INTRODUCTION

Background

Milk is a food material which contains proteins, fats, lactose, minerals, vitamins and enzymes. It is produced by the mammary glands in the udder under the influence of certain hormones. It is a food material that is destined to satisfy nutritional requirements and is consumed in a modified, prepared or treated form through drinking, eating or intake in any other form. Milk always contains a few microorganisms. Contamination comes from the cow, equipments, unhygienic human handling, unclean storage rooms, and milking tools (Volk and Wheeler 1990). For human consumption it must fulfill the requirements for safe foods since it is already proved that milk is one of the vehicles through which pathogenic microorganism can be transferred into the human body (WHO 2002). Some of the pathogenic microorganisms that contaminate milk and make it unsafe for consumption are Brucella sp., Bacillus cereus, E. coli O157:H7, Campylobacter sp., Staphylococcus aureus, Salmonella sp. and L. monocytogenes that causes listeriosis are important food borne diseases that have emerged over the last decades. Milk has specific characteristics that support the growth of microorganisms and these include; higher water activity (a_w) of 0.993, temperatures of 25°C, a neutral pH of 6.6-6.9 and presence of large quantities of proteins (Anonymous 2001).

According to WHO (2002), it was reported that in 2001 alone, 2.1 million people died from diarrhoea diseases and a great proportion of these cases was attributed to contamination of foods and drinking water. In industrialized countries, the percentage of people suffering from food borne diseases each year has been reported to be up to 30% and in the USA alone, around 76 million cases of food borne diseases resulting in 325,000 hospitalizations and 5000 deaths are estimated to occur each year. While less documented, developing countries bear the brunt of the problem due to the presence of a wide range of food borne diseases including those caused by parasites. The high prevalence of diarrhoea diseases in many developing countries suggests major underlying food safety problems.
Listeria monocytogenes is one of those bacteria that have been involved in these outbreaks. It causes a disease known as listeriosis as a result of consumption of contaminated foods. The disease mainly affects pregnant women, new borne babies and adults whose immune system is very low such as in cancer and HIV/AIDS victims. It is a fatal disease with mortality rate of 25% (compared to mortality rate of 1% for salmonella), and hospitalization rate is 92% (Anonymous 2001). The organism causes two forms of the disease; invasive and non-invasive. The invasive disease normally occurs in people with weakened immune system while the non-invasive disease can occur in anyone if a high number of Listeria monocytogenes cells are consumed. The invasive form has an incubation period of 1-90 days following consumption of $10^2$ to $10^3$ cells and characterized by flu-like symptoms, meningitis, septicemia, diarrhea, vomiting and spontaneous abortion. The incubation period for the non-invasive form is 11 hours to 7 days following consumption of $10^5$-$10^{11}$ cells, characterized by diarrhea, fever, muscle pain, headache, and less frequent abdominal cramps and vomiting. It has also been termed as febrile gastroenteritis. Anonymous (2001) reported that in one outbreak neurological problems (cranial nerve palsies) developed in 30% of the survivors of meningitis. Pre-term infants may suffer from excess fluid in the brain.

The sources of Listeria monocytogenes include humans, animals, food and the environment. In humans, Listeria monocytogenes is carried asymptomatically in the feces of 2-6% of the population. It is shed in high numbers ($>10^7$g) in feces of infected people (Anonymous 2001).

Like in humans, animals too are affected and veterinarians are considered to be a high risk group. Listeria present in the animal feces can contaminate milk and other animal products and improperly made silage can be a source of domestic animal infection. The organism is also considered to be potentially present in all raw foods and ingredients. Risk posed is likely to be greatest in ready-to-eat foods with long shelf lives. However, pasteurization is an important process used to reduce bacterial populations present in milk hence safe for consumption. The two methods include high temperature short time (HTST) at 71.7°C for 15 seconds and low temperature long time (LTLT) at 61.7°C for 30 minutes.
Problem Statement

Food borne illness is recognized as a significant public health problem throughout the world, though data is incomplete that would permit accurate quantification of morbidity and mortality associated with food borne hazards especially in developing countries. Much of the burden of illness were as results of basic sanitation failures that occur in food production, processing, retailing, and handling at home. For processed foods, Uganda depends heavily on imports and must be protected from products that are sub-standard in quality or beyond their expiration date. Consequently, expansion for production and export of value-added products in developing countries are strategic keys for future economic development. This will require the implementation of reliable in-plant HACCP-based quality and safety control systems. There is failure of many African produced food products to meet the international food-safety and quality standards thereby hampering the continent’s efforts to increase agriculture trade both intraregionally and internationally, locking many farmers out of a chance to improve their economic well-being.

Objectives of the Research

a. The objective of this research was to detect the presence of *L. monocytogenes* in different brands of pasteurized milk sold in supermarkets in Bogor City.

b. To determine the number of colony forming units per ml of *L. monocytogenes* in the sterile milk sample after 7 consecutive days in the refrigerator at 4°C and relate it to the health of the consumer.

The hypotheses of the research were that there is *Listeria monocytogenes* in pasteurized milk sold in supermarkets in Bogor City and the second was that there no *Listeria monocytogenes* in pasteurized milk sold in supermarkets in Bogor City.