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EFFECT OF CLENBUTEROL ON FATTY ACID AND PHYSICOCHEMICAL COMPOSITION OF m.L.Dorsi IN HOGGETS

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During the last years, investigations have been conducting for applying the B-agonists in animal production as an alternative to genetic improvement of meat performence. According to a series of research workers, when using them an easily achieved progress is possible or so called "dramatic" effect on carcass composition as well as on both muscle fat and adipose tissue deposition. Changes exerted by those agents on metabolism, influence on post mortem changes of meat, inducing in single type of animals - in some measure - occurence of DFD syndrom (Hanrahm et al., 1987; Williams, 1987; Marinova et al., 1992).

Comparative investigations for treating different doses of B-agonists, duration of treatment and period of residual metabolic activity on some physicochemical parameters of meat and fatty acid composition of triacylglycerols, are scanty, and therefor they are an object of this investigation.

MATERIAL AND METHODS. Two experiments were carried out on 30 male hoggets, fed the same diet containing energy and protein - 4.1 MJ and 130 g/kg of complete diet, respectively. Animals in each experiment were divided into 1 control and 2 experimental groups. The first experiment started in 10 months-old hoggets, the experimental groups receiving for 24 weeks 1 mg of clenbuterol per kg of mixture. The second experiment lasted 6 weeks, during that time animals of experimental groups received by 10 mg of clenbuterol daily. At the end of the experiments, animals of control groups and one of experimental groups each were slaughtered. The second experimental groups were slaughtered 7 days later for I experiment and 14 days for II experiment, during that time hoggets received no clenbuterol. Samples of m.L.Dorsi were taken 24 h post mortem. Physicochemical analysis of m.L.Dorsi included myoglobin, pH, colour (525 nm), Water Binding Capacity (WBC) and fatty acid composition of triacylglycerols. Methods applied as described in our previous publications (Pinkas and Marinova, 1984; Banskalieva et al., 1992).

RESULTS AND DISCUSSION. Between control group and 1 mg of clenbuterol treated animals no significant differences were established in pH values. Values for that index in control group distinghuish themselves from normal ones for this kind of meat and do limit parameters of both colour and WBC. Experimental groups of the first trial are of significantly lower myoglobin content, showing that clenbuterol effect on examinated parameters is not recorded because of occurence of DFD meat in control group. In the second experiment - where animals are of a normal meat pH- 10 mg of clenbuterol intake has increased significantly pH values in both experimental groups. Similar results in lambs after applying clenbuterol, have been obtained by Beerman et al., 1985, suggesting a decrease of muscle glycogen content in treated animals. According to Allen et al., 1985, pH of m.L.Dorsi in sheep treated with the same B-agonist has been by 0.3 units higher than that of control group, the incidences occurence of dark firm, dark cutting meat have been of triple greater frequency. Significantly lower myoglobin content in treated animals, darker meat colour and lower WBC values (proven at high significance degree) in the second experiment show that clenbuterol creates a procondition for DFD syndrom. Such a meat is of an increased firmness and of indesired organoleptic characteristics (Kretchmar et al., 1990; Kochmarie et al., 1991).

Data of Shindarska et al., 1992, on hoggets under the same experimental formula, show that B-agonists stimulate deposition of muscle proteins and significantly reduce the fats in m.L.Dorsi. Changes in lipid content considerably exceed those in protein. Changes in lipid status are double higher in longterm treatment with 1 mg of clenbuterol compared with those with 10 mg. In lambs, Kim et al., 1987; Beermann et al., 1987, establish an increase in RNA and accelerated growth rate of muscle fibers, giving a reason to accept that B-agonists predispose to a muscle hypertrophy. In confirmation of those studies are also obtained data about a greater size of muscle cells in clenbuterol treated animals of the same type (Hamby et al., 1986; Miller et al., 1988; Marinova et al., 1993). In our previous investigations on lambs and hoggets (Banskalieva et al., 1991, 1992) single fat depots have been pointed out to react in different manner to clenbuterol effect. Investigations by Beermann et al., 1987; Reeds et al., 1986, also pointed out that both muscle fibres and different muscles manifest a specific reaction in reply, when using B-agonists. According to the results by Miller et al., 1980, clenbuterol does not change lipogenesis in m.L.Dorsi. Lipid content reduced is a result of highly reducing size of fat cells. Data of Shindarska et al., 1990, as well as our investigations on hoggets (Marinova et al., 1993) show that clenbuterol reduces the size of adipocytes in different topographic areas, and that to a dissimilar degree.

Both at high and low clenbuterol doses, an identical trend to increasing the unsaturated/saturated fatty acids ratio is observed in triacylglycerols of m.L.Dorsi. It varies in the order between 7 and 10% for I and II experiment, respectively but it is insignificant and provides no possibility for making an inference about clenbuterol effect on fatty acid metabolism in muscle studied. With a view to a more complete elimination of possible residual clenbuterol metabolites, and on the other hand - a study to what a degree obtained results do keep their values after treating with that B-agonist, both 7 days (I experiment) and 14

days (II experiment) were paused. Pause-lasting exerts no essential effect on results obtained at physicochemical analysis. Increase of muscle mass in clenbuterol treated animals (at a reduced feed consumption per unit of gain - unpublished data) is of importance for producers. On the other hand - obtaining of leaner meat related to its dietary properties will be of interest to consumers. Parallel to that, however, probabilities for worsening some organoleptic characteristics as well as uncbeared question about both the dose and duration of treating with B-agonists need further more detailed investigations.

CONCLUSION. Based on investigation conducted, supplement of 1 mg of clenbuterol per kg of complete mixture for 24 weeks was established to reduce significantly myoglobin content and at the same time a trend to increasing total unsaturation of triacylglycerols in m.L.Dorsi, was observed. In 10 mg of clenbuterol-treated animals for 6 weeks, m.L.Dorsi is of more marked characteristics of DFD meat. Pauses of 1 or 2 weeks exert no essential effect on both physicochemical and fatty acid composition in m.L.Dorsi.

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TABLE 1

Physicochemical and fatty acid composition of m. L. Dorsi in hoggets fed clenbuterol

Groups:	Experiment I Control	Exp.1	Exp.2	Experiment II Control	Exp.1	Exp.2
			Physicochemical composition			
pH, 24h	6.24±0.16	6.11±0.18	5.97±0.29	5.69±0.10	6.13±0.18*	6.20±0.09
Colour, 525 nm	16.23±0.16	15.76±0.71	16.89±1.23	17.30±1.47	16.74±0.38	16.50±0.26
WBC, %	30.64±1.34	32.64±1.87	31.78±1.83	39.82±1.03**	29.44±2.11	29.00±1.98
Myoglobin, mg/g	4.51±0.36**	2.39±0.15	2.54±0.59	3.37±0.67**	2.77±0.12	2.80±0.09
			Fatty acid composition (M%) of triacylglycerols			
16:0	27.3 ±1.4	25.2 ±1.2	26.3 ±0.7	28.0 ±1.5*	25.2 ±1.3	27.8 ±1.5
16:1	2.9 ±0.2	5.1 ±0.8*	3.8 ±0.6	4.1 ±0.3	3.9 ±0.3	3.5 ±0.1
18:0	20.3 ±1.6	19.9 ±0.4	18.5 ±0.9	20.8 ±0.8	21.3 ±1.0	19.0 ±0.6
18:1	43.9 ±0.8	44.1 ±0.9	43.1 ±1.2	41.0 ±1.7	42.7 ±0.7	43.7 ±2.0
18:2	6.6 ±0.6	5.8 ±0.2	8.4 ±1.0	6.0 ±0.2	6.8 ±0.1	6.1 ±0.6
Total unsaturation	53.4	55.0	55.3	51.1	53.4	53.3

*P < 0.1; **P < 0.05