

Lydyer

HISTOLOGICAL CHANGES IN MUSCLES THROUGH INSUFFICIENT DIET ?

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Introduction

In relation to investigations to the influence of antibiotics added to the rations of pigs, I got the opportunity to do histological examinations in the musculature of these pigs, whether there were histopathological changes or not.

In the experiments 60 pigs, divided into 4 groups of 15 each, were used. The first group received a normal ration; the second got the same diet with the addition of antibiotics. The remaining groups got the same diet with an equivalent of vegetable protein percentage instead of animal protein. So, because of this insufficiency, they were used as negative controls. For the fourth group's diet, antibiotics were added. Pigs up to 50 K.G. body life weight got ration A; after reaching this weight ration B was used. (See for the rations table 1).

For the antibiotics aureomycine (20 m.gr. per K.G. meal-mixture A and B) and terramycine (10 m.gr. per K.G. A and 11 m.gr. per K.G. B-mixtures) were used. In the case of the second and fourth group 7 pigs got aureomycine, while 8 got terramycine.

The meal-mixtures were composed of as follows:

<u>Table 1.</u>	Positive controls (group 1 and 2)		Negative controls (group 3 and 4)	
	<u>A</u>	<u>B</u>	<u>A</u>	<u>B</u>
Barley	51	48	49.5	48
Maize	15	25	15	25
Oats	10	-	10	-
Rye	-	10	-	10
Wheat bran	10	-	10	-
Herring	8	-	4	-
Animal	-	5	-	2
Soy	-	6	5	8.5
Gras (dried)	5	5	5	5
Minerals	1	1	1.5	1.5
Vitamins (A-D <sub>3</sub> )	0.05	-	0.05	-

/The.....

The total protein percentage in all rations was within the usual range. Nevertheless the substitution of animal proteins by vegetable ones, was to be considered as a fact, which made the rations of the negative controls more or less insufficient.

#### Materials for examination.

After reaching a weight of 90 K.G., the pigs were slaughtered in a meat-factory. Out of each pig two muscle samples were taken out for examination, namely one part of the Musculus Carpi Radialis and one out of the Musculus Psoas. After fixation in 10% formaline, embedding in paraffin and cutting in 10 micron sections, we used the Haematoxylin-eosin and the van Gieson stains. Canada balsam was used for mounting.

#### Examinations.

Our purposes of this investigations were:

1. to find out whether there were changes in the musculature or not, and if present, what kind of changes and in which frequency they would to be seen.
2. to point out if there were differences in these changes between the groups used in this experiment.

After orientation and comparative examination of these sections with normal muscular tissue, it appears that there was a great deal of changes in the muscles of a great number of our pigs.

Here we give a short review about the histology of normal muscular tissue. In this we only find muscle fibres with nuclei, peripherally distributed, and a very slight netmesh-work of collagen fibres. Capillaries are hardly to be seen in muscular tissue of animals, when they are slaughtered, and bled to death. The collagen tissue round the bundles of fibres of course are stronger and show small vessels, nerves and nuclei of fibroblasts.

In the muscular tissue of the examined pigs changes of different types were found and divided in three groups:

/1. degeneration...



1. degeneration of some of the muscle fibres of varying degrees, from the acute to the chronic state, nearly always together.
2. increase of the intermuscular connective tissue, especially of fibroblasts, indicating a more chronic situation.
3. acute cellular activity of the connective tissue cells, only to be seen in the margin of the muscle bundles.

Explanation of those foregoing points.

1. The acute degeneration was marked out by:
  - a. a darker discolouration of the muscle fibres.
  - b. the falling down of the fibres into pieces.
  - c. the displacement of the nuclei from the normal peripheral to a more or less central situation.
  - d. the appearance of connective tissue nuclei around and in the decayed fibres and
  - e. the increase of collagen fibres around and in the degenerated fibres.

The chronic form was manifested out by:

- a. the fibre rests are more rounded.
  - b. the formation of a wide lymphsheath around the fibre rests and
  - c. the formation of a well differentiated collagen wall containing small blood vessels around this lymph-sheath.
2. The increase of connective tissue always was slight and sometimes difficult to be pointed out. Increase of collagen fibres was hardly to be seen, but the number of nuclei of connective tissue cells was more or less increased. In those cases they never showed any activity.
  3. Acute cellular activity of the connective tissue cells was never found in the centre of the muscle fibre bundles but always going out from a rather heavy connective and tendinous tissue. Often it seemed that through this activity the adjoining muscle fibres were affected and degenerated.

In table 2 we want to give a survey of all the changes, found by the microscopical examination.

/Table 2.....



Tabble 2.

Kind of changes		Degenerated muscle fibres	Increase of connective tissue		Acute cellular activity of c. tissue	
Examined muscles		M.C.R./M.Ps.	M.C.R./M.Ps.		M.C.R./M.Ps.	
Group 1.	pos.controls	6+50(n) 8+11	7+	1+	3+	-
" 2.	" " + antib.	10+29 6+2	11+	-	4+	-
" 3.	neg. " 11+11(n)	10+13(n)	9+	-	8+	-
" 4.	" " + antib.	13+37 10+9	10+	-	4+	-

Explanation of the table.

It is to be known, that each group consisted of 15 pigs. The numbers preceeding the positive sign are the numbers of pigs in which changes in the muscles were found, the numbers following it are the totals of the frequency of the changes. The letter n is used in three cases with the utmost alterations; the two n's in group three refer to different pigs.

Results and discussion.

Out of these investigations we came to the conclusions that:

1. the composition of the used rations of these pigs have caused histopathological changes in a good deal of the examined muscles in varying degrees of intensity.
2. the Musculus Carpi Radialis was a seat of more alterations than the Musculus Psoas.
3. both groups of the negative controls were the seats of most of the changes.
4. in the groups, which got no antibiotics were the cases with the utmost changes.

After all it was a surprise for us to find the alterations we have just mentioned, because we have never heard that, giving a rational diet to pigs, degeneration and other changes mentioned before, were found in the muscles. Of course we have to realise, that we will never find the most perfect diet for pigs, but always we are trying to approximate the ideal one. It seems us recommendable to pay more attention to the question and to do more histological investigations on the musculature of slaughter-animals. This is the reason why I asked your attention at this moment.