



## A VARIETY OF FOOD PRODUCTS ARE LINKED TO LISTERIOSIS OUTBREAKS WHICH HAVE OCCURRED MORE FREQUENTLY IN RECENT YEARS.

Among these are ready-to-eat fish products, e.g. cold smoked salmon, being in the high risk group.

The hurdles utilized in processing cold smoked salmon, such as salting, smoking and drying, are not adequate to ensure that *Listeria monocytogenes* cannot develop. In addition, the packaging and storage conditions do not prevent further growth of *L. monocytogenes* to an extent which might inflict a health risk.

Some help might be found by applying lactic acid bacteria producing bacteriocins which are antimicrobial compounds to which *L. monocytogenes* is susceptible.

Consequently, application of a starter culture producing bacteriocins will be an additional hurdle enhancing the safety of food products. The mode of action may be illustrated as shown in the figure to the right. Sacco has a protective culture for seafood application. Lyoflora FP-18 and Lyoflora FP-50 consist of Carnobacterium producing bacteriocins efficiently inhibiting *L. monocytogenes* in fish products such as cold smoked salmon.

The culture has been developed by two French national research institutes, Ifremer and Oniris, and comprehensive scientific documentation for the activity is available.

The culture might be used in **dry salting process** or **sprayed onto the surface** of fish products but most capably the culture is applied using **brine injection** to ensure an even distribution of the culture. It is necessary to adapt the way of application to local production facilities nevertheless some recommendations are available.

For all **application methods the aim is a minimum of 10<sup>5</sup> CFU/g fish product** but the needed amount forcefully to enhance safety is probably in the ratio 10<sup>6</sup> CFU/g to 10<sup>7</sup> CFU/g. The inoculation level will depend on the processing and the bacteriological quality of the raw material.

In an external challenge test, with a storage temperature of 8°C, the data illustrated to the right were found.

The graph shows that with 10<sup>7</sup> CFU/g the added 70 CFU *L. monocytogenes*/g did not exceed the limit of 100 CFU *L. monocytogenes*/g after 30 days of shelf-life whereas also added 10<sup>6</sup> CFU/g kept the growth below growth potential (upper limit) in ready-to-eat food of 0.5 log<sub>10</sub> CFU/g. These results demonstrate the advantage of applying Lyoflora FP-18 or Lyoflora FP-50 and that the inoculation level should be determined by expected contamination level in the finished product.

### APPLICATION EXAMPLES

#### Dipping



#### Injection



#### Dry Salting



#### Spraying

