

# Milk research essay



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I choose milk as the food type I would investigate for microbial contamination from ' Farm to Fork'. I choose milk because I live in a rural area and find that the raw versus pasteurised milk debate is a very topical and important debate, which is ongoing. Raw milk was banned from being sold in Ireland from 1997. I plan to investigate how microbial contamination occurs from before milking start until the milk is placed in the consumer's glass. I have chosen to in particular investigate how microbial contamination with E. Coli 0157: H7 occurs. I have chosen E. Coli 0157, as it has become known worldwide because of increased food poisoning outbreaks that are all extremely serious. I will show how a mastitis infection in a cow while she is being milked leads to a major increase in microbial contamination. From this proper handling and sanitisation on farms become important. I will also show how important the correct distribution and storage of milk is in reducing possible microbial contamination.

## Mastitis

Mastitis is a bacterial infection, which causes an inflammation of the udder. Raw milk from cows with mastitis is heavily contaminated with bacteria. The most common bacteria found on the udder during the inflammation are E. Coli, S. Aureus and Enterobacter.

There are 3 different classifications of mastitis

### 1. Contagious Mastitis.

This is caused by bacteria, which can survive on the skin of teat and in the udder. The pathogens involved in mastitis spread from udder to udder. A common type of bacteria that causes this would be *S. Aureus*.

## 2. Environmental Mastitis.

This is caused by bacteria, which usually can't live on the skin of teat or udder. This type of bacteria enters the teat canal through dirty housing conditions and poor hygiene standards on farms and milking parlours. A classic example of the bacteria causing Environmental Mastitis is *E. Coli*.

## 3. Summer Mastitis.

This type of mastitis normally occurs in dry cows that are at pasture during the summer.

Good hygiene practices on farms like cleaning teats and udder before milking and sanitised milk handling and storage can be a major factor in reducing mastitis incidents and their spread on farms. Milk handling equipment if inadequately cleaned can be a major source of gram negative, psychotropic bacteria, which survives at refrigerated temperatures.

Microorganisms present in milk can be seen under the microscope when stained. Somatic cells may also be seen. The Somatic Cell Count can be used as an indicator of milk quality. Uninfected cows have below 200, 000 cm cubed of somatic cells.

Somatic cell count is sometimes the only way of diagnosing mastitis.

### i. Sub Clinical Mastitis

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This is where the udder and milk appear normal even though there is an infection present. This is where the Somatic Cell Count is especially important, to ensure the quality of milk.

## ii. Clinical Mastitis.

This is when the udder area is swollen and clots may appear in the milk. This is an obvious indicator that the milk will have high bacteria content.

## Potential Pathogens

### Escherichia Coli

Escherichia Coli bacteria are gram negative, facultative anaerobe, straight rod bacteria from the family Enterobacteriaceae. They exist singly and do not form spores. Many forms of Escherichia Coli exist naturally and do not cause harm in the gut and intestines of humans and animals. E. Coli's optimum growth temperature is 37 – 44 degrees Celsius. The 0157: H7 strain of E. Coli is especially heat sensitive and will not survive temperatures of 44 degrees Celsius or higher.

Escherichia Coli 0157: H7 is the most serious strain of Escherichia Coli. It was classically associated with undercooked ground beef but has increasingly become associated with fruit, vegetables and raw milk and its associated products. Raw milk is normally contaminated by Escherichia Coli from exposure to faecal material. Raw milk is contaminated by faecal matter from teats becoming soiled with dung and bedding, which if not removed before milking can wash into the milk. Controls which will help reduce the amount of milk contaminated by E. Coli begin with the proper and effective cleaning of

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the milking parlour- cleaning and disinfection of udders and teats, cleaning and sanitisation of milking equipment and later storage areas especially transfer pipes.

There are 5 main strains of Escherichia Coli

- \* Classical Enteropathogenic E. Coli (EPEC)
- \* Enteroinvasive E. Coli (EIEC)
- \* Enterotoxigenic E. Coli (ETEC)
- \* Enterohemorrhagic E. Coli (EHEC)
- \* Enteradherent E. Coli (EAEC)

Escherichia Coli 0157: H7 has been shown by studies to be able to survive for up to 150 days in soil and 90 days in cattle faeces (Cassteles, 1998). This particular strain of E. Coli is extremely deadly with only a small infection oral dose of one thousand organisms causing illness. Escherichia Coli 0157: H7 can cause severe damage to internal organs. Hemorrhagic Colitis is normally lasts between two and nine days with an incubation period of three to five days. Faecal shedding of the organism can last up to four weeks which is why any suspected cases of E. Coli food poisoning should be notified immediately with the suffers avoiding any food preparation etc. The second stage of E. Coli 0157: H7 food poisoning is Haemolytic Uremic Syndrome (HUS) most patients require dialysis and 3-5% of all patients die

Milking Practices, Storage and Distribution.

Milk is stored on farms after milking in refrigerated vessels which are capable of holding 1-2 days of the farms daily milk amount. Farm bulk tanks are designed for operation at temperatures below  $7\frac{1}{2}^{\circ}\text{C}$ . The milk is transferred from the farm bulk tank to the tanker by a vacuum pump. A vacuum pump is used because it is hygienic and doesn't damage the milk fat globules. The milk is then transported by a stainless steel milk tanker. This tanker is thermally insulated to ensure that the milk remains at the correct cool temperature during transportation. When the milk arrives it is passed through a coarse filter which removes large physical particles present in the milk. After this it is transferred into a milk storage silo by a centrifugal pump. The silo is filled from the bottom to avoid damage to the fat globules from agitation and foaming.

### Pasteurisation

Rapid cooling, cold storage, proper pasteurization, and clean cold storage of microbial contamination. Pasteurized milk are necessary for the prevention of

There are many different types of pasteurisation techniques. Pasteurization destroys most disease producing organisms. The pasteurization process heats milk to 161 degrees for 15 seconds, this inactivates or kills organisms that grow rapidly in milk. Pasteurization does not destroy organisms that grow slowly or produce spores. While pasteurization destroys many microorganisms in milk, improper handling after pasteurization can recontaminate milk.

Ultra-high temperature (UHT) processing destroys organisms more effectively and the

milk is essentially sterilized and can be stored at room temperature for up to 8 weeks

without any change in flavor.

## Discussion

After gathering the information needed for this assessment it has become very obvious to me that there are some very basic but crucial steps for ensuring minimal microbial contamination of milk from 'farm to fork'. The first important step is the removal of dirt and bedding from the cows udders which removes a lot of microbes before milking even occurs. The Somatic Cell Count is a basic but crucial test to rule out mastitis and other bacterial content from the milk. The proper cleaning and sanitisation of the milking parlour and all associated milking equipment further protects the milk from microbial contamination.

The next steps are the responsibility of the creamery, a properly sanitised vehicle for the transport which is kept at the correct temperature. When the milk arrives at the creamery correct handling is essential. Pasteurisation is the most effective way of keeping milk's microbial content down. When I first started this assessment I didn't fully realise all the dangers associated with raw milk and its products. From the gathering the information needed I now know that raw milk can be lethal e. g. the mortality rate for E. Coli 0157: H7 is quite high compared to most other food borne pathogens. I have come to

the reckoning that raw milk being banned for human consumption is completely fair and correct as the risks associated with it are far too high. I also feel that more precautions should be taken in dairy farms to prevent bedding, manure etc being embedded in the cows udders prior to milking. I now feel that the preventive measures being enforced under the 1953 and 1956 Dairies Act are very fair and just.

## Conclusions

On completion of this assessment I consider raw milk to be a major health risk to anybody who drinks it. I feel that the risk associated with raw milk has dramatically increased in recent years and that the widespread serious outbreaks which have become public knowledge are a strong and constant reminder of the dangers of raw milk and its associated products. I have also learned that pasteurised milk has become safer and better over recent years. Flavour and smell have markedly improved. I found the information on milk to be widely available with easy access ensured to consumers. I noticed the raw milk versus pasteurised milk is quite a topical debate. I live in the countryside and found that the knowledge of the dangers of raw milk was quite low. I found the Food Safety Authorities website to be a major help with gathering and understanding information.