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Meat quality

QUANTIFICATION OF PYRIDINOLINE COLLAGEN CROSSLINKS IN SEMI-MEMBRANOUS MUSCLE OF PIGS WITH DIFFERENT AGES AND WEIGHTS BY IMMUNOASSAY.

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ABSTRACT

Intramuscular collagen in semi-membranous muscle had been studied by immunoassay of pyridinolines. Work was carried out on three different groups of pigs with Pi x LW genotype. Group 1 had a mean slaughter age of 197 days and mean weight of 130 kg, group 2 were slaughtered at mean age of 163 days and mean weight of 100 kg and group 3 were slaughtered at mean age of 197 days and mean weight of 100 kg. When comparing the three groups of pigs, no significant difference in the quantity of intramuscular collagen was found. The study of intramuscular collagen by quantification of pyridinolines in *semi-membranous*, showed two significant points.

The first is the influence of age:

- the group 1 and group 2 animals had similar alimentation but were slaughtered at different ages; a link ($p < 0.05$) was found between the pyridinoline-collagen ratio and age; the younger group of animals had a lower concentration of pyridinolines.

- group 2 and group 3, had identical weights but were slaughtered at different ages. The youngest animals (group 2) had significantly ($p < 0.05$) lower pyridinoline to collagen ratio compared with to older animals.

The second is the influence of alimentation:

- from the two groups of same slaughter age (group 1 and 3), group 3 was found to have a lower ratio of pyridinoline to collagen content. However it would be necessary to carry out a more extensive investigation in order to confirm these results.

The immunoassay permits the evaluation of concentrations for two different pyridinoline molecules quickly and easily. The result obtained conforms with the literature, but it is necessary to confirm this technique by HPLC method. New research is being carried out in this field.

INTRODUCTION

After cooking, young and old animals contain similar collagen (cot) concentration in their muscles but differ significantly in their level of tenderness. This phenomenon can be explained by crosslinks, which are more important in older animals. Several molecules have been identified for this function. Two have been retained for our study: lysylpyridinoline (LP) and the hydroxyllysylpyridinoline (HP). Works by Bosselmann et al. (1995) and Moriguchi et al. (1978) have demonstrated that the content of pyridinolines (pyr) in collagen in tissues varies according to age; older animal tissues contain greater concentrations.

The concentration of pyridinolines are often determined by chromatography HPLC phase reverts (Bosselmann et al., 1995). In addition to this technique there are immunoassay methods, which are easier to use (Seyedin et al., 1993; Robbins S.P., 1982). After extraction of pyridinoline from *semi-membranous muscle*, the quantity of pyridinolines LP and HP was determined by immunoassay. The antibody used has the same affinity for HP and LP molecules (PYRILINKS Metra Biosystems, inc.).

The animals used were female pigs of genotype (LW x Pi). These were fed different diets (abundant or restrictive) and slaughtered at different ages. The object of this work is to verify the influence of the mode of growth and age on the quantity of pyridinolines in intramuscular collagen of *semi-membranous muscle*.

MATERIALS AND METHODS

Three groups of female pig of Pi x LW genotype and weight and age characteristics controlled were studied (table I) (figure 1). The extraction of the pyridinolines at muscular level was carried out according to the procedure described by S.P. Robbins (1982). A PYRILINKS Metra Biosystems, inc., Mountain View, U.S.A. ref. 8010 kit was used for this assay. The total collagen was found by a similar technique used by Bonnet et al. (1978).

RESULTS

By variance analysis no significant differences were found for the pH, the percentage of dry material and the quantity of intramuscular collagen between the three groups. However when comparing the mole/mole pyridinolines collagen ratio (figure 2) between the three groups by variance analysis, a significant difference was observed. Concerning the influence of age and weight on pyridinolines collagen crosslink, by variance analysis (Kruskal-Wallis), a statistically significant difference ($p < 0.01$) was shown between the level of pyridinolines of group 2 compared with the other two groups.

CONCLUSION

The study of intramuscular collagen of *semi-membranous* gave two results: The first concerns the influence of age:

- animals of group 2 and 1, slaughtered 34 days apart, showed a significant difference ($p < 0.05$) in the concentration of pyridinolines molecules to molecules of collagen, animals of group 2 having a lower concentration to that of group 1.

- groups 2 and 3 had identical weights but different ages. The youngest animals proved to contain a lower concentration of pyridinoline molecules ($p < 0.05$). The second result concerns the influence of feed: - two groups of pigs with the same age but different diets and weight (batch 1 and 3), and with slow growth showed a low pyridinoline concentration, although it would be necessary to confirm these results on greater numbers of pigs.

These results confirm work done by Bosselmann et al., (1995) and Moriguchi et al., (1978) that is the influence of age on the quantity of pyridinoline.

In terms of the pyridinoline immunoassay it is interesting in value as it is: an easy quick technique, practical on a great number of samples and in all laboratories.

However, it is necessary to compare this method with the HPLC method by using the same muscle medium. The validation to the level of pyridinoline in urin has already been realized (Seyedin and all., 1993).

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group	mean age of slaughter (days)	mean weight of slaughter (kg)	n
1	197	130	14
2	163	100	15
3	197	100	15

table I : partitioning age/weight of pig at slaughter

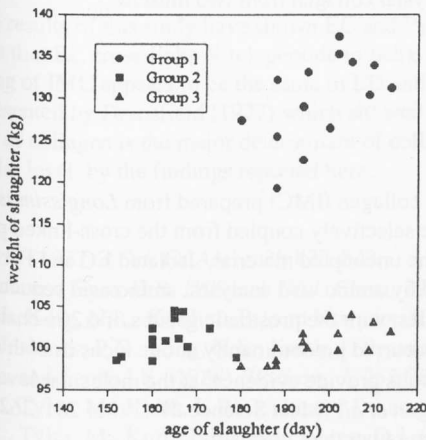


figure 1 : partitioning age /weight of female Pi x LW pigs.

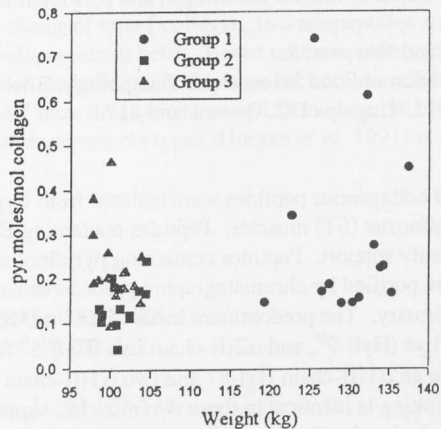


figure 2 : partitioning of mole/mole pyridinolines collagen ratio as a function to the weight of slaughtered pigs.
group 1 mean : 0.28 ± 0.18 pyr mole / col mole
group 2 mean : 0.14 ± 0.05 pyr mole / col mole
group 3 mean : 0.22 ± 0.09 pyr mole / col mole