# AN ALTERNATIVE ASSAY OF MEAT PIGMENTATION; THE TOTAL IRON CONTENT

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## INTRODUCTION

The pigment content of meat, i.e. the sum of myoglobin and remaining haemoglobin contents, is a dominant parameter for the visual perception of pork, and hence for consumer appeal. In addition, the "colour" of processed meats is highly dependent on the pigment content of the raw material used in their production. As pigment content may be partly controlled through breeding, objective measures of the entity are needed to evaluate results thus obtained. Furthermore, both objective and direct measures of pigment content are called for as the basis for development of rapid, indirect on-line methods.

Traditionally, pigment content is determined after extraction of the colouring matter (myo- and haemoglobin) from homogenised, finely minced meat.

After a number of operations, the haem parts of the coloured species are ultimately quantified by visual spectrophotometry. This is a laborious, time-consuming procedure, employing hazardous organic solvents. Alternatively, in lieu of quantifying intact haem molecules, determination of the central atoms of the haem moieties, i.e. the iron atoms, will conceptually provide results of equal useability. Below we disclose our preliminary results obtained by comparing traditional pigment content determinations with total iron contents as assayed by atomic absorption spectrometry.

## MATERIALS AND METHODS

Samples were obtained from Danish slaughter pigs of various breeds.

The day after slaughter, samples of longissimus dorsi (n = 272) and biceps femoris (n = 267) muscles were collected and homogenised by mincing. Pigment determinations were carried out in accordance with a modification of the procedure given by Hornsey (Hornsey, 1956). Iron analysis was done as follows: To 5 g of finely minced meat in a Teflon container was added 10 ml of analytical grade concentrated $HNO_3$. 12 such containers were placed in the carousel of a CEM model MDS 81 D microwave digestor, and samples were subsequently decomposed in open containers over 30 minutes. (10 min. 50%, 10 min. 60% and 10 min. 75% power). After cooling down, the digests were quantitatively transferred to 25 ml volumetric flasks and made to volume with deionised water. Next, they were analysed on a Perkin-Elmer Model 2100 spectrometer by flame atomic absorption spectrometry using standard conditions. Quantification was done by comparison to a standard curve obtained on standards in 2 M $HNO_3$.

All results given for both pigment and iron contents are means of duplicate determinations.

## RESULTS

In Figure 1, a plot of pigment versus total iron contents is shown. All values are in parts per million (ppm). The correlation coefficient is 0.96, which to our minds is more than satisfactory, as random errors inherent to both methods are influencing the value. We do recognise some outliers, in which the iron contents apparently are too high. They are probably real outliers, and their elevated iron concentrations are most likely caused by spurious contamination. Hence, we do not claim to have identified all pitfalls in the iron analysis procedure at this preliminary stage. We are confident, however, that time and experience will have beneficial effects on the accuracy of the iron analysis.

## CONCLUSION

The results shown here indicate that total iron content in porcine muscles

is as good a parameter of pigmentation as are traditional pigment assays. This is in contrast to an earlier investigation claiming that the major part of muscle iron in pork originates from non-haem sources, and that high iron contents do not necessarily reflect high myoglobin contents (Hamm & Bünning, 1974). To the best of our knowledge this claim was never challenged. The rationale behind it has always eluded us, and we speculate whether a systematic error occurred.

In conclusion, therefore, we feel that determination of iron by atomic absorption spectrometry after microwave-induced digestion of the meat in nitric acid yields exellent correlations to traditional pigment content assays. Furthermore, analysis time is approximately a factor of three shorter, and hazardous organic solvents are avoided.

REFERENCER

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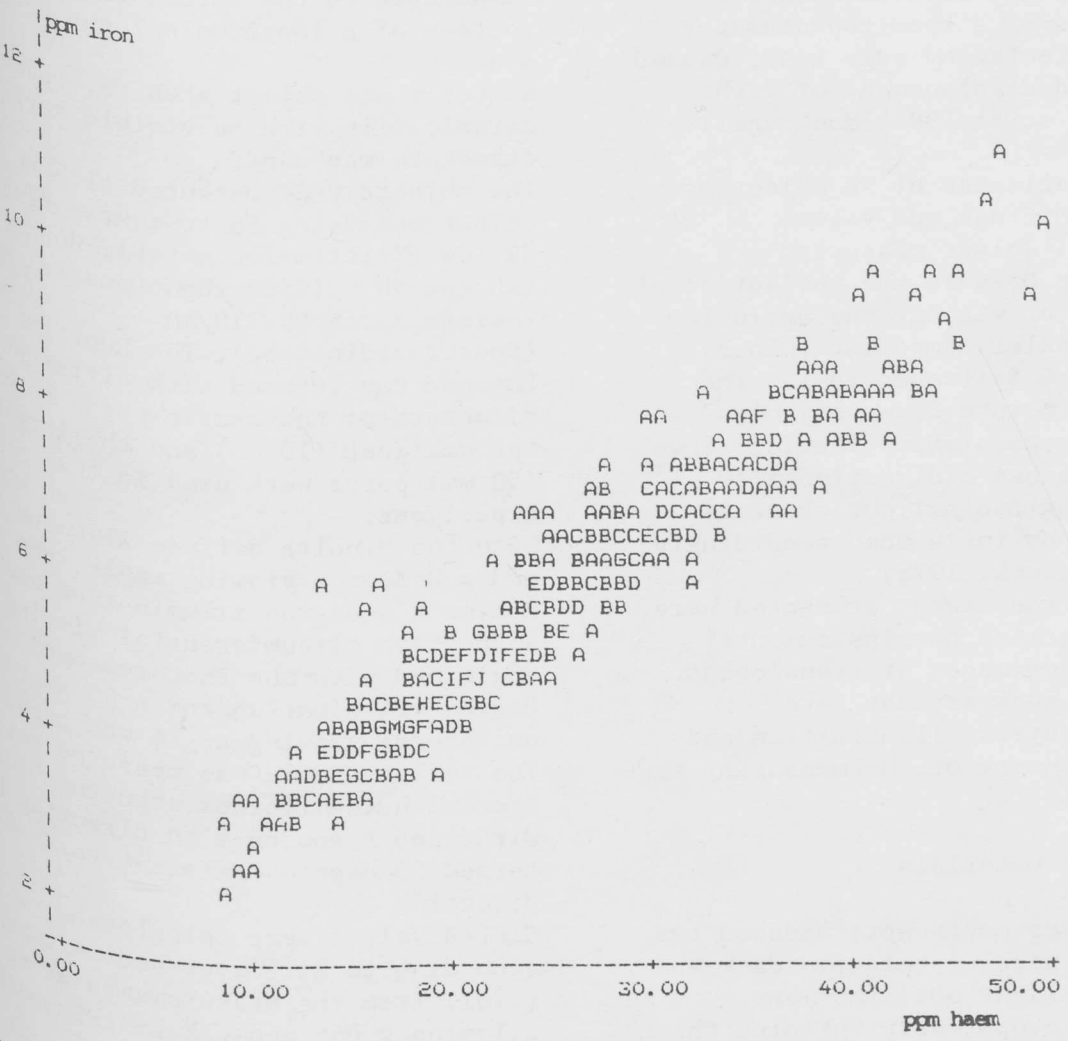


Figure 1: Scatter plot of haem pigment versus iron content in pork longissimus dorsi and biceps femoris muscles. The correlation coefficient is 0.96. A corresponds to one observation, B to two observations etc.