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ECHINOCOCCOSIS IN RUMINANTS IN ALBANIA
RISES AND RISKS

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ABSTRACT

Echinococcus spp. causes cystic echinococcosis which is characterized by created parasitic cysts occurring in the liver or the lung but also the brain, spleen, or kidneys. Echinococcosis affects all types of herbivorous animals and humans, but it is more common in sheep because the possibility of infestation in pastures is greater. The sources of the disease are infested dogs that serve as a source of disease for herbivores and humans. Our data over the years indicate that echinococcosis affects more sheep (28.5-50%), cattle (10-25%) and fewer goats (5-15%). The results of the echinococcus monitoring in sheep and goats show that the lungs and liver are equally affected, while in cows the lung is more affected than the liver. Overall, there is no significant difference between the pulmonary and hepatic localization of the echinococcus cysts (45% and 51%), while in the organs and tissues there are 4% of the cysts. People are infested with fruits, vegetables, water and hands stained with Echinococcus eggs. The most vulnerable are people that work with animals (dogs), and small ruminant farmers in which echinococcus is three times higher than the other population, people living in rural areas, poorer and people in need. The level of infestation of humans and animals by echinococcosis directly reflects the level of dog's infestation and the level of veterinary and hygienic measures. Reducing the level of risk to humans involves the implementation of personal hygiene and continuous washing of hands and herbs. This becomes extremely important in cases where the territory is populated by dogs that routinely need to be dehelmized four times a year periodically every 3 months. To reduce the level of infestation by echinococcosis, The animals' condition in the slaughterhouse should be carried out under the supervision of the veterinarian and never should be given to dogs consumption liver and the lungs of echinococcus cysts.

Keywords: Echinococcosis, cyst, sheep, goats, cattle.

Introduction

Echinococcosis is a parasitic disease affecting all domestic animals, mainly sheep, cattle and goats, causing damage to the condition and livestock products and

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sometimes to death. Echinococcosis also affects people by causing life and health hazards. Echinococcosis at the intermediate host is a fluid bladder located in various organs, mainly in the liver and lungs. Hydatidosis/cystic echinococcosis (CE) is a severe zoonosis caused by the larval stages of a cyclophyllidean cestode genus *Echinococcus.* Two hosts are involved in the completion of the life cycle of *Echinococcus*. The definitive hosts are carnivores which harbour mature tape worms in the intestine the growth of echinococcos cyst in animals lasts 5-10 years and in humans 10-30 years. Cystic echinococcosis is a zoonotic disease caused by the larval stage of the tapeworm *Echinococcus* species. The parasite has a wide geographical distribution and despite significant progress achieved in the field of control it still remains a considerable problem for animal health and livestock economy (Eckert et al., 2000). Its worldwide distribution is mostly on account of the adaptability of the larval stage (hydatid cyst) to several domestic mammalian as intermediate hosts, including humans (Craig *et al.,* 1996). *E. granulosus* is characterized by high genetic diversity. Until now on the systematics of the living world, have been recognized *Echinococcus granulosus*, *E. multilocularis*, *E. oligarthus*, *E. vogeli* etc. But taxonomy of the genus Echinococcus has been recently revised based on the complete mitochondrial genome (Nakao *et al.,* 2007) and on nuclear data (Saarma *et al.,* 2009). Today ten genotypes (G1-G10) have been reported and *E. granulosusis* considered as complex consisting of four species: *E. granulosus sensu stricto* (s.s.) (G1-G3), *E. equines* (G4), *E. ortleppi* (G5), and *E. canadensis* (G6-G10) (Nakao et al., 2013, Saarma et al., 2009). The *E. canadensis* might be divided into two sub-species *E. canadensis* (G8/G10) and *E. intermedius* (G6/G7) (Thompson 2008). At least seven of nine *E. granulosus "*genotypes" are infective to humans, four of which exist in Europe. Globally, most human cases of cystic echinococcosis (CE) are caused *E. granulosus* s.s. (G1) which predominantly has a dog-ruminant life-transmission cycle (Eckert and Deplazes, 2004). In Albania during the last decades several studies focused mainly on sheep and goats, reporting high prevalence, and documenting that cystic echinococcosis is still an ongoing problem. Unfortunately, these studies were spatially and temporally restricted; therefore the information provided is not sufficient to draw country-wide conclusions. Hence, the aim of our study was to contribute to the assessment of the current epidemiological situation of cystic echinococcosis in Albania by defining the incidence of *Echinococcus* infection in ruminant species all over the country and the intensity of the infection and the cyst fertility in the different animal species. The tapeworm is 3-6mm long and their body consists of three to five proglotids, of which the latter is filled with eggs. The last proglotid, which contains several hundred eggs, stripped off of strobes and together with the faeces, comes out in the outer environment, where it disintegrates under the influence of atmospheric agents. Each egg has a larva equipped with 6 hooks (oncosphere), which should be choked by an intermediary host to continue the biological cycle of the cestod. Intermediary host are herbivores and all-rounders including humans. Echinococcos

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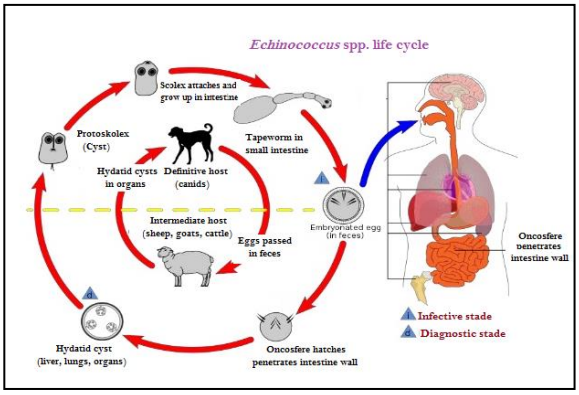
cyst is filled with juice, which contains many cystic and protoscolex capsules that swim free in it. An echinococcus cyst contains several thousand protoscolexes. Protoscolexes in goats are formed 9 months after ingestion of *Echinococcus* eggs. The biological cycle will be closed if the carnivore is fed to the internal organs of the intermediate host with the echinococcus cysts containing protoscolexes, which are fixed on the walls of the small intestine of the dog and from which adult cestodes develop. Matured proglotids begin to break off 45-60 days after the canine's infestation. The parasite is reproduced by sexual and asexual multiplication; sexual multiplication is carried out in the organism of the carnivore, and asexual multiplication in the organism of intermediate host. The echinococcal tapeworm is among the smallest of the Taenidae family, but the most risky for human and animal life. Intermediate hosts are infested with tapeworm eggs in foods and drinking water. In the digestive tract the oncosfere, enter the blood vessels and go into the liver. A part of the larvae remain in the liver, while the rest through the bloodstream go to the lungs and develop there. Part of the larvae pass the pulmonary barrier and through veins return to the heart and from there can be distributed into various organs (kidneys, spleen, etc.). Once localized, the onchosfere begin to develop and turn into echinococcus hydatid cysts, which are multiplied asexually and characteristic form echinococcus structures (three membranes).



Cysts develop slowly, one week after infestation they appear in the form of a bladder with a diameter of 60-70 μ and after 5 months its diameter arrives 15-20 mm. The most preferred organs are the liver and the lungs. This does not exclude the finding of echinococcus cysts in tissues and other organs all over the host organism. Final hosts are infested by eating animal organs in which echinococcus hydatid bladders are located. From protoscolexes to the carcasses in the carnivores in small intestine (final recipients), 4-10 weeks later, are developed sexual tapeworm which in the dog live one year. The form grown in the final hosts (echinococcus causes tenidosis) parasites

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in the small intestines of dogs, wolves, foxes, jackals, etc., whereas the larvae form in the intermediate hosts (*Echinococcus hydatidosus*) causes echinococcosis or hydatidosis in sheep, goats, cattle and humans. In our country (Albania), echinococcus is widespread in ruminants. Albanian area is endemic and highly endemic and high prevalences have been reported in dogs (tapeworm) and livestock (cystic echinococcosis) (Gjoni et al., 2014; Preza, 1988; Xhaxhiu et al., 2011). According to previous information, the common sheep strain (G1 genotype) is predominant in Albanian area (Bizhga, 2013). However, even if the distribution of *Echinococcus granulosus* is considered worldwide, it is higher in developing countries, especially in rural communities where there is close contact between dogs and various domestic animals (Eckert and Deplazes, 2004). In some other countries, cystic echinococcosis is being considered a re-emerging zoonosis, due to recent increases in the observed prevalence (Himsworth *et al.,* 2010). In humans, cystic echinococcosis is the most common presentation and probably accounts for more than 95% of the estimated 2 to 3 million global cases (Craig *et al.*, 1996, Budke *et al.*, 2006). Transmission and maintenance of echinococcosis is dependent on complex interactions of several factors, including environmental, host and pathogen factors. A number of such factors are of local epidemiological significance and the identification of such factors is important in the effective implementation of control strategies.

Material and method

Echinococcus (hydatid echinococcosis) in ruminant animals (large and small) was diagnosed by post mortem observations in the slaughterhouse. In animals slaughtered in the slaughterhouse was checked carcasses and cysts were evaluated in tissues and organs. Observations in the slaughterhouse were directed under the observation and documentation of the echinococcus cysts in the organs. The data was collected throughout the country and included records for a long period of time. Part of the data was obtained from veterinary and veterinarian directorates in districts and Institute of Veterinary Research. While about 50% of the results include the data from Faculty of Veterinary Medicine observation and monitoring results for a 30 year period (1985-2015). In the statement of the results of the echinococcosis monitoring are included older results that could be collected in different ways, and outside the data of the official veterinarian service (slaughterhouses). The study area was selected because of a significant livestock population being present in the area, and Albania its neighbouring characteristic with other Balkan countries. The abattoirs were selected on the basis of their number of animals slaughtered and the variety of animals slaughtered. The results presented in the study are a amount of data collected from cystic echinococcosis in ruminants in Albania for a period of 30 years. More precisely the viscera of each carcass were examined for the presence and location of hydatid cysts by visual inspection, palpation and systematic incision of each organ. All infected

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organs were recorded, removed and sometimes separately transported in individual bags to the laboratory. In our observations, besides site assessment, the number of cysts in slaughter animals was sampled to assess the fertility of echinococcus cysts, and the estimate of the number of protoscolexs in fertile cysts.

Results and discussion

The results of the observations in the slaughterhouse have been collected from veterinary service records and other examinations recorded at the moment of slaughterhouse control of the ruminant carcass. Cystic echinococcosis is considered an emerging disease in humans and a serious animal production problem and thus economic concern in many areas of the world. Great progress has been achieved in the last years in understanding the geographical distribution and genetic diversity of *E. granulosus*, but still there is a clear need to complete the epidemiological and economic data sets for many endemic areas in order to implement standardized recording and reporting systems for livestock cystic echinococcosis.

Table no. 1. Summary of the monitoring results in slaughterhouses.

Nr	Kind	To – 1991			1991 – 2000			2000 – 2015		
		Checked	Positive (no)	%	Checked	Positive (no)	%	Checked	Positive (no)	%
1	Sheep	22 530	6434	28.6	87560	34 400	39.3	244 490	106 160	43.4
2	Cattle	4 460	482	10.8	18 890	2 640	14	63 320	9 320	14.7
3	Goats	16 480	920	5.6	28 680	1 460	5.1	112 620	6 240	5.5
4	Amount	43 470	7836	18.03	135 130	38 500	28.5	420 430	121 720	28.95

The table provides aggregate monitoring data through the slaughterhouse. The number of animals slaughtered is greater than the number of samples observed for each monitoring for two reasons: First because not all animals in the slaughterhouse were observed or marked for the presence of echinococcosis. Secondly, a small number of sheep and goats are consumed and without veterinary control. The results of the echinococcosis monitoring in the slaughterhouse are presented in three time periods. The period until 1991 has summarized the veterinary surveys that mostly pertain to a centralized economy and veterinary service. For this reason, the numbers are smaller, the values of the infestation of animals by lower echinococcosis, but the data can be considered to be more exact and near to the real value. The second period belongs to the years of democratic change in our country. At this time monitoring and veterinary service disorders were observed, which is also reflected in the tendency of increasing echinococcosis infection values in all types of animals.

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The period 2000-2015 represents the period of consolidation of the veterinary service and its confrontation with veterinary problems and between them and with echinococcosis. Increasing values of echinococcosis are attributed to the 1991-2000 conditions (infection rate), the time of disease manifestation, controls and the increase in veterinary service in slaughterhouses. Although it should be noted that this period corresponds to the time when a part of the animals continue to be slaughtered in unlicensed slaughterhouses, in indoor conditions (holidays and family party) and outside veterinary control.

Table no. 2. Results of the monitoring CE in slaughterhouses depending the ruminant species.

No	Kind	**CE in ruminants**		
		Checked	Positive (no)	Positive %
1	Sheep	354 580	146 994	42.3
2	Cattle	86 670	12 442	14.35
3	Goats	157 780	8 620	5.46
4	**Amount**	**599 030**	**168 056**	**28.05**

Collected results show that echinococcosis cysts in our country are more widespread in sheep. Evidence suggests that echinococcosis affects more sheep (depending on the areas 28.5-50%, average 42.3%), cattle (10-25%, average 14.35%) and fewer goats (5-15%, average 5.46%). This is explained by the way they feed them, which allows them to fall into contact with the eggs of ekiquoies tenies. The rate of infestation of sheep ranged from 8% to 55% (average 42.3%) in certain areas resulting in the highest value of the observed echinococcosis in slaughterhouses in Albania. Sheep result in the most infested and in numbers that often need to alert us because they graze down, and increased the chance of getting echinococcus eggs. Dogs are more in contact with sheep especially farmers dogs and often farmers and specialists have not paid attention to the infestation even in areas that increase the likelihood of infestation. The abundance of the parasite differs quite a lot between different regions in Albania. Cystic echinococcosis resulted widespread across the country, but more in the southern part (Vlora, Tepelena, and Gjirokastra) and in the western lowlands including Lezha and Shkodra. These findings support the theory of infection “hot spots” found in different locations all over the country, which may be linked to practices applied in the region and educational status of the farmers. Precisely, as documented in similar studies, although control programs are still in action, still in the majority of the farms home-slaughtering is still happening and viscera are either used as dog meal raw or not discarded properly to avoid infection. The cattle are the second most affected category after sheep. Echinococcossis variations have been expressed according to years of study with an upward trend like sheep, but at lower prevalence. The cattle result less affected because their food is more controlled and therefore

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reduces the possibility of falling into contact with echinococcus eggs. The level of our cattle infestation from echinococcus varies from 10% to maximum to 30% (average 14.35%) in some areas. The results of echinococcal minitoring show that both sheeps and goats are affected equally by the liver and the lungs (both organs are affected equally), while the liver is more affected by the echonoccoccus cysts. Generally in the final result there are no major differences between the pulmonary and hepatic localization of the echinococcus cysts (45% and 51%) in sheeps and goats. In the other organs only 4% of the echinococcus cysts are observed.

Echinococcosis affects all types of animals, wild and humans, but it is more affected by herbivores because the possibility of pasture infestation is greater. The sources of the disease are infested dogs (the final host) who serve as a source of disease for intermediate hosts. The rate of goat infestation was lower than that of other ruminants. Also, this level was not affected by the time variations that were clearly affected by sheep and cattle. The level of goat infestation varied from 3% to 28% depending on the areas with the highest tendency to be observed in rural areas. This is directly related to the lack of control and dehelmation of house dogs or farms that directly affect the echinococcus values in these areas. Generally, traditional goats (races of the country) graze up and this reduces the risk of echinococcosis as a result of diminishing collapse in contact with echinococcus eggs. There is also a tendency to check the quality of food for their own physiological characteristics and to increase the percentage of improved breeds. This is a continuing process. However, the increasing trend of echinococcus in goats should not reduce the control and veterinarian interest in the control of echinococcosis cysts in this species. By helminthological expertise, carried out on 1789 animals, it was observed the invasion of granulose *Echinococcus* (Pepa, 1986). The invasion affected 47.8% of the cattle, 15.2% of the sheep, 5% of the pigs and 4.6% of the goats. Are considered several measures that should be taken for the confinement of this disease, which affects both men and animals (Pepa, 1986).

People are infested in the same way as carnivors and can take the echinococcus eggs through fruit, vegetables, water, and dirty hands. The most resourceful are the people working with animals (dogs), farmers and small ruminants to whom echinococcus is three times higher than the other population, people living in rural areas, poor people and people in need. Echinococcus is a dangerous zoonotic, and the only way to treat it is the surgical one that has to be repeated several times due to the growth of young cysts. Public Health Data indicates that the incidence of echinococcosis in humans in Albania is 2-4 per 100,000 inhabitants. Human echinococcosis affects more women than men and more those who live in the village than those who live in the city. The reason is understandable and it is about the pathways of infestation. The level of infestation of humans and animals by echinococcosis directly reflects the level of dog's

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infestation and the level of veterinary and hygienic measures. Reducing the level of risk to humans involves the implementation of personal hygiene and continuous washing of hands and herbs. This becomes extremely important in cases where the territory is populated by dogs who routinely need to be dehelmized 4 times a year periodically every 3 months. To reduce the level of infection by echinococcus, the slaughter of animals should be carried out under the supervision of the veterinarian, but in cases where this rule is circumvented in a categorical manner, you should not be given to dogs for liver consumption and the lungs of echinococcus animals. Increased forms of dogs do not give any major concern. The human epidemiological situation of 1997-2006 periods is described by an infection rate of 30.4% and a prevalence of 6% (Gjoni at al 2012). The number of diagnosed patients with *Echinococcus* in Albania goes up to ± 14 case/year. In surgery the hydatidosis diagnose was confirmed 100% of cases for seropositive patients, after undergoing the operation. Human serological diagnoses prevalence in Albania was statistically estimated at 52.63% for male and 47.36% for female patients (Gjoni at al 2012). The highest prevalence age group was 5-14 years for males and 15-24 years for females. With 83% of infected pacients, liver presented the highest prevalence, followed by respiratory tract with 14 %, and 3% for spleen. The supervising examination of pets or animals belonging to infected patients showed a prevalence of 2% for dogs, and 55.8% for sheep (Gjoni at al 2012). The relative incidence of cases in people in Albania referred to 2009-2013 was from 4.1% (2009) to 4.7% (2013); (per 100,000 inhabitants). The maximum infestation rate reports that the most affected age groups are women 45-54 years and over 65 years old, as well as men over 65 years old. Referring to this period (2009-2013), the number of new cases has increased to ± 22 patients, compared to the study period up to 2006, with the number of new cases reaching ± 14. The most affected organs appear to be hepar 41.54% and lungs 21.7%. About 85% of patients have undergone treatment. Cases suspected of having clinical or radiological hydatidosis and which have been confirmed in advance with the ELISA test have been fully (100%) and surgically (Gjoni at al 2014).

Conclusions

The multi-year results of the echinococcosis show that the pathology affects most sheep (28.5-50%), cattle (10-25%) and less goats (5-15%). This is explained by the way they feed, which allows them to enables to come into contact with echinococcus eggs. The rate of infestation of sheep ranged from 8% to 55% in certain areas resulting in the highest value of the observed echinococcosis in slaughterhouses in Albania. Echinococcosis in sheep is widespread throughout the country, but more in the southern part of Albania such as Vlora, Tepelena, Gjirokastra and the western lowlands including Lezha and Shkodra region. The cattle are the second most affected category and the level of infestation from echinococcosis varies from 10% to

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maximum to 30% in some areas. The goats in Albania were less affected by hydatid echinococcosis with a prevalence ranging between 5-15%. The results of echinococcal infection observed show that both goats and goats are affected equally by the liver and the lungs and are no major differences between the pulmonary and hepatic localization of the echinococcus cysts (45% and 51%). In other organs, only 4% of echinococcosis cysts are observed. All animals should be slaughtered in the slaughterhouse under veterinary control and evacuated with echinococcus in order to eliminate the possibility of infestation of dogs. To prevent the infestation of dogs, humans and animals from echinococcosis, veterinary and hygienic care should be increased by evaluating the biology of the parasite and the possibilities to avoid infestation of humans and animals. Dogs and especially farm dogs should be regularly dehelmentizated and the other population of the dog's will kept under veterinary control until it is confirmed to reduce their echinococcosis infestation at acceptable levels.

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