

INDICATOR ORGANISMS

Total Aerobic Count

The term “total viable count on surface” describes the number of colony forming units (cfu) which exist on a defined area (e.g. 1 cm²) of the analyzed surface. Normally it will be determined using a total plate count agar by means of grown colonies after incubation at 30 – 35 °C for approx. 48 hours colonies will be counted. The total viable count is an indicator for the hygienic status of the food production and shows possible microbial loads and contamination sources. The “aerobic mesophilic count” indicates the number of colony forming units (cfu) formed on a plate count medium during a specified incubation time at mesophilic temperatures (approx. 30 – 37 °C). The aerobic count is an indicator for the microbial status of the production and environmental conditions.

Coliform bacteria

Coliform bacteria are considered to be indicators for faecal contaminations and are often used for monitoring water quality. Detection of coliform bacteria on surfaces in the production environment or solid foods indicates that the hygienic conditions in the food production process need to be optimised. The term “coliform bacteria” does not describe a taxonomical group beyond the eubacteria; it actually is more a summary of some genera from the family of enterobacteria. Their common biochemical characteristics are a positive lactose reaction as well as a negative oxidase reaction. These bacteria are easily to identify using nutrient media which contain chromogenic substrates for their enzyme β -galactosidase (e.g.: X-GAL).

Enterobacteria

The *Enterobacteriaceae* are gram-negative, rod-shaped bacteria which are typically 1-5 μ m in length. They are facultative anaerobes and most are motile, but non-motile genera exist as well. *Enterobacteriaceae* cannot produce oxidase and can be distinguished from similar genera by this criterion. *Enterobacteriaceae* are a normal part of the gut flora which is found in the intestinal tract of humans and animals. They are also spread widely in the environment (e.g. soil, water). Some genera are pathogenic and can cause serious diseases. Genera of *Enterobacteriaceae* are *Cedecea*, *Citrobacter*, *Enterobacter*, *Escherichia*, *Hafnia*, *Klebsiella*, *Kluyvera*, *Morganella*, *Proteus*, *Rahnella*, *Salmonella*, *Serratia*, *Shigella* and *Yersinia*.

Enterococcus

Enterococci are gram-positive organisms which belong to the intestinal bacteria as well as the gram-negative Enterobacteriaceae. *Enterococci* may appear as contaminations in a variety of fermented foods. Their presence in food products has long been considered as an indication of poor sanitary conditions during production and processing. On the other hand, *Enterococci* are specifically used as starter cultures for the fermentation processes of a variety of foods. It is claimed that *Enterococci* play an important role in the development of the organoleptic properties of the fermented foods. For water, the presence

of *Enterococci* serves as an indicator of faecal contamination. *Enterococci* will only appear in water if they are inserted by contaminations with human or animal faeces.

Yeasts and Molds

Yeasts and molds are able to contaminate foods and are responsible for quick spoilage of the infested food stuff. Due to their ability to produce toxic or allergenic substances molds are especially predestinated to be a potential health risk. As these organisms might be rapidly spread by dusts and aerosols, surfaces in the production environment will be consistently contaminated. Therefore, they should be taken into account and added to the sampling plans of the general hygiene monitoring.

Yeasts are facultative anaerobe, mono-cellular fungi (Ascosporidae), fermenting sugar substrate to CO₂ and H₂O. Under anaerobic conditions yeasts ferment sugar to alcohol and CO₂. Those qualities are commercially used in the brewing, wine and baking industry. *Saccharomyces cerevisiae* is the most common strain used for industrial purposes. In terms of food spoilage genera of *Candida* play a major role. This germ is located on the human and animal mucosa (nose, throat).

The term “mold” is commonly used for the visible part of the fungi present on the surface of contaminated food. Under the surface the fungi forms mycelium which cannot be recognized with the naked eye. Specific molds as well as yeast are used for industrial purposes (e.g. cheese production). Harmful genera of molds exist as well and are able to produce toxins (mycotoxins). Almost all molds have an allergenic potential related to their spore form capabilities. Besides food spoilage molds are subject to be discussed in conjunction with buildings infested by molds.