MINOR CONSTITUENTS IN SOME MAMMALS' MILK

By

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THESIS

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To my father, whc

To my mother, who
bility for her love ar
giving right throug

APPROVAL SHEET

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has been approved by :-

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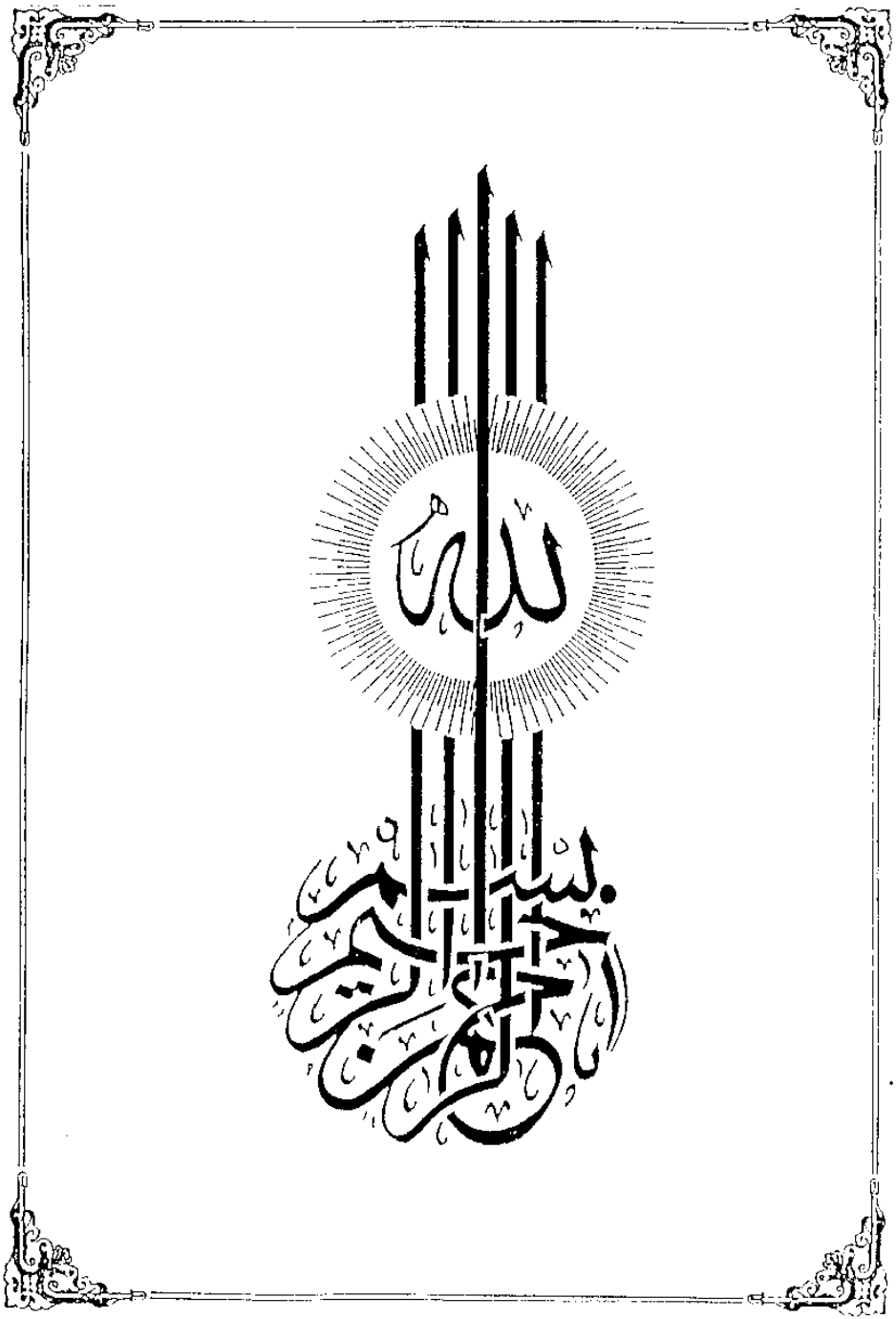

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INTRODUCTION

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Lactose is no longer considered the only sugar in milk, since other carbohydrates have been detected. It is well known that lactose is the major carbohydrate in the milks of mammals, and that other carbohydrate are present at low level. Thus, most of the work has been concerned with lactose.

The presence of carbohydrates other than lactose has become increasingly evident from chromatographic experiments enabling the separation of complex mixtures. The most important developments in this field of carbohydrate chemistry have been conducted for the discovery of "Bifidus factor", the growth promoting factor for Lactobacillus bifidus var. penns., as well as determination of its structure and those of other related oligosaccharides in milk, especially in human milk.

The carbohydrates attached to proteins contribute to, or modify, the properties and functions of milk proteins (Gottschalk, 1969), also carbohydrate moiety of glycomacropeptides released from casein by the action of rennin has been used to follow the kinetics and extent of first-stage rennin action (Gibbons and Cheeseman, 1962).

Little work has been cited on these minor carbohydrates in milk. So, the main part of this work was conducted to compare the minor carbohydrate constituents in some mammals' milk, namely buffalo, cow, goat, sheep, and human.

On the other hand, lactones play a very important role in the flavour of many dairy products. These compounds are known to contribute significantly towards both desirable and undesirable flavours. The principal impetus for research on lactones of butteroil arose from the attractive flavour properties of butter as a cooking and baking additive and as a bread spread. Lactones are also belived to be responsible for some off-flavours such as coconut-like flavour defect of butter.

The survey of literature revealed paucity of information on the lactone fractions in butteroil, thus it becomes evident that a more fundamental approach on the basic nature of lactone fractions of different mammals' milk is required.

Therefore, the present study, was conducted to furnish further information about the chemistry of

minor constituents of some mammals' milk. The obtained results are presented and discussed under the following three headings; namely, (I). Protein bound carbohydrates, (II). Free minor carbohydrates, and (III). Lactones.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

I- Protein bound carbohydrates :

Johansson and Svennerholm,(1956) determined the carbohydrates in caseins from the milks of human, cow, ewe, goat, whale, mare and reindeer. They reported that hexosamine and sialic acid contents of various caseins were: 1.32, 0.76 % for human, 0.18, 0.39 % for cow, 0.15, 0.11 % for ewe, 0.16, 0.30 % for goat, 0.42, 0.37 % for whale, 0.44, 0.56 % for mare and 0.23, 0.46% for reindeer, respectively. They indicated that the physiological importance of the carbohydrate components of milk was unknown.

Kitschmann et al.,(1957) characterized a macropeptide which was released from bovine casein following a rennin treatment. This component was soluble in 12 % trichloroacetic acid (TCA), contained 15.2 % galactose, 4.3 % glucosamine, and 11.4 % neuraminic acid.

Reynolds et al.,(1959) studied the content of different carbohydrates in whole bovine casein and its fractions. They found that it contained 2.24 mg/g hexosamine.

Jollés et al.,(1961) compared the composition of caseino-glycopeptides obtained after rennin digestion of whole caseins from cow, sheep and goat milk. They found that hexosamine and sialic acid contents were: 5.0, 8.3%; 2.1, 1.1 % and 2.8, 3.0 %, respectively. They also demonstrated the casino-glycopeptides released from cow's k-casein and reported that this part was characterized by a high content of glucides (28.2 %) especially of sialic acid (14.3 %), and contained about 74 % of the glucides in the original casein.

Alais and Jollés,(1961) determined the galactosamine and sialic acid contents of cow, sheep. and goat casein. They obtained values of 0.35, 0.35 %, 0.24, 0.09 % and 0.31, 0.13 %, respectively.

Malpress,(1961) showed that casein precipitated at pH 4.6 from cow's skim milk contained 0.21 % nuraminic acid, of which a maximum amount of 68 % was released by the action of crystalline rennin. He also found that human milk casein contained 2.1 % sialic acid, of which not more than 50 % can be liberated by rennin.

Gayen et al.,(1962) reported a value of 3.84 mg/g sialic acid for bovine whole casein.

Gibbons and Cheeseman (1962) studied the action of rennin on casein, and found that the glycomacropeptide (GMP) released, contained 14.3 % N-acetylneuraminic acid. They observed that washed precipitated para-k-casein was devoid of neuraminic acid.

Marier et al.,(1963) indicated that bovine proteins precipitated with TCA contained 17 to 28 % more sialic acid than casein precipitated at pH 4.5. They reported that whole acid casein contained 0.26-0.59 % sialic acid. They also observed that protease-peptone is a component rich in sialic acid (1.8 %), while heat-coagulable whey proteins contained little or no sialic acid.

Furuya and Nachara,(1964) reported that human milk contained 125 mg/100 ml sialic acid, while the corresponding value for cow's milk was 25 mg/100 ml.

Gupta and Ganguli,(1965,b) examined the N-acetylneuraminic acid (NANA) content of casein prepared from the milk of Indian buffalo and zebu cow. They observed that NANA content of casein from buffalo