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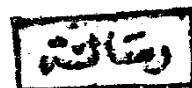
STUDIES ON THE EFFECT OF ADDING CERTAIN
ACIDS, BACTERIAL CULTURES AND YEASTS ON
THE PROPERTIES OF MILK FED TO INFANTS

By

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THESIS

SUBMITTED IN PARTIAL FULFILMENT
OF THE REQUIREMENTS FOR THE DEGREE OF
DOCTOR OF PHILOSOPHY



TO THE

FOOD SCIENCE DEPARTMENT
FACULTY OF AGRICULTURE,
AIN-SHAMS UNIVERSITY



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TITLE : STUDIES ON THE EFFECT OF ADDING CERTAIN
ACIDS, BACTERIAL CULTURES AND YEASTS ON
THE PROPERTIES OF MILK FED TO INFANTS.

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Date: 31 / 12 / 1973



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ACKNOWLEDGEMENT

The author with great respect acknowledges professor G. M. EL SADEK the head of Food Science Department Ain Shams University, for his helpful suggestions and highly valuable opinions.

The author feels indebted to professor A. G. WISHAHY the head of Department of Paediatrics Ain Shams University, for his help and advice throughout this work.

The author feels much indebted also to professor A. A. G. HASSAN, the professor of Dairy, Food Science, Department. Ain Shams University for his valuable suggestions and encouragement during the research work, and help in editing this manuscript.

Thanks also extended to my colleagues and workers of the Department of Food Science and Department of Pharmacology, Ain Shams University, due to their help this work was completed.

I N T R O D U C T I O N

DISCUSSION

Milk is a suitable diet necessary for the maintenance of the adults and growth of the young.

Human milk is the ideal food for the feeding of infants during the early months. Owing to various causes an infant may not derive adequate nutrition from the mother. Artificial feeding of infants therefore may be necessary. Cow's milk is customarily used for the feeding of infants. Since the buffer capacity of cow's milk averages three times that of breast milk, cow's milk acidified chemically or biologically is accordingly used.

Vegetable milk is also employed in European countries under conditions of war or where is inadequate supply of raw milk. The Italian malted food for infants and children called "Maltavena" was produced by Caprino in Rome in (1945). The Egyptian vegetable cheap diet which is called "El-Labat" was also produced by Wishahy (1958). Fermented milk also has many advantages in promoting the growth of infants and longevity of adults.

The problem in cow's milk feeding lies in diminishing the buffer capacity of milk given to the infant, and this is achieved by using diluted or acidified cow's milk.

Dilution was the first method tried to reduce the butterfat content of cow's milk to improve the digestibility of cow's milk. By diluting it with water, the concentration of both the casein and buffer substances is lowered in the same proportion, therefore the infant receives a diet poor in fat and protein.

The best method to lower the buffer capacity of cow's milk is to acidify it by using different methods of acidifications. This is done either chemically by adding certain acids or biologically by using bacterial cultures and yeasts.

In infant feeding, the acidified milk of "Nutricia" (Holland) contains 5.5 % of lactic acid. Whereas Gingoiz, preferred the acidification of Acico with 2.5 % citric acid.

Nestle, (Suisse), (1970) produces the acidified milk "prodieton" and "Milon" for initial feeding of healthy infants using biological acidification by lactic acid ferments.

The aim of the present work is to study the chemical and other properties and nutritive value of the

dry milk "Nestogen" fed to infant by adding acids, bacterial cultures and yeasts.

Therefore the present study was divided into three main parts as the following:

Part I : Effect Of Adding Acids, Bacterial Cultures And Yeasts On The Properties Of Milk.

Part II : Effect Of The Diets On The Weight Parameters Of Rats.

Part III : Effect Of The Diets On The Net Protein Utilization By Rats.

REVIEW OF LITERATURE

During the years following the Second World War, numerous studies which appeared in Europe and America proved the numerous advantages of acidification of cow's milk for infant feeding.

Freudenberg, (1929) reported that the digestion of 750 cm³ of breast milk required a secretion of only 75 cm³ of gastric juice. The digestion of 750 cm³ of two third strength of cow's milk namely 500 cm³ of full cream milk plus 250 cm³ of water, required the secretion of four times as much as gastric juice. According to Brock, (1954) the buffer capacity of cow's milk averaged three times that of breast milk.

Gastric hypoacidity in infants :

In infants gastric hypoacidity is frequently present as a result of :-

- 1- Immaturity of the digestive system.
- 2- Climate.
- 3- The type of the diet.

1. Hypochlorhydria and digestive system :

In young and new born infants the secretion of gastric juice and its hydrochloric acid increases as the child gets older. At the age of one year their values are not as high as in older children.

2. Climate :

A high prevailing temperature in summer season, tropical and subtropical climates aggravates the tendency to hypochlorhydria less frequently than in temperate and sub-tropical regions.

Beyns (1958) found that hypochlorhydria generally occurred during the first months as shown in the following table :

Age	Secretory volume cm ³ /min.	Free acidity	Total acidity
Prematures	0.12 - 0.45	0	0 - 8
New borns	0.20 - 0.45	0 - 20	15 - 4.0
2 weeks to 6 months	0.25 - 1.10	0 - 59	5 - 71
7th to 12th months	0.40 - 1.50	12 - 80	25 - 105
1 - 2 years	0.70 - 1.80	15 - 95	25 - 105

3. The type of the diet :

Breast milk for example has vastly different effect from cow's milk in digestion. The difference is attributed not to a variation of secretion but to the disparity in "buffer capacity" of these two milks.

Glanzmann, (1948) reported that lactic Acid was an active antidyspeptic factor and prevented diarrhoeic disorders.

Jeans, (1951) reported that healthy new born infants would double its weight in six months. The importance of adequate protein intake for promoting satisfactory growth was therefore evident. A normally growing infant obtained 2.0 - 2.5 g. of protein per kg. weight when fed on human milk, and 3 - 4 g. of protein when fed on cow's milk.

Szoreay, (1964) reported that cow's milk contained more pantothenic acid than human milk. It was usually fed under more alkaline condition which was less favourable to the absorption of the vitamin. A diet generally considered as an optimal when contained only 50 - 60 % of pantothenic acid up to the age of six months. The vitamin

deficiency in young animals however to be supplemented by foetal reserves.

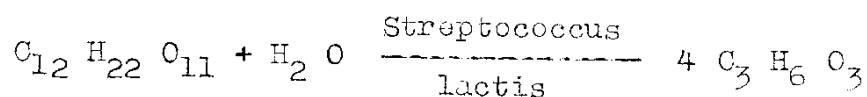
Gordon et al, (1947) have demonstrated that the premature infants fed on cow's milk gained weight at greater rate than those fed on human milk.

Sankaran, (1941) showed that the addition of 40 - 60 drops of 40 % lactic acid solutions to a pint of milk reduced the curd capacity of milk. They also produced finely divided suspension of protein.

Mayer, (1960) reported that lactic acid had advantages over other acids. Clinical trials had proved the superiority of lactic acid over other acids both mineral and organic. He also indicated that dried lactic milk was the most convenient type of milk generally used at the present time. Juice of citrus fruits might also be used in this purpose. Orange juice was commonly employed in the proportion of two ounces of juice per litre of milk. Lemon juice was added in the proportion of 1 ounce to 1 litre of milk. Milk treated in this way was easily digested.

Biological Acidification of milk :

Biological acidification can be defined as the development of acidity by means of lactic bacteria which multiply at the expense of lactose following the reaction.



The process involves the selection of pure strains of lactic bacteria to standardised milk under aseptic conditions. Biological acidification lasts 6 - 8 hours. The development of acidity is controlled when the desired degree is attained. The acidification process is stopped by cooling the mixture.

Ponte, (1969) reported that the dried acidified milk "prodieton" was acidified biologically. It had PH 5.12 and 0.45 % of lactic acid content.

The consumption of living cells is a problem which has been engaging the attention of clinical specialists and microbiologists for many decades, Metchnikoff, (1908) early recognized that the human intestines were populated by microflora. However for the lack of adequate culture procedures, it was not possible for him to determine the

attempts to control the intestinal flora. It appeared to colonize better than other Lactobacilli.

Wheater, (1955) found that L. acidophilus fermented amygdalin, cellollose, salicin and sucrose, whereas L. bulgaricus did not. Also L. acidophilus grew in 2 % sodium chloride or bile salt whereas L. bulgaricus did not.

Chandan, (1963) reported that twelve representative cultures were grown in a fermentor at constant PH of 6.0. It was found that Leuconostoc dextranicum appeared to be the most lipolytic and L. acidophilus to be the least active culture.

Oehler, (1911) fed mice and monkeys with Bulgarian sour milk for eight days. He found Bulgarian bacilli in the intestinal tract during the feeding period but they disappeared in two or three days.

Belonovsky, (1908) fed mice for one and half months with milk cultures or Bulgarian bacilli added to sterilized grain and water. He was able to detect the bacilli for fifteen days after the last feeding.

Siegenthaler, (1966) reported that in trials carried out at two children's clinics, administration of