THE COMPARISON OF WARMED-OVER FLAVOUR IN PORK BY SENSORY ANALYSIS, GC/MS AND AN ELECTRONIC NOSE.

M.G. O'Sullivan[1], M.T. Jensen[2], H.J. Andersen[2] and J. Vestergaard[3]
[1]*The Department of Dairy and Food Science, The Royal Veterinary and Agricultural University, DK-1958, Frederiksberg C, Copenhagen, Denmark*
[2] *The Department of Animal Product Quality, Danish Institute of Agricultural Sciences, P.O. Box 50, DK-8830, Tjele, Denmark*
[3]*YTI Research Centre, P.O Box 181, FIN-50101, Mikkeli, Finland*

Background
Up to the present, the analysis of characteristic food odours has been commonly carried out by human assessment and headspace/direct gas chromatography mass spectrometry (GC/MS). However, instrumental techniques, such as GC/MS, have high operating costs and are time consuming. The electronic nose may provide a practical advantage over other methods and may have an application in an On-Line/At-Line capacity for the quality determination of meat products.

Objectives
The principle objectives of this experiment were: 1. To correlate sensory and GC/MS analysis and to identify compounds that could be used as indices of lipid oxidation. 2. To assess the suitability of the electronic nose for the measurement of warmed-over flavour (WOF) development in different types of cooked pork meats. 3. To determine the reproducibility of electronic nose measurements of similar samples over time and space, i.e., two sets of similar samples measured using the same instrument, but in 2 separate laboratories and with a time separation of 11 months.

Methods
Sensory, GC/MS and electronic nose analysis was conducted on a set of samples of *M. longissimus dorsi* with vitamin E and iron treatments, *M. psoas major* with control treatments. These samples represented day 0 of WOF development. Also samples of *M. longissimus dorsi* with an iron/vitamin E treatment, *M. psoas major* with vitamin E and iron treatments were analysed and represented 5 days of WOF development.

Results and discussion
Many of the compounds associated with oxidation of lipids were found to correlate with the oxidative sensory descriptors and the samples with the greater levels of WOF development, i.e., pentanal, 2-pentylfuran, octanal, nonanal, 1-octen-3-ol and hexanal. The electronic nose device coupled with the multivariate methodology used in this experiment could clearly separate samples on the basis of muscle type, treatment and degree of WOF development. The electron nose data agreed with and correlated to sensory analysis and was effective in the determination of the oxidative state of the experimental samples. Electronic nose analysis could be reproduced using similar samples measured using the same instrument, but in 2 separate laboratories and with a time separation of 11 months.

Pertinent literature
Grigioni, G.M., Margaria, C.A., Pensel, N.A., Sánchez, G. & Vaudagna, S.R. (2000). Warmed-over flavour in low temperature-long time processed meat by an "electronic nose". *Meat Science*, 56, 221-228.
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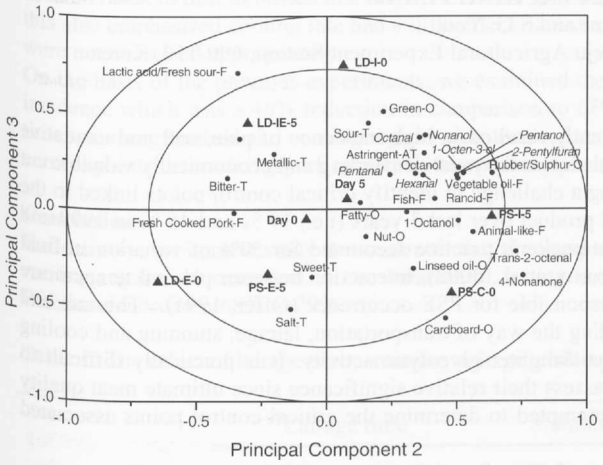

Fig. 1a

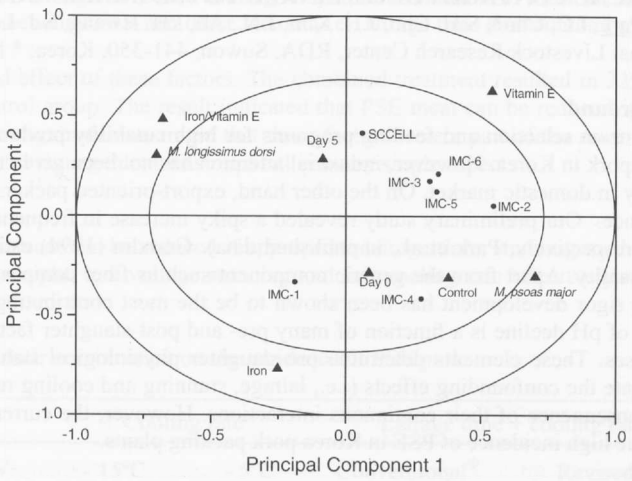

Fig. 1b

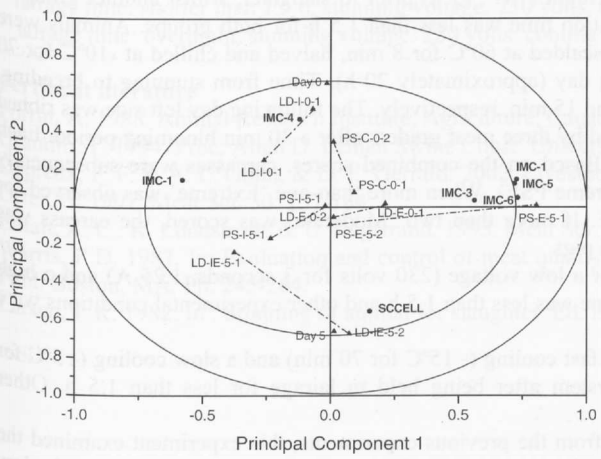

Fig. 1c

Fig. 1a, b and c. An overview of the variation found in the mean data from the ANOVA-Partial Least Squares Regression (APLSR) correlation loadings plot for a), sample set 2. Shown are the loadings of the X- and Y-variables for PC 2 versus 3. = sensory descriptor and GC/MS isolated compounds and = sample. b), sample set 1 and sample set 2 combined. Shown are the loadings of the X- and Y-variables for the first 2 PCs. = electronic nose sensor (IMC-1-6) and = design variables (Main effects). c), sample set 1 and 2. Shown are the loadings of the X- and Y-variables for a) PC 1 versus 2. = Electronic nose sensor (IMC-1-6) = sample. LD = *M. longissimus dorsi*, PS = *M. psoas major*, I = Iron treatment, E= Vitamin E treatment, I/E= Iron/Vitanin E treament, C= Control treatment. 0 and 5 represent days of WOF development respectively. 1 and 2 represent sample sets 1 and 2. The concentric circles represent 100% and 50% explained variance respectively.