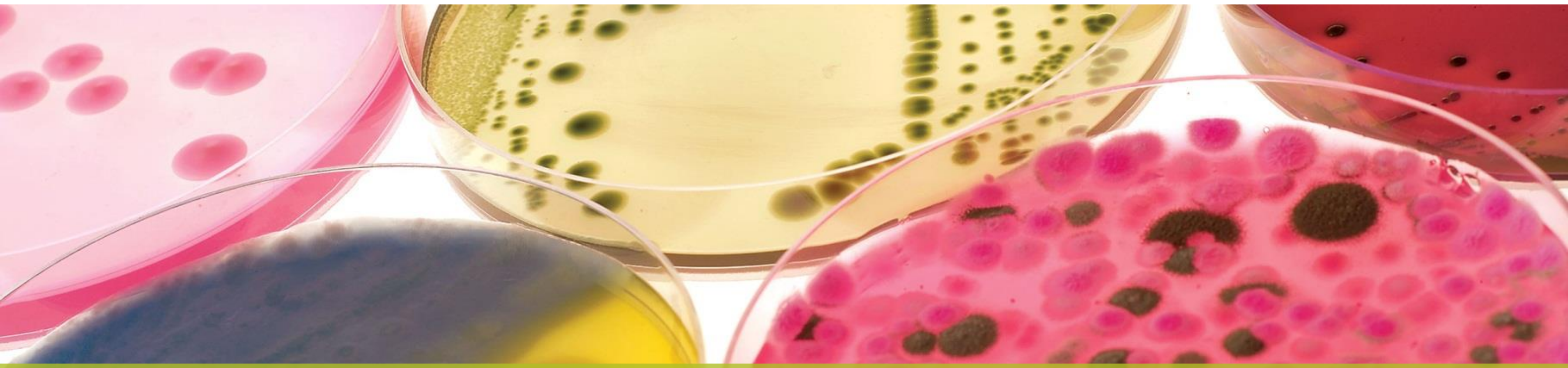
ALS Food & Pharmaceutical



# Microbiology bulletin 11

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## Is it possible to control Listeria in drains by influencing the total bacterial population?

Listeria species (like all bacteria) experience complex interactions with other microorganisms, which may promote growth and colonization of the organism in local environments or conversely inhibit their potential growth.

A recent study published in Applied and Environmental Microbiology investigated the microbial community at a food production facility, examining interactions between Listeria and the associated microbial populations. Drains that were colonized by Listeria species and those determined to be free of Listeria were examined.

Increased populations of the genera Prevotella and Janthinobacterium were associated with the absence of Listeria species in particular areas, whereas Enterococcus and Rhodococcus were in higher abundance in drains colonized by Listeria species. Based on these results, a selection of bacterial species were grown in a biofilm mixed culture with a *Listeria monocytogenes* strain identified as having colonized a drain at the facility.

Mixed-species biofilm experiments showed that Janthinobacterium inhibited attachment and subsequent biofilm formation of *L. monocytogenes;* whereas *Enterococcus gallinarum* significantly increased it.

The results of this study suggest the microbial community in food processing facilities can impact the colonization of Listeria species and that influencing the total microbial population may reduce the colonization of Listeria species and limit the likelihood of product contamination.

## How Salmonella obtain the energy required to act as pathogens in the intestine.

The first step of the infection process of Salmonella is invasion of the epihelial cells which line the intestine. These cells are adapted to defend against such attacks, but Salmonella has developed strategies to overcome these and make it more virulent. It also needs these virulence genes to overcome the cells of the immune system, which it also invades to move around the body. The Institute of Food Research, has been studying *Salmonella typhimurium* to understand why it is such an effective pathogen. To discover more about Salmonella's feeding habits, scientists constructed *S. typhimurium* strains lacking certain key genes in important metabolic pathways. They then examined how well these mutated strains reproduced in human epithelial cells, when grown in cell cultures.

It was demonstrated that glucose is the major nutrient used by *S. typhimurium*,. Salmonella converts glucose to pyruvate in a process called glycolysis, which also releases the energy needed to fuel growth and reproduction. Knocking out enzymes used to transport glucose into the bacteria severely reduced *S. typhimurium's* ability to reproduce in epithelial cells, but didn't eradicate it completely. This suggests that although S. typhimurium requires glucose, it is also able to use other nutrients.

This however contrasts with previous findings from similar experiments on macrophage cells, as it has been demonstrated that for successful macrophage invasion, glycolysis is absolutely essential. Macrophages are the immune cells sent to destroy Salmonella, but instead Salmonella invades the macrophages. Infected macrophages can carry Salmonella around the body causing a systemic infection.

## Using competitive bacteria to inhibit the growth of Salmonella on fresh produce

Scientists from the U.S. Food and Drug Administration (FDA) have identified a harmless bacterium that shows promise in blocking Salmonella from colonizing raw tomatoes. Their research is published in the journal Applied and Environmental Microbiology.

When applied to Salmonella-contaminated tomato plants in a field study, the bacterium, *Paenibacillus alvei*, significantly reduced the concentration of the Salmonella compared to controls.

Farmers and agricultural scientists have long adopted the principles of competitive inhibition to prevent plant diseases, and the researchers are going to try and develop this microbiological approach to cantaloupe, leafy greens, and other crops that have lately been responsible for outbreaks of food-borne Salmonella, Listeria and E. coli.

## Recent *Cl perfringens* outbreak.

More than 300 people were ill with gastroenteritis caused by *Clostridium perfringens* at a wedding in the US state of Indiana.

Health officials stated that the cause was gravy that took too long to cool down, allowing the bacteria to grow and produce toxins.

Hours after the wedding, guests suffered symptoms of abdominal cramps and diarrhea.

This is the classical way that *Cl perfringens* (an anaerobic spore forming organism) acts, with the spores surviving the cooking process and being held in warm, anaerobic conditions such as those present in the central portion of a large vat of gravy.

An astonishing 750 people attended the event which probably accounted for the large quantity of gravy produced.

## An outbreak of Salmonella in the States attributed to feeder mice

After recent articles highlighting the risk of contracting Salmonella from pet reptiles, a new *Salmonella typhimurium* outbreak affecting 37 people from 18 US States has been traced to the frozen mice used to feed the pet reptiles and amphibians.

## An interesting article

An interesting article appeared today in Farmers Weekly, http://www.fwi.co.uk/articles/30/05/2014/144253/campylobacter-causes-and-solutions-for-poultry.htm outlining current thinking regarding Campylobacter at the Poultry industry.