veterinary diagnostics have been accredited in the AVLs in B&H. Of these, 30 different test methods were accredited in the RS (73.20%), and 31 test methods (75.60%)in the FB&H. In AVLs in B&H, test methods for diagnosis of 25 different causitive agents of animal disease were accredited, of which 19 in RS (63,30%) and 20 in FB&H (66,70%).

Figure 6 shows the number of different causitive agents of animal diseases that can be diagnosed, compared to the number of ATMs in the field of veterinary diagnostics in B&H.



Graph 6. Number of different pathogens of animal diseases compared to ATMs in the field of veterinary diagnostics in B&H

ALVs in B&H can diagnose the largest number of causitive agents with one ATM (about 40% of the cause), while only one causitive agent can be diagnosed using five methods in one AVL from RS (BATA, 2018b). The next causitive agent with the most ATMs causes salmonellosis (4 ATM), followed by classical swine fever and equine infectious anemia (3 ATM).

Tests for rabies (TFA), classical swine fever (iELISA antigen and antibody), nosemosis of honey bees (OIE Manual) and Aethina tumida (OIE Manual) are done using accredited methods and performed exclusively in RS (BATA, 2018b). Tests for enzootic bovine leukosis (AGID), infectious bovine rhinotracheitis/infectious pustular vulvovaginitis (iELISA), Maedi Visna / arthritis encephalitis (iELISA), equine infectious anemia (iELISA), atypical form of rinderpest (iELISA, IHA), Salmonella serotyping (ISO 6579-3), campylobacter from feces and swabs (OIE Manual), anisakis (OIE Manual) and spring viraemia of carp (iELISA) are carried out using accredited methods and performed exclusively in FB&H (BATA, 2017a; BATA, 2018v).

When it comes to transmissible spongiform encephalopathies, tests are carried out in both entities, but by different accredited methods (Priostrip in RS (BATA, 2018b), and EIA test in the FB&H (BATA, 2018v)).

In the case of brucellosis, common disease in the territory of B&H, with high zoonotic potential, at the level of B&H only two laboratories, one from RS (BATA, 2018b) and FB&H (BATA, 2018v) can perform complete diagnostics by accredited methods consistent with current regulations (Rose Bengal + RVK). Also, when it comes to another zoonosis, Avian influenza, AVLs in B&H have the possibility of diagnosing this disease using ATMs (screening iELISA and Confirm Real Time PCR) (BATA, 2017a; BATA, 2018b; BATA, 2018v), while only one AVL applies both of these ATMs (BATA, 2018b). Ratio of accredited laboratories for diagnosis of trichinellosis in RS and FB&H is 1: 2 ie. artificial digestion method was accredited by one AVL in the RS (BATA, 2018b), and two in FB&H (BATA, 2017a; BATA, 2017v). Analyzing the scope of accreditation of AVLs in B&H (BATA, 2017a; BATA, 2017b; BATA, 2017v; BATA, 2017g; BATA, 2018a; BATA, 2018b; BATA, 2018v; BATA, 2018g), it is noticed that the technical sub-area of serological tests have been accredited by all AVLs. Serological tests are certainly the most common in terms of both the test requirements and the number of ATMs so some test methods are accredited in 100% of the laboratories, in RS Rose Bengal and iELISA for diagnosis of brucellosis, then iELISA for enzootic bovine leukosis, cELISA for Q fever and bluetongue and in FB&H and B&H Rose Bengal and iELISA for diagnosis of brucellosis and cELISA for Q fever. The participation of serological testing methods in the total number of ATMs in the field of veterinary diagnostics in RS is 53.30%, in FB&H 64.50% and in B&H 53.70%. The participation of AVLs in PO in these testings is 66, 70% in RS, 33,30% in B&H, while AVL in PO does not exist in B&H. This is particularly significant given that these are infectious diseases with high zoonotic potential (brucellosis, Q fever), diseases that cause great economic losses (blue tongue), or diseases on the basis of which the health status of animals is assessed (brucellosis, enzootic bovine leukosis). Based on these facts, we conclude that AVLs in PO have a significant role in the diagnosis of infectious animal diseases in B&H, and consequently in the protection of animal and human health, especially in RS. Veterinary laboratories in SO accredited fundamental, demanding, sophisticated, modern, expensive and unprofitable tests (eg, virological, molecular and parasitological diagnostics) which reflect the strength and readiness of the entities and the state for rapid, adequate and professional response in all situations, and for which the testing requirements are very rare or non-existent in the normal circumstances. (BATA,

2017a; BATA, 2018b; BATA, 2018v). In addition to serological testing, salmonella testing in feces and swabs is very common, so most AVLs accredited these tests (in RS 66.70%, in FB&H 100% and at B&H level 80%), ie only one AVL did not accredit these tests (BATA, 2018g).

CONCLUSION

Based on the obtained results, the following conclusions are drawn:

1. In Bosnia and Herzegovina (B&H), eight veterinary laboratories were accredited, three in the Republic of Srpska and five in the Federation of B&H. All eight (100%) accredited test methods in the field of food testing, while six (75%) accredited test methods in the field of veterinary diagnostics.
2. The participation of accredited veterinary laboratories in the total number of accredited laboratories for food in the Republic of Srpska is 37.50%, in the Federation of B&H 23.80%, while at the level of B&H it is 27.60%. The participation of state owned accredited veterinary laboratories in the total number of accredited food laboratories in the Federation of B&H amounts to 23.80%, while there are no accredited veterinary laboratories in private ownership. At the level of B&H, the participation of accredited state-owned veterinary laboratories in the total number of accredited laboratories for food is 20.70% and privately owned 6.90%.
3. Accredited veterinary laboratories in B&H have accredited test methods in 10 technical sub-areas of food testing, and in seven sub-areas, their participation in the total number of accredited laboratories for food in B&H amounts to 50% or more. Accredited veterinary laboratories in Bosnia and Herzegovina have accredited 326 test methods in the field of food testing, with their number ranging from 9 to 141 per laboratory, and the number of technical sub-areas of accreditation per laboratory ranges from two to eight. The individual participation of accredited veterinary laboratories in B&H in relation to the number of accredited test methods in the field of food testing ranges from 2.80 to 43.30%, with 62.50% of the laboratories having a number of accredited test methods less than 10% in relation to the total number of methods accredited by these laboratories.Only one accredited veterinary laboratory (12.50%) in B&H has over 40% of accredited test methods in comparison to the total number of methods accredited by these laboratories.
4. The participation of accredited veterinary laboratories in the microbiological examination of feed and surface swabs is 80%, Physico-chemical tests for feed, examination of residues and contaminants in food and testing of the activity of radionuclides in food and feed in B&H are performed exclusively by accredited veterinary laboratories (100%). None of accredited veterinary laboratory in B&H accredited all test methods for testing all physico-chemical parameters in food, feed and water. Likewise none of accredited veterinary laboratory in B&H accredited all test methods for toxicological testing of residues and contaminants in food, as well as residues of veterinary medicinal products prescribed by law regulation. When it comes to microbiological food testing at the level of B&H, only two accredited veterinary laboratories, one from the RS and one from the FB&H, fully accredited the test methods in accordance with the requirements of the legislation, which amounts to 25% of accredited veterinary laboratories, ie 6 , 90% of the total number of accredited food laboratories in B&H. Microbiological testing

of feed in accordance with the requirements of the legal regulations has been accredited by 87.50% of accredited veterinary laboratories, or 24.10% in relation to the total number of accredited food laboratories in B&H. Microbiological testing of water in accordance with the requirements of the legislation, as well as surface sweep testing, has been accredited by 37.50% of accredited veterinary laboratories, or 10.30%, in relation to the total number of accredited food laboratories in B&H.

5. Accredited veterinary laboratories in Bosnia and Herzegovina have accredited 97 methods in the field of veterinary diagnostics, in total of seven technical sub-areas, with the number of methods ranging from 6 to 40 per laboratory. The number of technical sub-areas of accreditation per laboratory ranges from one to six. The individual participation of accredited veterinary laboratories in B&H in relation to the number of accredited test methods in the field of veterinary diagnostics ranges from 6.20 to 41.20%, with 50% of laboratories having a number of accredited test methods less than 10% compared to the methods accredited by these laboratories. Only one accredited veterinary laboratory (16.70%) in B&H has over 40% of accredited test methods compared to the total number of methods accredited by these laboratories. The individual participation of accredited veterinary laboratories in B&H in relation to the number of technical sub-areas in the field of veterinary diagnostics ranges from 14.30 to 85.70%, with only 33.30% of the laboratories accrediting the test methods in over 50% of the technical sub-areas.
6. Veterinary laboratories in B&H have accredited 41 different test methods in the field of veterinary diagnostics. Out of this, 30 different test methods were accredited (73.20%) in the Republic of Srpska, while in the Federation B&H 31 test methods (75.60%) were accredited. In the accredited veterinary laboratories in B&H, test methods for the diagnosis of 25 different causitive agents of animal diseases were accredited, of which 19 in the Republic of Srpska (63.30%), and 20 (66.70%) in the Federation of B&H.
7. The largest number of causitive agents of animal disease can be diagnosed in the accredited veterinary laboratory in B&H using one accredited test method (about 40% of the cause), while only the causitive agent of brucellosis can be diagnosed using five different methods in one laboratory from the Republic of Srpska. The next causitive agent with the most ATMs causes salmonellosis (4 ATM), followed by classical swine fever and equine infectious anemia (3 ATM). When it comes to zoonoses, accredited veterinary laboratories can do a complete diagnosis of two very significant diseases, brucellosis (Rose Bengal, RVK, and ELISA, CELISA, Real Time PCR) and avian influenza (iELISA, Real time PCR)The technical sub-area of serological testing was accredited by all accredited veterinary laboratories, and some serological test methods were accredited in 100% of laboratories (in Republic of Srpska, Rose Bengal and iELISA for the diagnosis of brucellosis, then iELISA for enzootic bovine leukosis, cELISA for Q fever and bluetongue and in the Federation B&H and Bosnia and Herzegovina Rose Bengal and iELISA for the diagnosis of brucellosis of and iELISA for Q fever).The participation of serological test methods in the total number of accredited test methods in the field of veterinary diagnostics in the Republic of Srpska is 53.30%, in the Federation of B&H 64.50%, and in B&H 53.70%. The participation of accredited veterinary privately owned laboratories in serological surveys in Republic of Srpska is 66.70% (2 of 3), 33.30% in B&H, while in the Federation of B&H there are no accredited veterinary laboratories in PO.

8. Accredited veterinary laboratories are one of the most important links in the chain of control and protection of animal health and indirectly humans, but they also play a very important role in the direct preservation of human health through food control. The development trend of accredited veterinary laboratories goes primarily towards food testing, while the field of veterinary diagnostics is secondary. The food testing area, although highly demanding from a technical point of view, relates to a large number of technical areas, test parameters and sample types and is defined by regulation, which provides laboratories with a constant flow of samples. Veterinary diagnostics is the most present in the field of serological studies that are most economical, ie, the most profitable and the least demanding tests are mostly regulated, while other areas of veterinary diagnostics are very demanding from a technical point of view, do not provide a constant flow of samples and are not profitable.

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