N-LIGHT™
LISTERIA MONOCYTOGENES

**PREVENT.
DETECT.
ACT.**

ABOUT LISTERIA MONOCYTOGENES

Listeria monocytogenes is a 'zoonotic pathogen,' meaning it can spread between humans and animals. It is among the leading causes of death from foodborne illness with a 15% to 30% case-fatality rate. While the disease is quite rare, we learn that many types of food and food processing operations are vulnerable to the organism, which has its natural home in the soil, and on crops upon which animals graze.

CROSS-CONTAMINATION IS THE MOST SIGNIFICANT RISK FOR MEAT PRODUCTS

Any type of raw meat can contain a variety of different pathogens. At the start of the meat production process, pathogenic organisms can transfer on the freshly slaughtered carcasses and then be spread onto primal cuts. These raw meat cuts are typically converted into meat products through a rich diversity of technologies and recipes. Even if the carcasses are not contaminated or *Listeria* was successfully eliminated through cooking or fermentation, the risk of cross-contamination remains. It has been well-established that *Listeria monocytogenes* can become firmly ingrained in equipment and the factory environment. Thus, the most significant risk for the meat industry is cross-contamination. To fully assess and effectively manage this invisible risk, the precise locations of *Listeria monocytogenes* in the meat plants and its behavior must be understood.

UNDER WHICH CONDITIONS DOES LISTERIA MONOCYTOGENES SURVIVE?

The European Food Safety Authority in 2019 attributed 5/12 outbreaks of listeriosis to meat products.
doi: 10.2903/j.efsa.2019.5898

The worldwide largest listeriosis outbreak in South Africa during 2017–2018 [1,060 listeriosis cases, 216 deaths] was traced back to a heat-treated meat product.
doi: 10.1128/genomeA.00538-18

	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_w	0.93 [0.90 with glycerol]	0.99	>0.99
Salt concentration (%)[2]	<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			
$D_{65°C}$	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 $\log_{10}$ reductions in phosphate buffer [pH 7]
400 MPa for 10 min at 20°C ⟶ 8 $\log_{10}$ reductions in citrate buffer [pH 5.6]
400 to 500 MPa for 5 to 10 min at 20°C ⟶ 3 to 5 $\log_{10}$ reductions in meat products

Listeria monocytogenes is hardy; it is salt-tolerant and, unlike many other pathogens, can grow at refrigeration temperatures used in the meat supply chain. It is thus notable for its persistence in meat processing environments. Interestingly enough, *Listeria monocytogenes* is a poor competitor and is rarely found in conditions where other pathogens flourish. Thus, some indicators of 'poor hygiene' may not always be a good predictor of the presence of the pathogen.

THREE AREAS OF INCREASED RISK IN YOUR
MEAT PRODUCTION PROCESS

1

COOKING

Cooked meat is susceptible to contamination with *Listeria monocytogenes*. The cooking process of hams, pates, and comminuted meat 'logs,' for example, eliminates most pathogenic bacteria, which provides *Listeria* with the ideal environment to grow after cooking. Thus, if any cross-contamination occurs between the cooked meat and unsanitary equipment or environment, *Listeria monocytogenes* has a highly nutritious medium in which to multiply. Therefore, hygiene must be paramount in zones where cooked meat is knocked out of the metal molds and during grilling or smoking steps.

2

FERMENTATION

Fermentation is a technique that is centuries old. It relies on the natural microorganisms in meat and defined starter cultures, which help to acidify the meat by utilizing fermentable carbohydrates. Raw, dried, and fermented meat products have a long history of safe consumption, and traditional recipes and processes can eliminate *Salmonella* and *E.coli*. However, if raw meat is heavily contaminated, it is possible that the fermentation process might not eliminate *Listeria monocytogenes* completely. If the pathogen is still present in low numbers, it is possible that the routine sampling might not even detect it. In addition, many of these raw meat products will not support the subsequent growth of *Listeria monocytogenes* because the moisture content and acidity are too harsh. However, the fermented products can still cross-contaminate other equipment and spread *Listeria* to other (more susceptible) meat products, e.g., cooked meat.

3

SLICING AND DICING

In the industrial meat processing supply chain, high-speed slicing or dicing machines are the standard. Typically designed and operated for volume throughput, these machines can be challenging to clean and sanitize. *Listeria* may become deeply ingrained in the equipment and evade detergents and disinfectants, sometimes only re-emerging once the machines generate sufficient heat to melt the animal fat and release the microbial contamination from inside bearings and between metal and plastic parts close to the slicing and dicing blades. Regular swabbing of this equipment is needed to find the root cause of persistent, low-level contamination.
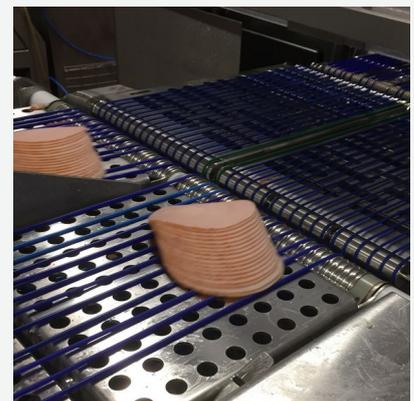
> **With the N-Light™ Listeria monocytogenes rapid test, we have found a method that allows us to perform an efficient Listeria monitoring in our production facility. The application is user-friendly and provides reliable results in a short time. This helps us enormously to ensure food safety in our products.**

Angela Stadelmann, Quality Manager Metzgerei Angst AG

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

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