

**PREVENT.  
DETECT.  
ACT.**



## ABOUT LISTERIA MONOCYTOGENES

*Listeria monocytogenes* is a Gram-positive bacterium that is among the leading causes of death from foodborne illness. It has 13 serotypes, amongst which three have been associated with the vast majority of foodborne infections. Although Listeriosis is not the leading cause in foodborne illnesses, the severe form of the infection has a case-fatality rate of 15% to 30%. When listerial meningitis occurs, the case fatality rate may be as high as 70%.

## DID YOU KNOW THAT YOU INVITE LISTERIA INTO YOUR FACTORY EVERY DAY?

The natural home of *Listeria monocytogenes* is in the fields, and thus, in the soil, water, and even the vegetables that are harvested. In that condition, it is termed a saprophyte, as the organism does not cause any harm in this condition. It is only when the crops are harvested and brought into the factory that becomes an issue. Considering this, most food manufacturers are inviting *Listeria monocytogenes* into their factories every day. Every piece of raw material could potentially have *Listeria monocytogenes* on it. Nevertheless, raw and fresh produce is consumed every day without people getting sick. This pathogen mostly affects people with a weak immune system and has to grow in the food before an infectious dose is reached. The problem is that *Listeria monocytogenes* can multiply from very low numbers and reach dangerous levels, even at fridge temperatures, so preventing even very low numbers from contaminating food is crucial.


## UNDER WHICH CONDITIONS DOES LISTERIA MONOCYTOGENES SURVIVE?

	Growth		
	Min. (lower growth limit)	Optimum (fastest growth)	Max. (upper growth limit)
Temperature [C°]	-1.5	30.0-37.0	45.0
pH	4.2-4.3	7.0	9.4-9.5
a <sub>w</sub>	0.93 [0.90 with glycerol]	0.99	>0.99
Salt concentration [%] <sup>2</sup>	<0.5	0.7	12-16
Atmosphere	Facultative anaerobe (it can grow in the presence or absence of oxygen, e.g. in a vacuum or modified atmosphere package)		
Thermal inactivation			
D <sub>65°C</sub>	0.2 to 2 min		
z	7.5°C (4 to 11°C)		
High pressure inactivation			
400 MPa for 10 min at 20°C → 2 log <sub>10</sub> reductions in phosphate buffer (pH 7)			
400 MPa for 10 min at 20°C → 8 log <sub>10</sub> reductions in citrate buffer (pH 5.6)			
350 MPa for 5 to 10 min at 20°C → 3 to 5 log <sub>10</sub> reductions in acidic products (e.g. fruit juices, jams)			


### REGULATORY REQUIREMENT IN SWITZERLAND:

For ready-to-eat foods that may favor the multiplication of *Listeria monocytogenes*, the germ must be “undetectable” in 25g. For foods that do not favor the multiplication of *Listeria monocytogenes*, the limit of 100 cfu/g applies.

Hygiene Ordinance [SR 817.024.1]

 Strawn et al. [2013] sampled five fresh produce farms in New York and found an estimated 15% prevalence rate of *L. monocytogenes*. The prevalence was highest in the winter season.

doi: 10.1128/AEM.02831-13

 Leong et al. [2017] monitored 54 small food businesses in Ireland found the greatest prevalence of *L. monocytogenes* in vegetable processing facilities [9.5%], followed by the meat, dairy, and fish segments.

doi:10.1016/j.jfoodmicro.2017.02.015

*Listeria monocytogenes* is hardy; it is salt-tolerant and not only can survive in temperatures below 1°C, but also grow in these conditions, unlike many other pathogens. It is notable for its persistence in food-manufacturing environments. Interestingly, *Listeria monocytogenes* is a poor competitor, and so it may not grow well where other organisms are active.



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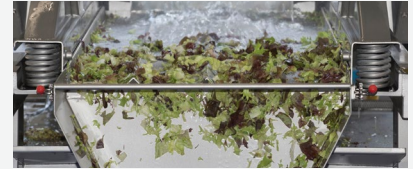


# FRESH AND LEAFY PRODUCE: LISTERIA IN YOUR FACTORY ENVIRONMENT

Plants live until the very moment when they are harvested. After that, they become sensitive to quality loss, making them perishable. In order to slow down this process, they are kept cold and may be packed under a modified gas atmosphere to inhibit microbial activity. From this point, the produce remains chilled, refrigerated up until the point of consumption. And that is the very environment *Listeria monocytogenes* thrives in and has an advantage over other pathogens.

## 1 WATER REUSE SYSTEMS

Ready-to-eat fresh and raw products are washed in chilled water. And because water is a precious commodity, it is most likely reused. This makes water reuse systems a critical point as it provides *Listeria monocytogenes* with optimal conditions to grow.



## 2 AIR CONDITIONING SYSTEMS

Chilling, refrigeration, or air conditioning systems are required to keep food cold. The warm and moist air is sucked into these systems, where it is converted into cold, dry air. The water condenses outside of the metal coils of these systems, and yet another niche for *Listeria monocytogenes* is created. Furthermore, if the air conditioning is contaminated, it can act as a vector and can spread the pathogen all over the factory. If these systems happen to be directly above vulnerable parts of the production process, condensate may drop onto the exposed area and cross-contaminate the products.



## 3 BIOFILMS

Biofilm is a thin but robust layer of mucilage adhering to a solid surface, containing a consortium of microorganisms and some food residue. Biofilms are typically associated with moist and wet surfaces. In the production of fresh and raw produce, there are perfect conditions for biofilms to accumulate on the equipment where the vegetables are washed, drained, and cut. Once organisms such as *Listeria monocytogenes* grow in biofilm, they are more difficult to kill with disinfectants, remove by cleaning, and thus, likely to recontaminate the new, fresh vegetables that are passing through.



**“ We have had a great experience with the N-Light™ rapid test. We have really fast results, it is incredibly easy to use and we are happy that there will be more tests available in the future. ”**

Elisa Stamm, Quality Manager Kellermann AG

Coming soon: N-Light™ *Salmonella* spp. and N-Light™ *Listeria* spp.



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