QUALITY EVALUATION OF SOME DRIED DAIRY PRODUCTS

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By

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فى

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مقدمة من

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فرع دمنهور

وما أوتيتم من العلم إلا قليلاً

صدق الله العظيم

سورة الإسراء الآية رقم ٨٥

Dedicated To
My Family

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INTRODUCTION

Milk and dairy products have made a major contribution to the human diet nearly in all countries allover the world. The drying of milk has become increasingly significant as the level of production within the world increased. Drying extends the shelf life of the milk, simultaneously reducing the weight and the volume, and consequently lowers the cost of transporting and storing of the product ***(Ranken and Baker, 1999).***

Milk powder is produced nowadays on a large scale in modern plants and stored for long periods without significant deterioration of taste or nutritive value. Skimmed milk powder has a maximum shelf life of about 3 years. Whereas whole milk powder has a shorter shelf life of only 6 months due to fat oxidation during storage with consequent deterioration ***(Lampert, 1984; Alfa–Laval, 1992 and Edgar and Axel, 1998).***

Drying of milk may be performed by either roller or spray methods. Generally the spray dried milk powder is of better quality than the roller dried one. Many modifications have been made to the two basic methods in order to improve properties of the dried milk. The most modification is instantizing, which is hydrating and dehydrating the previous dried milk ***(John and Malcolm, 1981).***

The quality of milk powder depends not only on the condition of the raw milk, but also on the changes which may take place during manufacture, storage and distribution. Milk powder may be subjected to contamination with different species of moulds, as they are widely distributed in nature as environmental contaminates of air, water, dust, etc.

Modern processing methods for manufacturing of milk powder are designed to render the product more acceptable in flavor and solubility and because of them the product has become more vulnerable to contamination and for growth of contaminants during manufacture. The milder heat treatments in spray – drying compared with those used in roller – drying afford little protection against the survival of pathogens.

Nowadays, the growing use of the dried milk has made its microbial quality of primary concern due to the high susceptibility of consumers to food – borne diseases.

The physical quality of milk powder relates to its suitability for reconstitution or incorporation into food products. The powder should be free from lumps. Other frequently used indices of physical quality are solubility and the extent of contamination with burned particles. Instant milk powders must be easily reconstituted and a number of empirical tests have been devised to assess this property, e.g. dispensability, wettability and sinkability. Certain physical characteristics are also sought in reconstituted powders, which are to be further processed e.g. viscosity and heat stability ***(Pisecky, 1978 and Ralph, 1998).***

Bacillus cereus, as an aerobic spore former, in food causes food poisoning, the organism is widely distributed in nature and frequently contaminates milk and dairy products. Between 9 and 48% of such products including milk powder are to be contaminated by *bacillus cereus*. The ability to form spore ensure survival of the organism through all stages of food poisoning.

Bacillus cereus is the causative agent of two distinct forms of gastroenteritis disease connected to food poisoning. The diarrheal syndrome which is characterized by

abdominal pain and diarrhea, with an incubation period of 8–16 hours and symptoms that last 12 to 24 hours ***(Ehling–Schulz et al., 2004; Lindback et al., 2004*** **and** ***Moravek et al., 2004)***, while, the emetic syndrome is characterized by an acute attack of nausea and vomiting within 1–5 hours after a meal. The illness is relatively mild and recovery within 12–24 hours ***(Ehling–Schultz et al., 2005; Kawamura et al., 2005*** **and** ***Taylor et al., 2005).***

Members of genus clostridium, as anaerobic spore formers are widely distributed in nature, soil and in the gut of both man and animals. Therefore, their presence in milk and dairy products is indicative of fecal or soil contamination. In semi preserved and heat–treated foods, the clostridial organisms are very often the most surviving organisms and produce undesirable changes affecting their important of which is the "late gas" ***(Foster et al., 1958; Abou–Elnaga,1969; Matteuzzi et al., 1972; Bosi et al., 1984*** **and** ***Disegnal, (1984).***

Clostridium perfringens is recognized as one of the food poisoning causative organism ***(Hoch et al., 1974; Willis, 1977*** **and** ***Gravini, 1984)***. Some strains of other clostridial species are responsible for wound infection and gas gangrene ***(Willis, 1977).***

The public health importance of moulds has been emphasized as certain species can produce mycotoxins which were implicated in human cases of food poisoning and neoplastic diseases including leukemia and other cancers ***(Deger, 1978*** and ***Bullerman, 1980).***

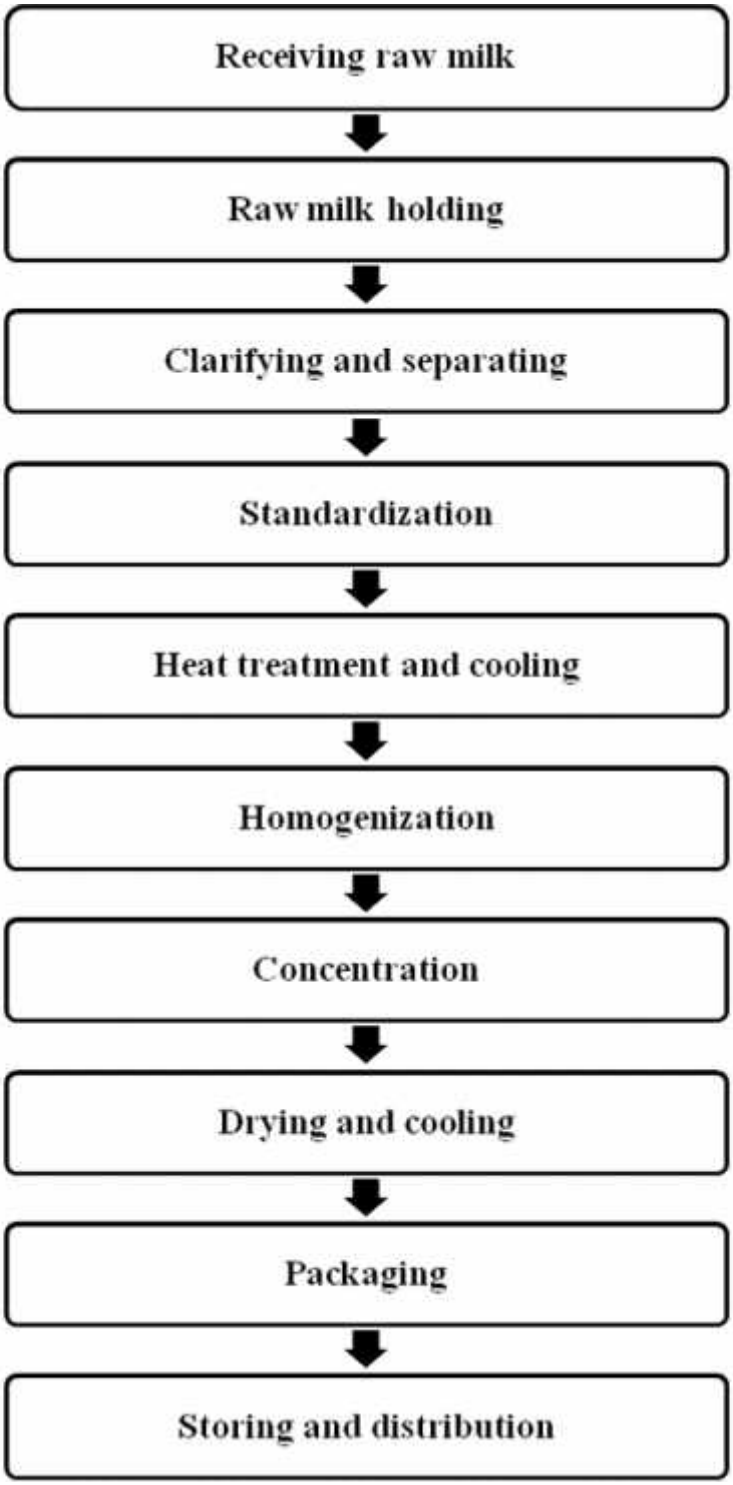
As the main purpose of this study is to evaluate the quality of some dried dairy products and secure the following topics:

- Determination of moisture content
- Determination of titratable acidity
- Determination of total colony count.
- Determination of coliform count.
- Enumeration and identification of enterococci
- Enumeration and identification of Bacillus species.
- Isolation and identification of *Bacillus cereus*.
- Enumeration and identification of *Clostridium perfringens*.
- Enumeration and identification of molds.

REVIEW OF LITERATURE

2.1. Manufacture of dried milks:

Diagram for manufacture of dried milk



2.1.1. Receiving raw milk:

The objective in manufacturing is complete germ inactivation, so the thermal load on milk is very high, which has negative effects on the proteins. Therefore, milk has to meet good casein stability to high temperature, pH 6.4– 6.7, no casein precipitation when mixed with 70% alcohol, low level or absence of thermo resistant microorganisms and low level or absence of anaerobic spore formers **(*Edgar and Axel, 1998).***

Raw milk is considered as a major source of contamination, it may be contaminated with different types of microorganisms from a variety of sources as interior and exterior of the animal, dairy worker, utensils, water supply and the environment. Moreover, long transportation may cause microbial growth and production of toxins or deteriorating enzymes. The presence of antibiotic, pesticide and mycotoxin residues in milk could create hazards, which cannot be controlled by later processing. ***(Chin, 1982 and APHA, 1992).***

2.1.2. Raw milk holding:

Holding of milk is a critical control point due to growth of psychrotrophs during long holding times. Although most psychrotrophs are killed by heat treatment, their heat–resistant enzymes (lipases and proteases) may remain active with subsequent deterioration of the quality of the product.

Cooling of milk below 4^{o} C within two hours of milking as well as controlling time and temperature during holding on the farm and transportation to the factory is an effective method for controlling the hazard associated with possible growth of psychrotrophs.

2.1.3. Clarifying and separating:

Prior to preheat treatment (pasteurization), the milk is clarified by centrifugation or filtration to remove somatic cells and debris and thereafter is passed through a separator to remove fat. Bactofugation can take place when manufacturing of products with very specific and high quality requirements, e.g., infant formula to reduce the level of spore formers **(*Edgar and Axel, 1998*).** The temperature during these stages may reach 40 ^{o}C, which may constitute a potential public health hazard as elaboration of their metabolite such as *Staphylococcus aureus* enterotoxins **(*Frazier and Westhoof, 1988*** and ***APHA, 1992)***.

2.1.4. Standardization:

The fat content of milk is standardized by adding fresh skimmed milk at a temperature less than 4^{o}C before pasteurization to avoid cross – contamination between raw and pasteurized milk.

2.1.5. Heat treatment and cooling: (*Walstra and Jenness, 1984; Linden, 1986; Baldwin et al., 1991; Alfa–Laval, 1992; Castberg, 1992 and Ralph, 1998*).

Milk is subjected to a combination of time and temperature treatments that will destroy vegetative microorganisms often present in raw milk and able to cause food borne diseases. Hence it is an important CCP and failure to control any aspect of this operation may prejudice the microbiological safety of the product.

After pasteurization, the milk is cooled to 4–6^{o}C and stored under conditions that prevent recontamination of the product and restrict the growth of heat resistant organisms that survive the pasteurization process.