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Total cell count
Hygiene
Safety

1872 · 1908 · 1946 · 1948 · 1962 · 1972 · 1984 · 1994 · 1995 · 1998 · 2006 · 2011 · 2013

sales in over 100 countries...

sales in over 100 countries...

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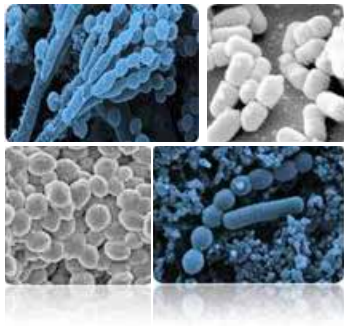
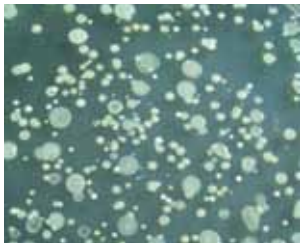
2013



Experience and tradition in starter culture production

The complexity and variation in level of indigenous bacteria in food products implies that it is impossible by one analytical method to cover all the bacteria present. Unfortunately it takes time and is very expensive to investigate broadly, and therefore, scientists over the years have made norms for best possible analytical practise.



Indigenous flora

Bacteria in food products consist of three groups:

- Pathogenic bacteria causing food poising
- Spoilage bacteria influencing the shelf-life of food products
- Harmless bacteria of which some even may be beneficial because they may be able to control/suppress the other bacteria. In this group also added starter cultures are included.

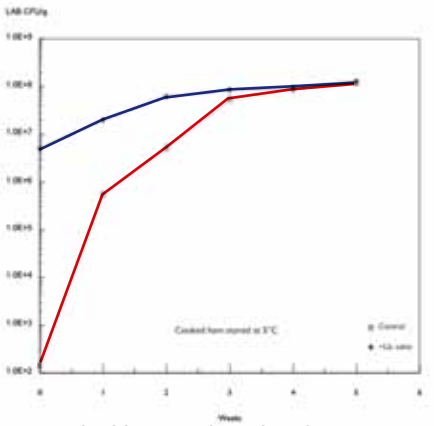
Product with culture added

Depending on the food matrix and processing it could be a combination of the three groups of bacteria present in the finished product.

The level of undefined total cell count (TCC) may indicate something about the manufactures level of production hygiene but nothing about the safety or expected shelf-life of the product. There are different set of circumstances to consider:

- Worse case could be an initial low TCC but contamination with few *Listeria monocytogenes,* a food pathogen. Without competition from harmless/good bacteria *L. monocytogenes* may grow up to a level that could cause outbreak of food poisoning leading to death of e.g. immuno-compromised persons. It has been documented that many big epidemics have been caused by "too clean" products because no natural competitive flora was present. Here a limit of 10^6 CFU/g at the end of shelf-life is no guarantee for safety.
- More safety is really obtained with an initial medium level of harmless bacteria but here the question will be: how to know that they are harmless? However, why count on uncontrolled indigenous bacteria when dominant and undamaging starter cultures might be an option?
- High initial level of TCC might indicate an uncontrolled production – apart from when a starter culture has been applied.

The overall goal of Good Manufacturing Practise (GMP) is to minimise the level of pathogenic and spoilage bacteria from soil to table. For authorities food safety is the focus area as the loss of work force, ranging from people staying home with upset stomach to death due to food poising, account for huge economical loses in missed working hours, hospitalisation etc. Manufactures are probably more concerned about food poising due to loss of creditability on the market. Additionally, the stability of their products is more important as returned goods due to spoilage for the single manufacturer is a bigger economical problem. Furthermore, manufactures as suppliers, especially to big supermarket chains, have often to comply with specific demands – very frequently expressed in TCC. This will, as before mentioned, not give any relevant information about the bacteriological quality of the food products but is just a measurable figure.



Cooked ham with and without protective culture added. Stored at 5°C ÷.

In 2005 (Regulation EU No 2073/2005) EU decided to harmonise the bacteriological demands to food products to minimise the waste in conducting analyses, which did not give useful information in insuring protection, in respect to shelf-life/food hygiene as well as pathogenic bacteria/safety, of the consumers. The regulation was updated in 2007 (Regulation EC No1441/2007). The only product for which TCC is relevant is determining the shelf-life of minced meat on the day of production. Otherwise it is safety considerations; such as the level of *L. monocytogenes* should be <100 CFU/g on the last day of shelf-life of ready-to-eat product, which are not heat treated before consumption. This group comprises products such as sliced meat products and smoked salmon.

As mentioned, if a protective starter culture is applied to a food product the initial TCC will be high. As it is good bacteria it does not impose any risk for the consumer but ensures better quality and safety. The way to evaluate if it is a starter culture added or a hygienic problem giving the high initial TCC is easily seen by surface plating. If the flora consists of various colony morphologies it is an indication of indigenous bacteria. If the colony composition shows the amount of different morphologies correlated to the amount of strains added it demonstrates that a protective culture is applied.