trophotometry has been developed for the determination of lactose by measuring unreduced copper. Lactose was oxidized by using a modified Munson-Walker procedure and the free Cu^{++} determined after precipitation of copper oxide. To eliminate sample dilution: the copper concentration was adjusted, the burner head was rotated 90 degrees and a minor copper spectral line was used. A working curve was prepared using standard lactose solutions. The procedure was applied to the determination of lactose in milk and other dairy products. Recovery studies and reproducibility determinations were also made.

M15. Inhibition of heat-induced browning of milk by L-cysteine. R. G. Arnold, University of Nebraska, Lincoln.

Potential inhibitors of the heat-induced browning reaction were investigated in raw whole milk systems. Autoclave heat-treatments for 0, 10, 15, 20, 30, 45, and 60 min were used. Degree of browning was determined by trypsin digestion followed by spectrophotometric measurement of the filtrate at 520 mμ. A color difference meter was also used to measure browning of the samples. Both L-cysteine hydrochloride and L-cysteine free base were effective inhibitors of the browning reaction, but the hydrochloride was less acceptable than the basic form because of the development of an objectionable brothy flavor. Concentrations of L-cysteine free base as low as 0.01% delayed the onset of browning and reduced the degree of browning for a particular heat treatment as compared to the control, but did not adversely affect the flavor of the samples. Increasing the L-cysteine free base concentration (to a maximum of 0.04%) increased the inhibitory effect, but longer heating times at the higher concentrations resulted in an objectionable flavor and aroma suggestive of hydrogen sulfide.

M16. Chromatographic separation of hydrolyzed products of polyphosphates added to milk. F. W. Douglas, Jr.*, J. K. Avants, and L. F. Edmondson, Eastern Utilization Research and Development Division, USDA, Washington, D.C.

The isolation of individual low-polymeric phosphate species was determined mostly by anion-exchange chromatography using a gradient-elution technique with KCl solutions. This technique was used to elucidate the hydrolytic degradations of the added polyphosphates. These compounds are thermodynamically unstable tending to break down ultimately in aqueous solution to the monophosphates. Since sample preparation usually involved removal of proteins by acid precipitation, the instability of polyphosphates in acidic media required preliminary studies for optimum pH conditions. The data showed that the polyphosphates were hydrolyzed to the low-polymeric species at a pH below 5.0. A procedure for minimizing polyphosphate hydrolysis before the chromatographing of milk samples was worked out. Chromatograms of high-temperature short-time sterilized milk containing added polyphosphate showed several peaks. The identification of these species was determined by paper chromatography supplemented by thin-layer chromatography and end-group titration.

M17. Rapid procedure for the detection of hydrogen peroxide-catalase treated milk. W. B. Barone* and O. J. Krett, Research and Development Division, National Dairy Products Corporation, Glenview, Illinois.

A methionine colorimetric method was used successfully for detecting hydrogen peroxide-catalase (PC) treated milk. The casein coagulum from the milk sample by acid precipitation was reacted with nitroprusside in an alkaline solution. After acidifying the solution, the casein from the untreated milk formed a red protein precipitate. In contrast, a light orange-colored precipitate was obtained from the PC-treated milk samples. Milk given various levels of H_2O_2 treatments ranging from 0.02 to 0.05% were easily differentiated from untreated samples by the color difference produced during the test. Milk samples which received less than 0.02% H_2O_2 treatment became difficult to detect. The difference in color between the untreated milk and PC-treated milk casein was attributed to the loss (oxidation) of methionine residues due to the H_2O_2 treatment. Amino acid analysis of the casein from 0.05% H_2O_2 treated milk showed a 75% reduction in methionine. Most of the methionines lost were accounted for as methionine sulfoxide.

M18. Relationship of freezing point of milk to its specific gravity and concentration of lactose and chloride. B. J. Demott, University of Tennessee, Knoxville.

During October, November and December, 368 individual-cow milk samples from eight Holsteins were collected from the weigh jar immediately after milking and cooled. After the samples were in the laboratory they were warmed to 40 C, to room temperature and analyzed for specific gravity on a "Speegrav." Freezing points were determined with a thermistor-type cryoscope; the lactose by 3, 6 dinitrophthalic acid; and chloride by titration with $AgNO_3$. Correlation coefficients were: freezing point depression versus specific gravity +0.45; freezing point depression versus chloride −0.40; specific gravity versus lactose +0.46; chloride versus specific gravity −0.68; chloride versus lactose −0.59; freezing point versus lactose, insignificant. The average Koestler number $100 \times \%\ Cl/\%$ lactose was 2.77 ± 1.02 and was statistically different between cows ($P < 0.01$), but not between milkings of the same cow ($P > 0.05$).