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PROTEIN HYDROPHOBICITY OF EXTRACTS OF HEAT TREATED PORK.

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Several recent publications describe correlations of protein hydrophobicity with functional properties (1-6). Reported here is a study of the surface hydrophobicity (So) of proteins in extracts of heat treated meat by the fluorescent probe method. Earlier studies of heated dispersions of proteins and protein mixtures have shown an increase in hydrophobicity with increasing temperature or time of heat treatment, although some aggregation was observed (2,6). Functional properties were best predicted by relationships involving hydrophobicity and other parameters (4,6).

Experimental

Pork samples were purchased locally. Ground samples were passed two times through a Möhle "boy" FW 70 N fitted with a 2mm plate and mixed thoroughly. Samples (11.0g) in polystyrene vials (2.8cm diameter x 6.2cm height) were heated in a water bath (80° C) to the desired center temperature. Samples were homogenized with 100.0ml deionized water in a Super Scan reactor (a rapidly shaken cup fitted with a hammer on a shaft) in which the cup was jacketed and cooled with water so that the sample temperature was 15-20° C during the 4 minute extraction. The resulting suspensions were cooled briefly (ca 5 min) in a freezer and gravity filtered through coarse filter paper. Filtrates were diluted with 8-anilino naphthalene 1-sufonic acid ammoniun salt (Merck) solutions so that a constant concentration of 17.4mg/l was

maintained. Fluorescent measurements were carried out on a Kontron SFM 25 spectrofluorimeter with the excitation and emission wave lengths 370 and 470 nm respectively. Band widths were 10 nm. High voltage settings of 413 and 482 were used for the ground and whole meat samples respectively. Protein determinations were carried out on a Kjel Foss using the factor 6.25 x %N = protein.

Results and Discussion

Surface Hydrophobicity (S_o) of Proteins from Heat Treated Meat

Sample	20°	60°	65°	70°
Ground pork with fat (total fat 39.8%)	-	970	570	270
Lean ground ham (shank)	2040	1220	800	460
Lean whole ham (shank)	2750	790	440	320
Averages of 6 determinations				

Table

Fig. 1 shows typical plots of relative fluorescence intensity vs protein concentration for lean ground ham samples. The table lists surface hydrophobicities of the extracted proteins. S_o is the initial slope of the relative fluorescence vs% protein plots. Increasing heat treatment results in decreased surface hydrophobicity. Nitrogen analysis shows that water extractible proteins (sarcoplasmic proteins, globulins) remain almost constant at about 15% if the total protein. It is well known that considerable denaturation of meat proteins takes place between 40-70°C accompanied by reduced solubility (7).

Previous studies have indicated that low ionic strength extractible protein mixtures had different compositions depending on the temperature and time of heat treatment (8-10). Little protein decomposition has been observed at these temperatures. Further investigation to explain the decrease in surface hydrophobicity is in progress.

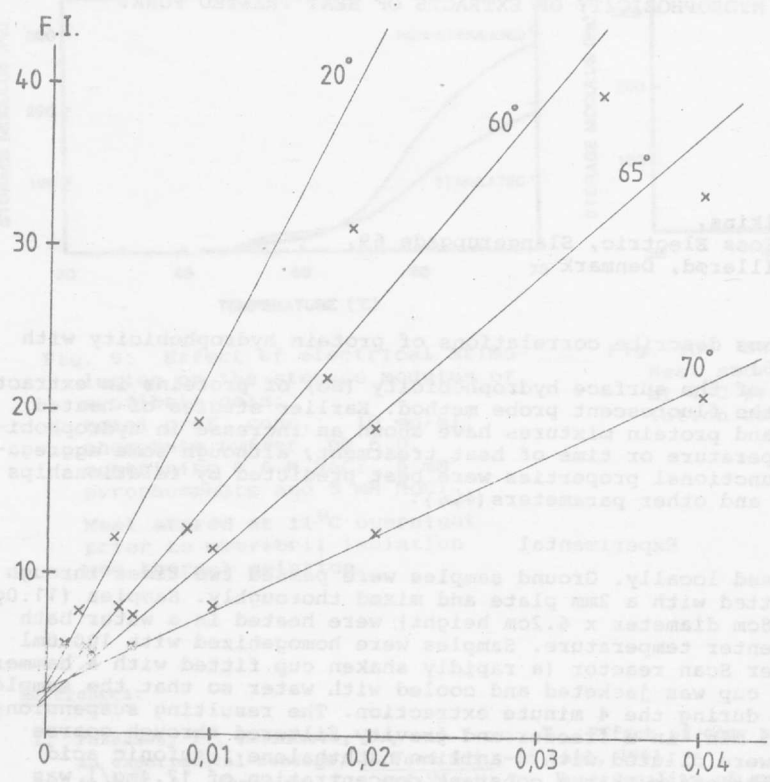

Figure 1

Relative fluorescent intensity (F.I.) vs Protein Concentration (%P) for Lean Ground Ham (shank) Points are averages of 6 determinations S_d (repeatability) for FI 0,2.

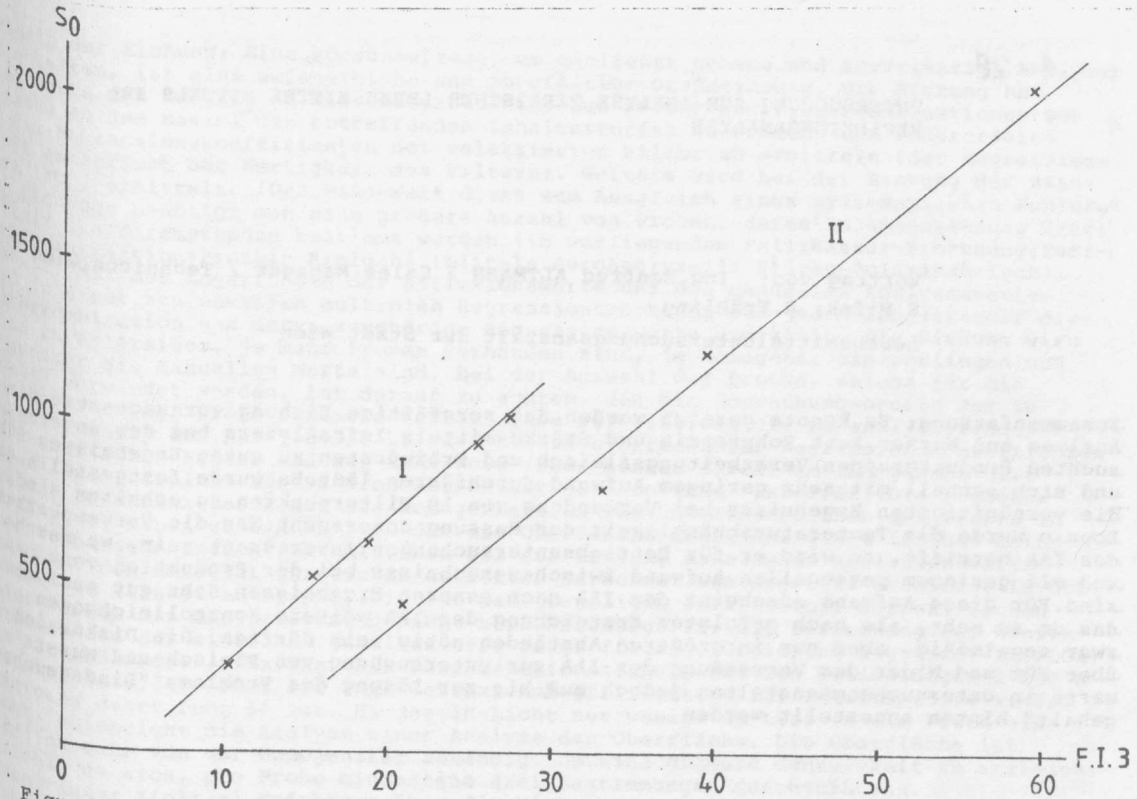

Figure 2 Surface hydrophobicity (So) vs Relative fluorescence Intensity (F.I.3) for I Ground pork with fat II Lean ground ham (shank) %P, I 0.043-0.046 II 0.035-0.040.

Fig. 2 shows plots of relative fluorescent intensities vs surface hydrophobicity for the ground meat samples. It appears to be possible to estimate surface hydrophobicity from a single fluorescent value for a sufficiently well defined sample type.

Since heat treatment of meat products is required for imparting microbiological stability, it may be possible to utilize measurements of surface hydrophobicity as a rapid indicator of heat treatment. Roberts and Lawrie have suggested using myoglobin denaturation as an index of heat treatment (10).

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