# BEEF PRODUCTION FROM DAIRY HERDS: DETAILED MINERAL PROFILE OF VEAL AND BEEF MEAT

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## I. INTRODUCTION

Genetic selection carried out in the intensive dairy systems to improve milk production traits has led to the worsening of the meat attitude of many cattle breeds. It has also led to reduced fertility and longevity of dairy cows, which implies a higher turnover of the dairy herds. For these reasons, male purebred dairy calves have little or no value to farmers. The introduction of sexed semen helped reduce the number of cows needed to replace those at the end of their productive career, leaving excess for crossbreeding with beef breeds to increase the meat production and the profit of dairy farmers [1]. The aim of the present study was to compare the detailed mineral profile of the meat of beef cross-bred calves obtained from dairy farms using sexed semen to produce purebred replacement, and subsequently retained for fattening on the dairy farm (breeder) or sold to specialized intensive veal and beef fatteners.

## II. MATERIALS AND METHODS

A total of 231 calves were monitored and sampled after slaughter: i) 12 beef × dairy crossbred calves reared and fattened on the dairy farm where they were born; ii) 104 beef × dairy crossbred calves intensively fattened for veal production; iii) 72 beef × dairy crossbred calves intensively fattened for beef production; iv) 26 purebred Charolais and 17 crossbred yearlings from suckler cows of mixed beef breeds fattened for beef production. After 7 days ageing at 4 °C, meat quality analyses were carried out on the *Longissimus thoracis* samples. The detailed mineral profile was obtained by the Inductively Coupled Plasma – Optical Emission Spectrometry (ICP-OES) technique. Statistical analysis was conducted on the mineral profiles using a linear model where the farming system and the crossbreeding combination were included as fixed effects and the farming system was tested on the error line of the breed combination within farming system. Details on fattening and slaughter characteristics and on meat quality of crossbred calves are found in previous works [2, 3].

## III. RESULTS AND DISCUSSION

Orthogonal contrasts between the least squared means of the farming systems show that most of the differences are between the veal and beef systems (Table 1). The veal meat is richer in macro elements, in particular Na, Mg, K, and Ca, provided by milk-based meals. Instead, it is poorer in essential micro-minerals, in particular Fe and Zn that are respectively 3 and 2 times higher in beef meat. The environmental micro-minerals tend to be higher in the veal meat, except for the Al. The differences between the crossbred calves fattened in the dairy farm and those fattened by specialized fatteners are almost null, if not for the slightly higher content of Fe, Cu and Zn in the beef from the specialized fatteners. If we take into account the contrasts between the different crossbreed combinations used to produce veal meat, there are almost no differences in terms of mineral profiles between these genetic lines. Also, when beef × dairy crossbreds are instead compared with purebred Charolais and beef × beef crossbreds for the beef production, the differences are small and not noteworthy. This implies a higher impact of feeding system than of the genetic factors on the mineral profile.

Table 1. Least squares means of production systems in the detailed mineral profile of meat (mg/kg) of calves obtained by dairy farms using sexed semen to produce purebred replacement heifers and beef semen to produce beef × dairy crossbred calves, and subsequently retained for fattening on the dairy farm (breeders) or sold to specialized intensive veal and beef fatteners.

| | Farming system | | | Contrast (P-value) | | RMSE |
|---|---|---|---|---|---|---|
| | Specialized fatteners | | Dairy breeders | Veal vs Beef | Beef-fatteners vs. Beef-breeders | |
| | veal | beef | beef | | | |
| Essential macro-minerals, | | | | | | |
| Na | 595 | 414 | 418 | <0.001 | 0.822 | 51 |
| Mg | 239 | 231 | 222 | <0.001 | 0.096 | 18 |
| P | 2036 | 2100 | 2018 | 0.476 | 0.121 | 163 |
| S | 2060 | 2188 | 2136 | <0.001 | 0.257 | 142 |
| K | 3522 | 3288 | 3077 | <0.001 | 0.067 | 357 |
| Ca | 120.6 | 55.0 | 69.6 | <0.001 | 0.262 | 38.9 |
| Essential micro-minerals, | | | | | | |
| Cr | 0.037 | 0.051 | 0.045 | <0.001 | 0.109 | 0.010 |
| Mn | 0.082 | 0.080 | 0.071 | 0.054 | 0.067 | 0.017 |
| Fe | 5.88 | 16.88 | 14.72 | <0.001 | 0.002 | 2.165 |
| Cu | 0.44 | 0.53 | 0.45 | 0.002 | 0.002 | 0.075 |
| Zn | 23.1 | 55.3 | 49.8 | <0.001 | 0.004 | 5.8 |
| Environmental micro-minerals, | | | | | | |
| B | 0.40 | 0.22 | 0.21 | <0.001 | 0.696 | 0.051 |
| Al | 0.66 | 1.09 | 1.31 | <0.001 | 0.262 | 0.564 |
| Ni | 0.088 | 0.087 | 0.056 | 0.065 | 0.155 | 0.042 |
| Sr | 0.044 | 0.028 | 0.025 | <0.001 | 0.621 | 0.015 |
| Si | 1.41 | 1.80 | 2.59 | <0.001 | 0.006 | 0.898 |

RMSE: Root mean square error.

## IV. CONCLUSION

The increase of beef × dairy crossbred calves obtainable because of the use of sexed semen is of great interest for the dairy farms and specialized cattle fatteners because represent a high added value in terms of growth, muscularity and carcase characteristics, but also in terms of meat quality traits and mineral contents.

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