CALPAIN ACTIVITY IN BEEF, HORSE AND HEN MEAT. EFFECT OF CALCIUM CHLORIDE AND MARINATION TIME.

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Background

Calpain activity had been associated to muscle tenderization (Parr et al., 1999). When meat is treated with calcium chloride, maturation time can be reduced producing certain degree of proteolysis (Lee et al., 2000). The optimum conditions to activate calpains are 25°C and pH 7.5, but the minimum calcium requirement seems to be independent of temperature(Cottin et al., 1991).

Nonetheless, some sensory properties like flavor and odor could be altered with this process (Lansdell et al., 1995). A bitter residual flavor had been reported in horse and rabbit meat marinated (Scanga y col., 2000). In this way, for different species is necessary to determine the marination time and calcium concentration to activate calpain system.

Objectives

The objective was to know the marination time and calcium chloride concentration needed to activate calpains in beef, horse and chicken meat.

Methods

Samples of *Longissimus dorsi* were taken from the right side of carcasses. Half of the muscle was treated with 75, 150 and 250 mM CaCl2 during 24 and 48 h at 4ºC, and the other half, stored at 4ºC, was used a control. Beef and horse meat samples were obtained from local abattoirs 18 h after slaughter. Chicken meat sample were obtained from the animal house at the University, shortly after slaughter and evisceration. Therefore, the meat of this specie, was in a pre-rigor condition.

Enzyme activity was determined by the methodology reported by Etherington et al. (1987), using pepstatin and leupeptin as inhibitors, reporting enzyme activity as mg of casein solubilisated/min/g of muscle.

Results and discussion

Calcium marination had been reported to improve meat in pre rigor (Koohmaraie et al., 1990) and post rigor meat (Alarcón-Rojo and Dransfield, 1989). This is due to the calpain activation with calcium chloride marination or the injection of calcium chloride in the carcass. Nonetheless, optimum concentration had been discussed. Morgan et al. (1991) using a 300 mM $CaCl_2$ concentration found a metallic and bitter flavor in the meat treated with this calcium concentration. Diles et al. (1994) using the later calcium chloride concentration reported an increase in meat juiciness, tenderness and palatability, postulating that this was the optimum concentration injected 24 h post mortem. Whipple y Koohmaraie (1992) found the same effect using a 150 mM $CaCl_2$ marination during 48h. Our results indicate that using 150 mM $CaCl_2$ the calpain activity is major, in agree with Whipple and Koohmaraie (1992). Maximum activity in horse meat was at 24 h and a 250 mM $CaCl_2$ concentration, but the activity was lower than beef. Hen meat had the maximum activity after 24h, with no difference between 150 and 250 mM $CaCl_2$. This high activity in minor time could be due to the to the presence of a third protease with same calpain I activity (Sorimachi et al., 1994).

Conclusion

Calcium chloride marination affected in different way the enzyme activity, depending mainly on animal specie. Increasing in enzyme activity could be reflected in a tender meat. Sensory analysis had to be done in order to determine the bitter flavor development during marination.

Pertinent literature

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Table 1. Enzymatic activity in beef , horse and hen using 3 $CaCl_2$ concentrations*

Animal specie	$CaCl_2$	24 hr	48 hr
Beef	75 mM	659.142*	732.000
	150 mM	751.428	1354.571
	250 mM	932.285	1037.428
Hen	75 mM	452.000	454.000
	150 mM	431.142	467.714
	250 mM	476.285	434.571
Horse	75 mM	432.571	434.571
	150 mM	449.714	426.285
	250 mM	448.285	422.571

* micrograms of casein solubilisated /min /gr of muscle