MEAT QUALITY IN MALE PIGS: EFFECTS OF CASTRATION AND TRENBOLONE ACETATE IMPLANTING.

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INTRODUCTION

Castration of the male in meat-producing animals have been a traditional practice of commercial livestock. In most countries pigs are castrated early in life mainly to prevent the problem of boar taint in meat, although numerous research studies have indicated that intact porcine males utilize feed more efficiently and produce a leaner carcass than their correspondig castrated (Fuller, 1985). Nowadays, more efficient production of leaner carcasses have been highlighted because of the declining demand for pork fat. It is clear that large savings would result from production of entire male pigs instead of castrated. Consumer preferences for leaner meat and producers´ need for more efficient production have stimulated researches to investigate production systems that optimice production advantages and result in meat quality and palatability similar to that of castrated. A possible alternative to castration is to use doses of androgens to decrease the levels of endogenous steroid synthesis and consequently boar taint presentation (López-Bote & Ventanas, 1988; Ventanas et al, 1989).

In studies cited by a review of Field (1971), meat obtained from intact males was less tender than meat from castrated. Factors influencing the amount and strength of intramuscular collagen have been linked to animal age, sex and breed (Andersen et al, 1977; Cross et al, 1984). All of then closely related to testosterone levels (Unruh, 1986). Several reports indicate that collagen solubility decreases with animal age (Cross et al, 1984). On the other hand, it has been also reported that there are essentially no differences in meat quality as a consequence of castration in pigs with respect to pigment content and characteristics expressing PSE/DFD status (Barton-Gade, 1987). The aim of the present work was to carry out a within litter comparison of meat quality in boars, castrated and trenbolone acetate implanted entire male pigs.

MATERIAL AND METHODS

The experimental material consisted of 36 animals divided in three groups: control (12 entire male pigs), castrated (12 castrated non implanted pigs) and implanted (12 implanted entire pigs). Castration was carried out at weaning (21 days) and implantation with 300mg of trenbolone acetated (Roussel Uclaf. France) at 50 Kg live weight. All animals were slaughtered at 6 months of age.

At slaughter serum samples were collected and placed in frozen storage until analysed for testosterone content. This was carried out with radio-immunoassy after extraction with diethyl ether. Testicle weight and diameters and carcass weight were recorded. pH measurement was determined at 45 minutes (pH_1) and 24 hours (pH_2) after slaughter. Water holding capacity (WHC) was determined according to the method of Goutefonguea (1960). Reflectance and pigment content were determined respectively using an EEL reflectometer (Evans Electroselenium) and the method of Hornsey (1956). M. *Longissimus dorsi* (LD) samples were taken and frozen until analised for protein (Kjeldahl method), fat (Soxhlet) and moisture content. Shear force values was determined with the Warner-Bratzler apparatus from 1 inch diameter samples from LD at two different distances from the spine: 2cm (D1) and 7 cm (D2). Total collagen content and insoluble in 0.6 M buffer (1.1 M KI/0.1 M buffer phosphate) collagen were determined according to the method of Bonnet & Kopp (1984).

Differences between means were tested for significance using the Student's t-test.

RESULTS AND DISCUSSION

Although it have been widely related the role of the endocrine system in the stress-suceptibility in pigs (Lister, Gregory and Warriss, 1981; Ludvigsen, 1987), no essential differences between the three groups under study in characteristics expressing PSE/DFD status have been found in our study. These data suggest that there is not a direct implication of the reproductive system in the aethiology of the stress syndrome. This is in agreement with results from Barton-Gade (1987), that did not find any essential difference between sexes in pigs according to this characteristics.

No differences were found in carcass weight (≃ 82 kg) between the three groups under study, but P_2 measurement of the backfat was statistically higher in castrated animals (2.7±0.60) than in control (1.6±0.38) and implanted (1.7±0.43) groups. Intramuscular fat content was significantly higher in castrated than in control and implanted groups, that did not differ between each other (≃1.30 in control and implated groups and 2.11 in castrated, this difference being significative).

The lower levels of fat in non-castrated groups must be consider as a favourable character due to the tendency towards reducing fat production in meats animals.

Besides the effect on the reduction of boar taint in entire male pigs previously reported (Ventanas et al, 1989), trenbolone implanting may affect the meat quality of boars by several modes, which may be explained partially by the sensitivity of a negative feedback system on the hypothalamic-pituitary axis. Important changes may be associated to carcass and meat quality due to the possible alteration of varios hormonal secretions of the pituitary and other endocrine glands that high doses of androgens may create. Our reported data suggest a higher intramuscular collagen content and an earlier maturation (increased percentages of nonreducible cross-links) from entire male than from implanted, and these in their turn than castrated (Figure 1). This lead to significantly higher shear force values in muscle *Longissimus dorsi* in control than in implanted or castrated male pigs in D1 ($P<0.01$) and not so marked, but still evident, in D2 (Figure 1).

In a study in bulls, Unruh et al (1986) suggested that the increase in collagen content at puberty was due to an increase in collagen synthesis related to the hormonal changes occuring during puberty e.g. increase testosterone levels. Trenbolone may decrease levels of luteinizing hormone (Deschamps et al, 1982), reduce testicle size (Unruh et al, 1986) and decrease gonadal hormones (mainly testosterone). In our study a significative reduction of the testicle weight have been found in implanted animals in relation to controls (188.1±74.37 g in controls versus 72.2±49.98 g in implanted). Decrease testosterone synthesis and concentration (Figure 1) may then delay collagen synthesis and accumulation of mature collagen in the feeding period. Correlation coeficient between testosterone serum concentration and total and insoluble collagen were significative ($r=0.68$ and $r=0.5$ respectively). Therefore we conclude that implantig with trenbolone may improve certain palatability traits of entire pigs by delaying the hormonal effects associated with puberty on the accumulation of mature collagen.

Trenbolone seems to have identical ability than testosterone in the stimulation of producing potential in male pig, but not implies the negative effects that this hormone provoke in collagen synthesis and

insolubilization, which is closely related mainly to testosterone.

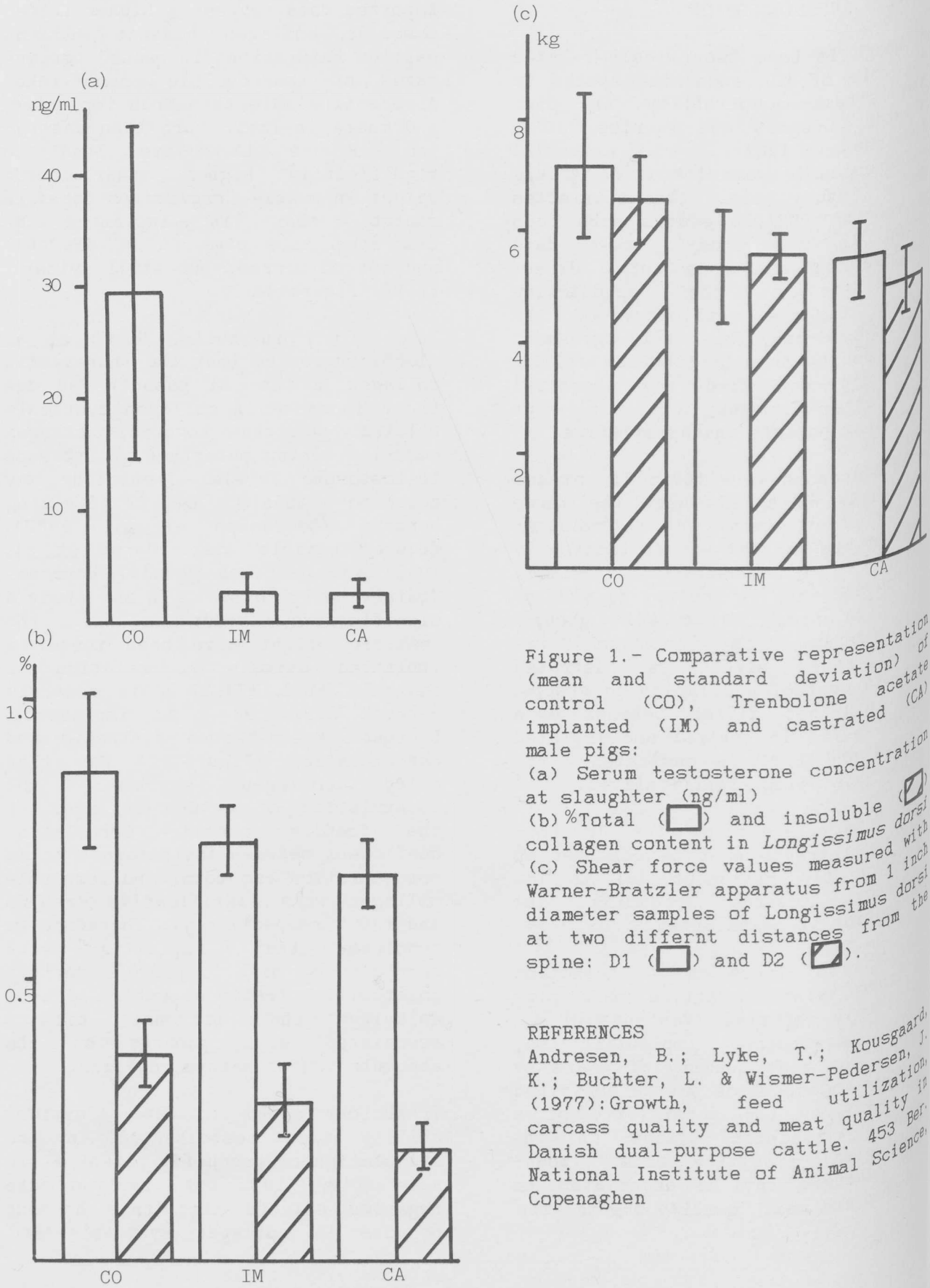

Figure 1.- Comparative representation (mean and standard deviation) of control (CO), Trenbolone acetate implanted (IM) and castrated (CA) male pigs:
(a) Serum testosterone concentration at slaughter (ng/ml)
(b) %Total (□) and insoluble (▨) collagen content in *Longissimus dorsi*
(c) Shear force values measured with Warner-Bratzler apparatus from 1 inch diameter samples of Longissimus dorsi at two differnt distances from the spine: D1 (□) and D2 (▨).

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