INTRODUCTION
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Milk fat globule membrane is a complex lipid-protein system oriented at the fat/plasma interface and stabilizes the fat emulsion by enveloping the fat globules in milk. Milk fat globule membrane fragments are 100 Å to 200 Å wide and up to 6.5 µ in length. Molecular weight of milk fat globule membrane proteins varies from 90,000 to 1,69,000. The membrane complex accounts for approximately 3-5% of the total milk proteins and is present in milk at a concentration of 0.1%. Washed cream contains about 0.5 - 0.9 g membrane protein and 0.2 - 0.4 g phospholipids per 100 g fat. Like erythrocytes, fat globule membrane is negatively charged having an isoelectric pH of 4.3. Washing of fat globules is accompanied by an increase in the electrokinetic mobility (i.e. a high net negative charge) and this behaviour explains that less-charged components which are loosely associated with the fat-globule surface, are washed away, exposing highly negative phospholipids.

Milk fat globule membrane (FGM) is lipo-proteinaceous in nature and contains high concentrations of phospholipids. It is now established that milk fat globule membrane contains microsomal particles and possesses enzymatic activity. FGM of milk contains 5'-nucleotidase, Na⁺-K⁺- activated ATPase, Mg²⁺- activated ATPase, and
non-specific phosphodiesterase as the plasma membrane
marker enzymes; thiamine pyrophosphatase and lactose
synthetase as the Golgi apparatus marker enzymes; and
glucose-6-phosphatase, NADH-cytochrome-c-reductase and
RNAase as the endoplasmic reticulum membrane marker enzymes.
Deoxycholate releases about 45% of the membrane lipo-
proteins which contains lipids and proteins in approxi-
mately equal quantities; 76% of the lipids are phospho-
lipids. The non-dissociated, insoluble pellet, contains
about half as much phospholipids as the supernatant fraction
and is believed to be the fraction most closely associated
with the fat globules and to which the soluble lipoprotein
particles are adsorbed.

The organization of the lipid-protein complex and
structure of FGM is not extensively studied. Schwarz and
Fischer (1936) reported from his electron microscopic
studies that the membrane is composed of an inner layer of
protein, a middle layer of phospholipids resembling small
beads and poorly defined outer layer, probably consisting
of xanthine oxidase. However, Brunner et al (1969)
proposed a model for FGM consisting of a protein matrix
with adsorbed micelle like lipoproteins. Studies of
Anderson et al (1972) indicate that there are no well-
deefined inner and outer regions of FGM since radioactive
labelling of intact fat globules with I125 gives at least
one labelled protein in each of the four fractions of the
FGM obtained by deoxycholate treatment. Most recent
studies using proteolytic enzymes indicate that membrane
does not exist in an intact form on the fat globule, since all the major associated membrane proteins could be cleaved by proteolytic enzymes.

Purified plasma membrane fractions from lactating bovine mammary glands and the membranes of milk fat globule are similar in distribution and fatty acid composition of phospholipids. Distinct morphological differences between plasma membrane and FGM also exist. Plasma membrane is vesicular in appearance, while milk FGM has a plate-like aspect. Keenan et al (1970) utilizing this information proposed that milk fat globule membrane is derived primarily from the plasma membrane and it undergoes compositional and structural rearrangement during the process of secretion from the acinar cells of mammary gland.

The importance of milk FGM in the processing and keeping quality of dairy products is now well understood by the dairy chemists and technologists all over the world. Many of the studies on FGM are now directed also towards applied work such as effect of pasteurization, boiling, homogenization and sterilization. All these processing treatments are likely to have impact on the stability of milk and milk products depending on the degree of change.

Effect of stage of lactation, season, breed, feed and animal on the composition of FGM have not been extensively studied. Moreover, the quantum of data on the FGM of buffalo, the major producer of milk in India, is very little. A preliminary account of some of the physico-
chemical properties and enzymatic profile of buffalo milk fat globule membrane has been reported by Bandyopadhyay (1974). In the present investigations, an attempt has been made to study the changes in physico-chemical properties of milk fat globule membrane proteins and membrane bound enzymes during different stages of lactation in buffaloes.