1. Studies were carried out on buffalo milk to assess the heat induced changes in milk proteins. Heat treatments employed were 65°C to 100°C for 10 minutes.

2. Assessment of the distribution of nitrogen in buffalo milk on heat treatment at 95°C and 100°C for 10 minutes revealed following changes:

   a) Total nitrogen and non-protein nitrogen were higher in the case of buffalo milk. Heat treatments (indicated above) did not induce any change in the total nitrogen and non-protein nitrogen in both buffalo and cow milk.

   b) Casein nitrogen was higher in buffalo milk than in cow milk. Considerable increase in the casein nitrogen was observed as a result of heat treatment. This increase was greater in the case of buffalo milk, than cow milk.

   c) Non-casein nitrogen was higher in buffalo milk than in cow milk. Significant reduction in the non-casein nitrogen in both milk samples were observed as a result of heat treatment. Between heat treatments, heating at 100°C for 10 minutes caused slightly more reduction in non-casein nitrogen.

   d) Total albumin nitrogen was higher in buffalo. Heat treatments significantly reduced total albumin in both buffalo and cow milk. The decrease was greater in
buffalo milk than in cow milk.

e) $\beta$-lactoglobulin nitrogen was lower in buffalo milk. Maximum decrease in this fraction was in the case of cow milk heated to $100^\circ C$ for 10 minutes.

f) Proteose-peptone nitrogen decreased as a result of heat treatment in both milk.

g) Residual albumin nitrogen and globulin nitrogen also underwent reduction in both milk.

3. Milk on heat treatment exhibited difference in relation to clotting by rennet. Fresh buffalo milk clotted faster than cow milk. On heat treatment, buffalo and cow milk resulted in the prolongation of the clotting time, buffalo milk clotted faster than cow milk in this case as well.

Interchanging the buffalo casein micelle with cow micelle by way of dispersing the buffalo micelle in cow UCW and vice versa, resulted in the change of rennet clotting time. In such a system where buffalo casein micelles were dispersed in cow UCW, the rennet clotting time prolonged more than that of buffalo milk itself. On the other hand, in systems where cow casein micelles were dispersed in buffalo UCW recorded lesser clotting time than cow milk itself. When these systems were heated, the clotting time was prolonged in all cases. Here again the system which contained the cow casein micelles recorded
longer clotting time than the system which contained buffalo micelles and vice versa.

4. Differential ultracentrifugation studies on the heat treated skim milk revealed distinct difference in the distribution of nitrogen in supernatant obtained at 105,000 x g showed maximum decrease of UCW 12 per cent nitrogen. Supernatant obtained at 46,956 x g was observed to contain 7 per cent lower in supernatant nitrogen. Supernatant at 11,739 x g showed a decrease of 5 per cent nitrogen.

5. Changes on the non-casein nitrogen in buffalo and cow milk at various temperature (65, 70, 75, 80, 85, 90, 95 and 100°C) for 10 minutes, had been studied in details. Non-casein nitrogen content of buffalo milk on heat treatment appeared to be more vulnerable than bovine milk at any particular temperature studied. Distribution of molecular size of milk proteins on heat treatment was studied using Sephadex gel filtration.

6. Unheated skim milk from both buffalo and cow resolved into three protein fractions on gel filtration. On heat treatments at 95°C and 100°C for 10 minutes, these patterns were considerably altered. These changes were primarily in the whey protein fractions, since on heat treatments these whey proteins emerged along with the casein peak with simultaneous disappearance of the whey protein peaks.
7. Heat treated skim milk was fractionated by differential ultracentrifugation and subjected to gel filtration studies. The supernatants on gel filtration still exhibited the presence of two protein fractions which corresponded to the positions occupied by casein and whey proteins irrespective of the speed of centrifugation.

8. Buffalo micellar casein obtained at 105,000 x g on heat treatment after dispersion in phosphate buffer pH 6.8 did not show any change in the non-protein nitrogen content.

9. Studies on the release of sialic acid from heat treated (95°C and 100°C for 10 minutes) micellar, acid casein, $\alpha_c$-casein, and $k$-casein dissolved in phosphate buffer by rennet did not show any difference in the release of sialic acid from that of unheated samples. Rennet action on micellar casein assessed by turbidity development in relation to heat treatment at 95°C and 100°C for 10 minutes did not show any difference.

10. Micellar, acid casein, and $\alpha_s$-casein aggregated as a result of heat treatment in presence of calcium chloride. The rate of aggregation was dependent on temperature and calcium ion concentration. However, insignificant difference was observed between buffalo and cow samples in this respect. Such aggregated solutions
showed a reversal of the aggregation phenomenon on cooling, whereas pH range of 6.4 - 6.8 did not affect the aggregation, and its reversal. K-casein and β-caseins were not aggregated to appreciable extent irrespective of the temperature, calcium ion and type of milk.


12. Heat treated casein and its fractions did not show any change in the molecular sieving properties on Sephadex G-100 gel filtration.


14. Distribution studies on the nitrogen in the UCW in relation to heat treatments at 95°C and 100°C for 10 minutes disclosed that non-protein nitrogen did not change as a result of heat treatment. On the other hand, casein nitrogen increased many fold. At the same time, whey proteins showed considerable decrease.

15. Heat treatment of acid whey, rennet whey and UCW indicated that acid whey underwent greater degree of destabilization and denaturation, buffalo whey samples being more vulnerable. Changes in the protein molecular
size also occurred in these whey preparation due to heat treatment as revealed by gel filtration.

16. Thiol group blocking agent viz. N-ethylmaleimide had a protective action on the serum proteins towards destabilization by heat treatment in both buffalo and cow milk.

17. Heat treated UCW prepared by differential ultracentrifugation showed that whey protein obtained at 11,739 x g underwent the least change in terms of non-casein nitrogen level.

18. Studies on isolated whey proteins from buffalo milk indicated denaturation of \( \alpha \)-lactalbumin and \( \beta \)-lactoglobulin as a result of heat treatment.

19. On the basis of gel filtration on Sephadex G-100 and polyacrylamide gel electrophoresis, interactions between casein and \( \beta \)-lactoglobulin and between \( \kappa \)-casein and \( \beta \)-lactoglobulin of buffalo milk were observed on heat treatment.

20. An interaction between \( \alpha \)-lactalbumin and \( \beta \)-lactoglobulin of buffalo milk was also demonstrated on the basis of gel filtration and polyacrylamide gel electrophoresis.