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PREVENTION OF APPEARANCE OF DARK CUTTING BABY BEEF (I)

V. Oluški, A. Wagner, B. Mihajlović, B. Sojer

Yugoslav Institute of Meat Technology, Beograd - Yugoslavia

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Factors causing appearance of dark cutting beef have already been explained in the literature. The presumption of Hall et al.(2), that dark cutting beef is the result of glycogen lack in muscular tissue in the moment of animal slaughter, was confirmed in later works by other authors (2).

The lack of muscle glycogen is due to different stresses caused by excitement, muscle exertion, unfavourbale weather conditions and others.

The appearance of dark cutting beef can be demonstrated by administering to animals chemicals that take part in the metabolism of carbohydrates in a certain way (larger amounts of adrenalin or insulin - 2, 3, 4, 6, 8) or by exposing the animals to greater physical efforts (2,7).

Although the appearance of dark cutting beef has been explained and although the problem has still been actual (5,7), effective measures for its prevention have not yet been found. Besides injections of insulin, of hydrocortisone and other similar measures, Hedrick et al. (2) used several kinds of tranquillizers but without any result. At the administering spot, an edema covering muscular and connective tissues occured. Losses due to rejection of altered carcass parts were equal to those due to the appearance of dark cutting beef. Wagner and Salobir (7) succeeded in preventing the appearance of dark cutting baby beef derived from cattle from the neighbouring farms (20 km in diameter) by injecting 1 ml of "Combelen" per 130 kg of cattle live weight into cattle (bred freely- unbound - in pens) just prior to their transport. The effect of "Combelen" was long enough (up to 7 hours) to have the animals transported to a slaughterhouse and slaughtered. In spite of such a short distance from the farm to the slaughterhouse, a considerable number of untreated animals were dark cutters due to jumping and disturbing each other.

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According to the findings of Champion et al. (1), tranquillizers were successfully applied to broilers during their transport, as poultry became immune against noise and presence of people. The same authors cited also a great number of authors using tranquillizers in order to prevent heat stresses of broilers.

Starting from experiences of Hedrick et al.(2) and partially continuing the research work of Wagner and Salobir (7), we decided to examine the possibilities of "Combelen" application on purpose to prevent the appearance of dark cutting beef in conditions of long-term effect of stress, namely in conditions like those existing during cattle transport to farther destinations.

Materials and Methods

Choice of animals.; - Symenthal young beef bulls 10 to 12 months old weighing 400 kg were used in experiments. Heifers were only exceptionally tested. The advantage was given to bulls owing to their aggressiveness - they jump one over another if left unbound in pens. In each experiment 14 animals were used, 4 of them being control ones. Prior to the experiment, all animals were bound in the slaughterhouse stable for 48 hours being fed and watered regularly. They were slaughtered 22 to 24 hours after being treated.

Tranquillizers.- The effect of "Combelen", "Bayer" preparation, was tested. It is 1% solution of N - (3' - dimethylamino - propyl) - 3 - propionyl - phenothiazin. The preparation was applied

1) as original solution in different quantities, and 2) combined with some preparations for resorption retardation (saponin, aluminium hydroxide and oil with emulsifier). The preparation was produced by the Veterinary Institution in Zemun, according to our conception. The preparation was administered to animal in the quantity containing 1.25 ml of the "Combelen" original solution per 50 kg of animal live weight.

pH-value was being determined by the pH-meter ("Elektron"-Vrhnika pH B_{60} type) with glass electrode (405 type).

Meat colour was determined in m. longissimus dorsi, at surface of the cut between the 11th and 12 th rib, 24 hours after animal slaughter. Experiments were done by daylight. A trained panel consisting of 5 experts from the slaughterhouse evaluated the meat colour by scores ranging from 1 to 10, starting from the lightest to the darkest shade. Scores from 1 to 5 refer to desirable colour and from 6 to 10 undesirable colour.

Results and discussion

Original "Combelen" preparation. - Investigations were carried out in three experimental groups. In all cases animals were i/m injected with tranquillizer and afterwards unbound and put into pens.

The tranquillizer was injected in the following quantities:

Group 1: 1 ml of "Combelen" per 100 kg of the animal live weight

Group 2: 1.5 ml of "Combelen" per 100 kg of the animal live weight.

Group 3: 2 ml of "Combelen" per 100 kg of animal live weight.

In all three cases, treated animals were in the same pen with the controls. The results are presented in Table 1

Table 1

Experimental group	Colour	pH	Number of dark cutters
I	7 - 9	6,4 - 6,9	9
II	7 -10	6,2 - 7,0	8
III	4 - 8	5,4 - 6,1	5
Control	5 -10	5,7 - 7,0	9

Certain animals from the III group were occasionally lying down, unwillingly standing up even when being tread by other animals. Prior to tranquillizer effect, they were very active. First signs of the preparation sedative effect were observed 40 minutes after injection. The animals moved

only when disturbed by untreated bulls. After 6 to 12 hours, the effect of the preparation ceased and bulls were again jumping one over another.

"Combelen"combined with preparations for resorption retardation. -

Group 1: The carrier of "Combelen" was saponin. Animals were unbound and put into pen immediately after being injected.

Group 2: The carrier of "Combelen" was saponin. Animals were put into pen 4 hours after being injected.

Group 3: "Combelen" was combined with aluminium hydroxide. Animals were put into pen immediately after being injected.

Group 4: "Combelen" was combined with aluminium hydroxide. Animals were put into pen 4 hours after being injected.

Group 5: "Combelen" was s/c injected in combination with oil and emulsifier. Animals were put into pen immediately after being injected.

Group 6: This group differs from the previous one only because in it animals were put into pen 4 hours after being injected.

Group 7: "Combelen" was i/m injected into neck muscles. After 4 hours, animals were unbound and put into pen.

The controls were together with treated animals in the cases when the latter were put into pen immediately after being injected (groups 1, 3 and 5). In all other cases the controls were in separate pens.

The obtained results are presented in Table 2.

Table 2

Experimental group	Colour	pH	Number of dark cutters
I	4 - 10	5,4 - 6,2	6
II	3 - 8	5,2 - 5,9	1
III	4 - 9	5,5 - 6,3	5
IV	2 - 8	5,3 - 5,9	1
V	4 - 10	5,4 - 6,6	7
VI	4 - 8	5,4 - 6,2	3
VII	2 - 6	5,2 - 5,8	0
Control	5 - 10	5,6 - 6,9	22

The effect of subcutaneously injected tranquillizer occurs after 3 to 4 hours. Stresses due to mutual disturbances (jumping, fighting) of animals put into pen immediately after being injected and prior to the preparation effect resulted in the appearance of dark cutting beef. Experimental conditions (free moving in the pen) were favourable for the appearance of dark cutting beef; it was established in most controls and in a considerable number of animals put into pen prior to occurence of tranquillizer effect (Table 2, groups 1, 3 and 5).

Animals s/c injected with "Combelen" combined with saponin and aluminium hydroxide showed better results than those s/c injected with "Combelen" combined with oil as carrier (Table 2, groups 2, 4 and 6). Remarkably good results were obtained if "Combelen" was i/m injected combined with oil and emulsifier (Table 2, group 7). However, this way of application cannot be taken into consideration due to the appearance of large edema of muscular and connective tissue at the injection spot.

The application spot is also very significant in the case of subcutaneous injection of the preparation. Injections must not be done into subcutaneous tissue of neck because of the edema appearance which can be enlarged to intramuscular connective tissue. If the preparation is injected into the neck skin fold, the edema of subcutaneous tissue can be removed even without damaging the skin.

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In cases when loading is to be carried out earlier, on purpose not to wait 4 hours after the injection, we tried to administer "Combelen" in combination, namely 3 ml of the "Combelen" original solution plus, per 50 kg of animal live weight, the quantity of the preparation with aluminium hydroxide containing 1.25 of the "Combelen" original solution. Animals were put into pen 40 minutes after being injected.

The obtained results are presented in Table 3.

Table 3

Groups	Colour	pH	Number of dark cutters
Treated animals	2 - 7	5,3 - 6,0	1
Controls	4 - 9	5,4 - 6,7	3

Opposite to the results obtained by Hedrick et al. (2), our results demonstrate that suitable choice of tranquillizer as well as application method show certain chances for the prevention of dark cutting baby beef. Having in mind that animals respond differently both to stimulation and to tranquillizer effect, our results cannot be considered final since the experiments covered a low number of animals.In a further study, they must be re-examined in the conditions existing during cattle transport to farther destinations and on a great number of animals. In addition, it should be examined whether the tranquillizers are retained in meat or in some internal organs (brain, heart and others).

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Summary

The "Combelen" original solution, administrered i/m in quantity of 2 ml per 100 kg of animal live weight, does not prevent the appearance of dark cutting baby beef if animals were subjected to stronger and longer stress effect.

"Combelen" combined with preparation for its resorption retardation (saponin, aluminium hydroxide, oil and emulsifier) was effective if s/c injected into the neck fold of animals 4 hours prior to being subjected to stress effect.
Combinations with saponin and aluminium hydroxide were more effective than those with oil. At the application spot, an edema of subcutaneous tissue occurs producting no economic loss. Intramuscular administration of "Combelen" in oil, although showing the best protecting effect, cannot be taken into consideration due to edema appearing in muscular and connective tissues.

The quantity of preparation containing 1.25 ml of the "Combelen" original solution is injected per 50 kg of animal live weight.

To accelerate the tranquillizer effect, each animal is i/m injected with 3 ml of the "Combelen" original solution, 40 minutes prior to transport, plus s/c injected into the neck fold with the quantity of preparation containing 1.25 ml of the "Combelen" original solution per 50 kg of live weight.

Our results ought to be re-examined on a greater number of animals.

VERHINDERUNGSVERSUCH DER ERSCHEINUNG EINER DUNKLEN FAERBUNG DES FLEISCHES VON JUNGEN MAST-RINDERTIEREN

Zusammenfassung

Combelen appliziert als original Präparat i/m in einer Menge bis 2 ml auf 100 Kg des Lebendgewichtes verhindert nicht die Erscheinung einer dunklen Färbung des Fleisches, wenn die Tiere einer stärkeren und langdauernder Schockwirkung unterzogen werden.

Kombination des Combelen und der Mittel die seine Resorption verlangsamen (Saponin, Aluminium hydroxid, Oel und Emulgator) zeigten sich wirksamer, wenn sie in die Halsfalte appliziert werden und zwar 4 Stunden vorher, bevor die Tiere der Schockwirkung unterzogen werden. Wirksamer sind die Kombinationen mit Saponin und Aluminium hydroxid, als mit dem Oel. An der Applikationstelle entsteht Edem des Unterhautgewebes, was aber keine ökonomischen Schaden darstellt. Intermuskuläre Applikation des Combelen in Oel kommt nicht in Betracht, obwohl die beste Schutzwirkung wegen Edem das in Muskel und Bindegewebe entsteht, zeigt.

Jene Präparatmenge die in sich 1,25 ml original Combelen enthält wird auf 50 Kg des Leibgewichtes injiziert.

Wenn man die Wirkung der "Trankileiser" beschleunigen will, wird einem jeden Tier i/m 3 ml original Präparat Combelen 40 Min vor dem Transport und auf jede 50 Kg des Lebendgewichtes jene Menge des Präparates injiziert die in sich 1.25 ml original Combelen enthält.

Diese Resultate müssen noch an einer grösseren Zahl von Tieren überprüft werden.

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