Introduction

Studies on the Pathogenicity and Heat-Resistant Characteristics of *Escherichia coli* in milk and milk products.
GENERAL INTRODUCTION.

It is well known that among the various food products, milk constitutes an ideal medium for the growth and multiplication of both beneficial and harmful microorganisms and it also plays an important role in the transmission of diseases. With the rapid growth and development of different facets of dairying in India, resulting in mass collection and distribution of milk, the problem has become all the more important.

Although several types of microorganisms are known to be present in milk, the coliform bacteria constitute one of the most important groups among them. These organisms are invariably found among the contaminants gaining entry into milk and milk products during their production and handling. Coliforms have probably received more attention than most other groups of bacteria occurring in dairy products, because of their importance as indicator organisms to predict unhygienic conditions of production and processing of dairy products. Among the organisms comprising the coliform group, Escherichia coli has been considered the most important species, since in recent years, it has been shown to be a potential pathogen of public health importance.

The routine presumptive coliform test generally used in the bacteriological analysis of milk and milk products does not, however, reveal the taxonomic identity of the particular type of coliform organism. Further, the above test is not useful for distinguishing the pathogenic coliforms from the non-pathogenic types.

The presence of E. coli in milk and milk products has a
three-fold significance. Firstly, *E. coli* is generally regarded as a spoilage organism causing considerable economic losses to the dairy industry. Some of the significant spoilages due to *E. coli* include souring and gas production in raw and pasteurized milk and cream and decomposition of unsalted butter and gassy fermentation of cheese. Secondly, as an index organism of true faecal origin, the presence of *E. coli* in milk and milk products constitutes one of the most valuable indicators of faecal contamination in dairy products with the possible presence of *Salmonella*, *Shigella* and other enteric pathogens. And thirdly, *E. coli* has attracted much attention recently as a potential pathogen since several *E. coli* serotypes have been isolated from raw and pasteurized milk and milk products suspected to be associated with outbreaks of gastro-enteritis and food poisoning in human beings.

Inspite of a great deal of literature that has accumulated in recent years on the various aspects of coliform bacteria in milk and milk products, comparatively little information is available on the occurrence of pathogenic serotypes of *E. coli*. Although outbreaks of gastro-enteritis and food poisoning in human beings have been frequently reported, the causative organisms responsible for such outbreaks are often not clearly indicated, since in the majority of cases the follow-up action is not carried out. This is particularly true in this country, where such outbreaks due to enteric organisms, although commonly occurring, are not even reported in majority of instances.
In the light of the above facts, the present investigation has been undertaken with the object of determining the incidence of different pathogenic serotypes of *E. coli* which have considerable epidemiological significance from the public health point of view.

Another important aspect of the study pertains to heat resistant characteristics of pathogenic and non-pathogenic strains of *E. coli* in milk and milk products. Although it is commonly believed that proper pasteurization generally destroys all the pathogenic microorganisms in milk, frequent reports have appeared on the occurrence of certain strains of *E. coli* in milk surviving the usual pasteurization treatment.

Several investigations which have led to the establishment of time-temperature relationship for the pasteurization of milk have also enriched our knowledge regarding the heat-resistant characteristics of certain pathogens that are likely to be present in milk and milk products. According to the available information, z-values for thermal death time curves of non-spore forming bacteria have been found to range from 8.0 to 20.0°F, but these values may vary considerably depending upon several factors such as type of organism, nature of the heating menstruum, initial concentration of cells, etc.

There is considerable divergence of opinion regarding the thermal destruction pattern of *E. coli* in milk and milk products. But it is now generally agreed that some strains of *E. coli* do survive pasteurization (Crossley, 1946; Hall and Trout, 1968). Except for the recent report of Yang and Jones (1969), very little information is available in regard to the comparative thermal destruction pattern of pathogenic and non-pathogenic strains of *E. coli*. 
Further, most of the earlier studies have been carried out on cow milk only. No such information is available for buffalo milk and on account of the compositional differences between cow and buffalo milk, the data on thermal destructions of microorganisms may show some differences in the above two types of milk. Support for this contention is provided by the fact that the nature of the medium in which the organisms are suspended during heat-treatment greatly influences the thermal resistant characteristics of organisms.

In view of the above considerations, the present studies have been undertaken to determine the variations in heat resistance among the different strains of *E. coli* isolated from milk and milk products. In addition, the effect of several factors, such as nature of suspending media, growth temperature of the organisms, initial cell concentration and pH of the suspending medium, influencing the heat-resistant characteristics of three selected pathogenic and non-pathogenic strains of *E. coli* has also been included in this study.