6 - 18 DRY LIVEX BLACK AND ITS MEDICAL APPLICATION

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Blood is a valuable albuminous material, as it contains up to 18 per cent of proteins, i.e. not much less than lean meat, hence its nutritive value is similar to that of cattle meat. With this regard in many countries the investigations concerned with the utilization of blood are directed towards its rational collecting and processing, first of all for consumption purposes, and then for animals feeding. For consumption purposes the blood plasma is also used, obtained mainly by means of centrifugation. Another fraction obtained in the centrifugation process is a blood cell condensate, the utilization of which is minimal or next to none. The main difficulty in its utilizing is a negative PER coefficient, resulting from the isoleucine : leucine proportion./2/

The fundamentals of biotechnological processing of animal blood and its fractions aimed at obtaining different forms of livex are presented in the proceedings of the XXX Meeting of European Meat Research Workers in Bristol, which enclose also a biotechnological method of black livex production./3/

For the production of the modified black livex a blood cells condensate is used, mixed with hardening substances and whey.

After several minutes a raw black livex is obtained, with the jelly consistency and brown-black colour. Directly after hardening the raw black livex is pasteurized in water at 80°C for 40 minutes, in pieces which diameter should not exceed 50 mm. After the pasteurization the obtained fresh black livex is coloured brown-black on the entire cross-section. The fresh black livex differs substantially from the blood cells condensate. And so the blood cells condensate is strongly contaminated with psychrothrophic and mesophilic bacteria, their number amounting to ca 10^7 cells/g, and the number of the Enterobacteriaceae is ca 10^5 cells/g. In the raw black livex the numbers of bacteria are similar. Table 1.

In result of the proper thermal processing a reduction of the mentioned bacteria in the fresh black livex to the level of 7 logarythmic cycles takes place. A residual microflora is composed mainly of the bacteria introduced with whey, such as the genus of Bacillus and micrococci. In the final product, however, no bacteria of Enterobacteriaceae family, coagula - positive staphylococcus nor Sporogeneous anaerobes are absent. A logical consequence of the bacteria number reduction in the fresh black livex is its stability which at 4°C is 16 days, whereas the total number of psychrotrophic bacteria is on the level of 10^4 cells/g.

Period of gvarance for a fresh black livex stored in refrigerating conditions is 14 days, hence it is possible to collect the batches of the fresh black livex during several days and then dry them together.

In the fresh black livex the content of dry matter amounts ca 28 %, protein ca 25 %, while in the blood cells condensate those values are higher /Table 2/.

The analysis of aminoacid composition is presented in Table 3. As it can be seen from the Table 3, the relation between the aminoacid content in the fresh black livex and the dried one is unbalanced, when compared to the FAO standard, and e.g. the proportion isoleucin : leucin in the fresh black livex is 1 : 37.

The prolong from of stability of the fresh black livex, a dry black livex is produced. A chemical composition of the dry black livex is similar to that of the fresh one, only the water content is lower. The water content in the fresh black livex is about 72 %, whereas in the dry livex it is not higher than 10 %.

The dry black livex contains many mineral compounds, particularly iron /ca 0,5 %/, copper /0,0001e %/, and zinc /0,003 %/, Table 2. It should be stressed that the dry black livex modified with whey is the only natural product with such high concentration of easily absorbed iron. For example, the products commonly regarded as containing high amounts of iron and the consumption of which is recommended in order to prevent anaemia, such as spinach, raw bovine liver or yolk, contain 3 to 6 mg of Fe in 100 g, whereas in the same amount of dry black livex the iron content is 62 to 166 times higher.

High iron content in the dry black livex, the presence of such microelements as copper, zinc as well as globin allow for an assumption that the livex can be used for medical purposes.

Such studies have been done in Dept. of Animal Internal Diseases of Agricultural Academy in Wrocław and referred to phyziological anaemia of piglets /Janiak and al. -1985/ 1/

The investigations were carried out on 200 piglets, 3 days old, in two big industrial farms, one of very good zootechnical conditions /farm I/ and the second of mean conditions /farm II/. Both were runless pig farms.

Piglets were divided into 4 groups. The first group obtained 10 g of black livex daily with feed orally or by means of spoon starting from the 14 life day and took it over 14 days. Piglets of the II group obtained in 3-d life day 2 ccm of Ferrodex /150 mg/ of iron/ and next starting from the 14 day livex orally over next 14 days. The piglets of the III group received beginning with the 3-d life day only Ferrodex and the IV group got neither Ferrodex nor livex. Clinical observations and the weighing of animals were carried out in both farms besides control laboratory tests were done in farm I.

The weight increases differed among the I, II, III and the IV group in farm I and attained almost 6 kg /19,5 - 13,9 kg/ at the 81 life day while at the farm II after 41 life day the difference among the I and II group in comparison with IV group was exactly 2 kg /6,3 - 4,3 kg/. The difference between the group which obtained only livex and that which got only Ferrodex was over 0,5 kg with advantage of livex.

It is worth to mention that in group IV of both farms, as well as in group III in farm II did happen collapses of animals and the necessity of animal selection was imminent. There was no collapses in the I and II groups and the selection in these groups did not exceed one individual.

The results of clinical studies permit to suppose that the advantageous livex activity is due to the presence of different micro- and macroelements as well as chemical compounds which are not present in Ferrodex. Basing on these results it may be suggested that their presence influences assimilation of iron and the metabolic processes of the organisms.

These supposition has been confirmed by blood laboratory tests of piglets. Carried out in the farm I. In these studies such parameters were taken into account as the amount of erytrocytes, haemoglobin, leucocites, total protein, albumin, alfa-, beta- and gamma globulines, urea, iron and copper as well as packed cells volumen /PCV/, mean corpuscules volumen /MCV/, mean corpuscular haemoglobin /MCH/ and mean corpuscular haemoglobin content /MCHC/. The results obtained are presented in "Wiadomości Weterynaryjne" /Janiak and al., 1985/ and now I would like to limit the presented material to the statement that for many mentioned indicators the advantageous action

of livexes on piglets was found not only in comparison to the test group but also with the group which got only Ferrodex. The advantageous activity of livex is seen primarly in the number of erythrocytes, amount of haemoglobin, PCV, the amount of gamma globulins, the concentration of urea and mainly in the contents of iron and copper.

In the same study, independently on the indicators mentioned above, it was shown, that the consumption of oxygen by piglets which got only livex was the highest and attained 7,93 to 9,28 ccm while those which got Ferrodex and livex achived 5,6 ccm. In remaining groups the consumption was low and attained for piglets which got only ferrodex 2,97 ccm and those of last group 3,56 ccm.

The results obtained explain two observations made at clinical studies concerning animal collapses and the weight increase indicators. It may be supposed that the lack of collapses is the signal of increased immunity resulting from the high level of gamma globulins, and the higher weight increases due to increased metabolism resulting from greater oxygen consumption.

In order to define the iron reserve in the organisms the piglets were slaughtered. It was found that in liver and spleen the amount of this element has doubled in case of those piglets which got livex. In liver the amount of iron was 620 ppm while in solen 200 ppm. It may be suggested that such high level of reserve will protect correct conditions of further breeding of these animals.

The results obtained have prompted PPF "Polfa" to further activities in order to use livexes for medicinal usage for animals and human beings. At present the Dept. of Animal Internal Diseases of Agricultural Academy in Wrocław has started further investigation to optimalisation of the method of administering black livex to piglets, besides PPF "Polfa" has asked the State Commision of Drugs about its opinion on the application of livexes in human medicine.

Expecting a positive opinion it was decided that the test studies would be carried out on anti-anaemia activities by the following clinics of Medical Academy of Wrocław

1/ Hematology Clinic
2/ Pediatry Clinic
3/ Pathology of Pregnancy Clinic
4/ Angiochirurgy Clinic

From the presented data it follows that the investigations made so far had been concentrated on black livex. In the near future studies will start on the therapeutic properties of brown modified livex, which may be used as an anabolic like drug.

literature:

1. Janiak T., Z. Hejłasz, J. Nicpoń, A. Kliś, A. Krzyżanowski, J. Wojda, Nowości Weterynaryjne, in press.
2. Tederko A., J. Janas, 1978: Wyniki najnowszych badań nad możliwością wykorzystania białek krwi na cele spożywcze, Gosp. Mięs. 30 /11/, 10-13.
3. Zaleski S.J., L. Kumor, B. Ławik, A. Malicki, M. Szubińska, R. Tereszkiewicz, 1984: XXX Meating of European Meat Research Workers in Bristol, 7.3.

Table 1. Number of bacteria in blood cells condensate and black livexes

Bacteria	Number of bacteria in 1 g				
	blood cells condensate /liquid form/	raw black livex /not pasteurized/	black livex		dry black livex, dried directly after pasteurization and stored at 22°C for three months
			directly after pasteurization /80°C through the chimney/	after 15 day storage at 4°C	
psychrotrophic	$2,4 \times 10^7$	$2,3 \times 10^7$	$0,36 \times 10^1$	$2,3 \times 10^3$	$2,3 \times 10^2$
mesophilic	$4,6 \times 10^7$	$4,3 \times 10^7$	$0,93 \times 10^1$	$7,5 \times 10^3$	$4,3 \times 10^2$
milk fermentation	$2,3 \times 10^7$	$2,3 \times 10^7$	$2,3 \times 10^1$	$2,3 \times 10^4$	$4,3 \times 10^2$
staphylococcus coagulase positive	absent	absent	absent	absent	absent
enterobacteriaceae family	$4,0 \times 10^5$	$3,0 \times 10^5$	absent	absent	absent
proteolytic bacteria	-	-	-	-	absent

Table 2. Chemical evaluation of blood cells condensate fresh black livex and dry black livex

No.	Subject of testing	blood cells condensate /liquid form/	black livex modified with whey	
			fresh	dry
	content of: /in %/			
1	dry matter	33,0	28,0	97,84
2	protein	30,0	25,0	89,1
3	fat	0,9	0,24	1,0
4	BWA	-	-	3,0
5	Fe	-	-	0,5
6	Ca	-	-	0,29
7	Mg	-	-	0,03
8	Zn	-	-	0,003
9	Cu	-	-	0,00018

Table 3. Aminoacid composition of fresh and dry black livex

Aminoacid type	Aminoacid amount in grammes per 1 kg of livex	
	fresh black livex	dry black livex
Aspargic acid	26,55	111,4
threonine	6,85	29,04
serine	10,22	43,21
glutamic acid	20,34	80,70
proline	9,08	27,66
glycine	10,85	44,71
alanine	17,48	78,81
cystcine		
valine	24,13	70,78
methionine		
isoleucine	0,84	2,93
leucine	30,45	124,9
tyrocine	4,6	21,33
phenylalanine	15,92	64,65
lysine	20,26	81,4
histidine	22,76	67,56
arginine	12,37	39,63

The analysis was done by means of the automatic analyser of aminoacids, Carbo Erba type 3A 27.