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CHANGES OF LACTIC ACID QUANTITY AND pH IN CATTLE MEAT INFECTED BY ECHINOCOCCOSIS

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The meat samples from ten healthy and ten echinococcosis – infected animals were examined in the order to compare concentrations of lactic acid and pH changes, which significantly affect the process of meat maturing. Studies have shown that meat maturing process during echinococcosis is too weak which increases the risk of contamination with microorganisms and decrease its food value and retention time.

***Keywords*:** cattle**,** echinococcosis, lactic acid, pH, meat maturation.

Introduction. Cattle breeding is one of the most important spheres of meat production. Beef is in a great demand in World market, as well as in Armenian market, because it is a high taste product with high calorie, it contains all necessary nutrients and biological substances for growth and metabolism of human organism.

However, there are many obstacles in meat production one of which is the infectiousness with parasitological diseases, particulary with echinococcosis which has big economic impact.

Echinococcosis has a big practical meaning in its larvae phase, during that liver and lungs of farm animals, wild animals and also people are infected by parasites cysts. Decreasing of all kind of animal productivity is caused by echinococcosis.

According to data from [1], slaughter weight of sheep infected by echinococcosis decreased by 10.4%, fat 19%, 56–62% of I, II category subproducts are scrapped comparing with healthy animals. There are lots of scientific researches on helminths detection, but there are no data on meat and sub-products food value and calorie. Therefore, there is nothing mentioned about differences of biological value of healthy and infected animals. Taking into consideration that fact our purpose was to study that issue.

It is known that glycogen becomes lactic acid after intermediate conversion in meat and its quantity in muscles is 0.82% [2]. Due to formation of phosphoric acid and lactic acid in meat the hydrogen ions concentration is increasing and after 24 *h* meat pH is decreasing up to 5.6 [3].

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According to data of many specialists, meat pH of infected animals is alkaline, which promotes progress of pus organisms [4–6]: Taking into consideration that echinococcosis is a chronic helminthiasis which produce pathological changes in meat products, so our aim was to study echinococcosis cysts influence on meat maturing process and food value.

Materials and Methods. The investigation has been done in faculty of veterinary sanitary and zoohygiene of Armenian National Agrarian University and in food safety laboratory of "Republican veterinary-sanitary and phyto-sanitary centre for laboratory services" SNCO in 2012–2013. Ten meat samples infected by echinococcosis and ten meat samples from healthy animals have been taken from markets' veterinary-sanitary laboratories.

Determination of pH in Meat According to Gost 51478-99 [7]. Meat is grinded then pH meter is calibrated in known medium buffer solution the temperature of which should be (20 ± 2^0C). pH meter-electrode is slipped into the sample, then temperature of pH meter and a scale figure is adjusted.

Determination of Lactic Acid by UV-vis Spectrophotometer [8]. For the test meat samples from 10 infected animals by echinococcosis were taken. 400 *g* meat was used for lactic acid detection, which was well homogenized for 1 *min* with Buchi B-400 mincing machine. Then 5 *g* homogenized meat sample was taken and added 20 *ml* perchloric acid (1 *M*) and homogenized again for 10 *min*. Received samples were transferred into the cup and 40 *ml* water was added. Then pH was adjusted 10–11 by 2 *M* potassium hydroxide (KOH) solution. Received solution was transferred into 100 *ml* volumetric flask. Mixture was shaken by electric mixer. For fat isolation and sedimentation of potassium perchloride the sample was cooled down for 20 *min*, then was filtered and the filtered few *ml* was spilt out, and the rest was used for further test.

The tests have been performed by Lambda XLS which gave an opportunity to perform measures in UV spectrum under the 300–500 *nm* wavelength. First of all we checked standard absorption with known concentration (0.4) Measurements were performed under the 340 *nm* wavelength in 1 *cm* cuvettes in $20–25^0C$ and test final volume was 2.260 *ml*.

Calculation was done by the following formula

$$c = \frac{V \cdot MW}{\varepsilon\, d\, v \cdot 1000} \Delta A \ ,$$

where c is lactic acid concentration in tested solution; V is final volume, *ml*; v is sample volume, *ml*; MW is molecular weight of the substance to be assayed, *g*/*mol*; d is light path, *cm*; ε is extinction coefficient of NADH at 340 *nm*, $\varepsilon = 6.3\ l \cdot mmol^{-1} \cdot cm^{-1}$; ΔA is the distinction between 2 absorbencies:

$$c = \frac{2.240 \cdot 90.1}{\varepsilon \cdot 1.00 \cdot 0.100 \cdot 1000} \Delta A = \frac{2.036}{\varepsilon} \Delta A \ \ [g \text{ lactic acid}/l \text{ sample solution}].$$

When analyzing solid samples, which were weighed out for sample preparation, the result is to be calculated from the weight amount, which was calculated according to the formula

$$\text{Content of lactic acid} = \frac{c \text{ lactic acid } [g/l \text{ sample solution}]}{\text{weight sample in } g/l \text{ sample solution}} 100\,[g/100g].$$

Statistical comparison of received results have been done according to Student *t*-test. Statistics were evaluated in case of $p < 0.005$ tolerance limit.

Results and Conclusion. Received absorbencies of 10 samples infected by echinococcosis under the 340 *nm* wavelength is mentioned in Table.

Quantity of lactic acid and pH in meat infected by echinococcosis

Sample №	Lactic acid quantity		pH	
	infected animals	healthy animals	infected animals	healthy animals
1	0.44	0.78	6.8	5.6
2	0.40	0.80	6.9	6.9
3	0.46	0.90	7.6	5.0
4	0.43	0.78	7.2	4.9
5	0.38	0.75	6.9	5.5
6	0.49	0.84	7.3	6.2
7	0.41	0.70	6.6	5.1
8	0.48	0.68	7.0	4.8
9	0.45	0.65	6.7	5.3
10	0.50	0.90	7.1	6.3
Average	(0.38−0.50)	(0.65−0.90)	(6.6−7.6)	(4.8−6.3)

Test results showed that the quantity of lactic acid in meat for animals infected by echinococcosis was 0.38–0.50%, with 0.44±0.06 tolerance limit and for healthy animals quantity of lactic acid was 0.65–0.90% with 0.77±0.13 tolerance limit (Fig. 1). pH was 6.6–7.6 with 7.1±0.5 tolerance limit for healthy animals pH was 4.8-6.3 with 5.5±0.7 tolerance limit (Fig. 2). We see that relative decreasing of lactic acid was 51% ($p<0.005$), and pH changes also were significant, more then 20% ($p<0.005$).

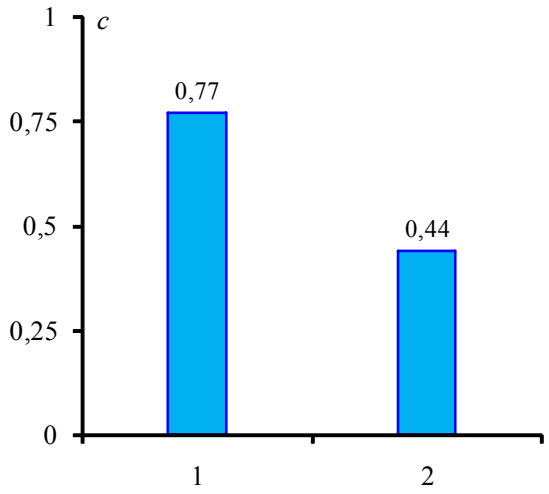

Fig. 1. Changes of lactic acid concentration ($p<0.005$):
1. meat of healthy animals; 2. meat of infected animals.

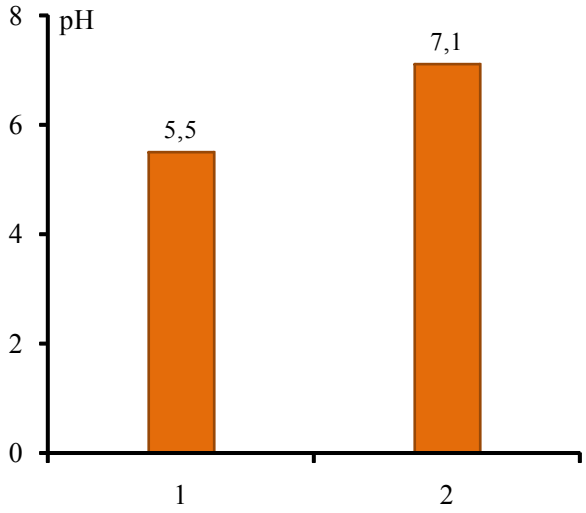

Fig. 2. Changes of pH ($p < 0.005$):
1. meat of healthy animals; 2. meat of infected animals.

Summarizing this results we can say that meat maturing process during echinococcosis is too weak, which increases the risk of contamination with microorganisms and decreases its food value and retention time.

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