



## Reduction of *Listeria* in fermented dried sausage with SafePro® B-LC-20

The presence of *Listeria monocytogenes* in fermented dried sausages is an increasing problem in the sausage industry. Often the raw materials are highly contaminated from the very beginning and even if the regular sausage processing procedure will reduce the concentration of *Listeria monocytogenes* due to the formation of lactic acid, the pH-drop and the drying out, a considerable number of *Listeria monocytogenes* could survive. This may cause safety problems in sausages where the water activity is relatively high at the end of the ripening period or the pH has only been slightly lowered. Additionally, some countries have a zero-tolerance regarding *Listeria monocytogenes*, even if the product is stabilized towards growth of *Listeria*.

In order to reduce the presence of *Listeria monocytogenes* in the final fermented sausage without altering the sausage quality, B-LC-20 was developed. B-LC-20 is an *adjunct* culture that is added on top of the existing starter culture without changing the sausage recipe or the sausage processing procedure. Addition of B-LC-20

to dried sausages produced according to European tradition (fermentation temperature < 26 °C) reduces the concentration of *Listeria* spp. dramatically.

IRTA (Institut de Recerca i Tecnologia AgroAlimentàries) in Girona, Spain has tested the efficiency of B-LC-20 when applied to a typical Northern European recipe together with the normal starter cultures. Two independent trials were performed. A 5-strain cocktail of different strains of *Listeria monocytogenes* was added to a typical salami recipe (approx. 2500 CFU/g) which already included a medium-fast starter culture. Additionally, B-LC-20 was added to one of the batches. The sausages were fermented at 24°C for 3 days and further ripened and dried for 26 days at 14°C to a weight loss of approx. 32%. Three sausages were analyzed at each sampling day for *Listeria monocytogenes*, total lactic acid bacteria, pH and weight loss. *Listeria monocytogenes* was analyzed by plate counting on Palcam agar at day 0, and on succeeding days by 'most probable number' by enrichment in Fraser broth and verification on Palcam agar.

The results showed that during the 29 days of processing, *Listeria monocytogenes* was reduced 3.0 log units on average in sausages with added B-LC-20, whereas the reduction in the control sausages was only 1.4 log units on average (Figure 1). The pH-profile during the fermentation period was very similar whether B-LC-20 was added or not (i.e. the acidification profile was not altered by applying B-LC-20 on top of the normal starter culture; Figure 2). In addition, the weight loss was not significantly influenced by the addition of B-LC-20 (results not shown).

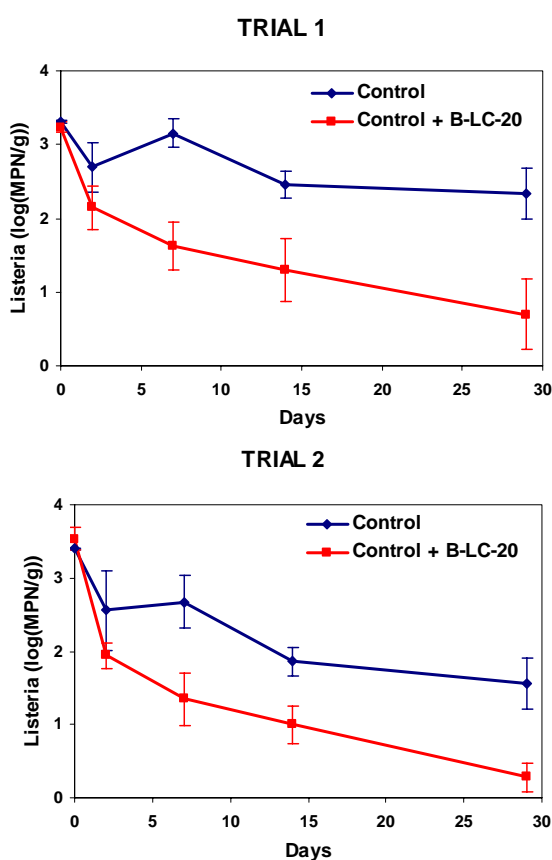
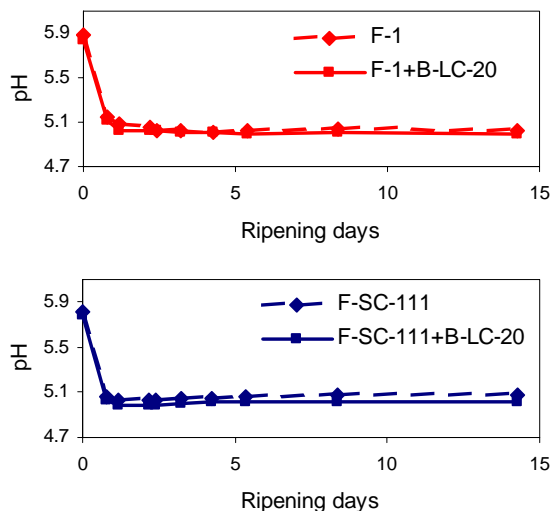
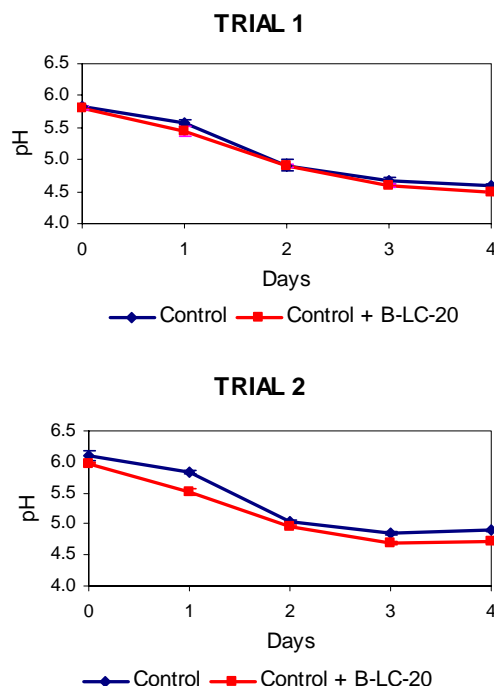


Figure 1. Development of *Listeria monocytogenes* in fermented sausages applied with or without B-LC-20 on top of the normal starter culture (IRTA-trials).

In the trials performed at IRTA, the control culture was a mixed culture from a competitor of Chr. Hansen and the sausage recipe was a typical Northern European salami recipe with a medium-fast acidification profile. However, B-LC-20 also works very well when applied together with other kind of cultures in European style sausages fermented at temperatures below 26°C. Figure 3 and 4 show the acidification profiles of German type dried sausages applied with or without B-LC-20 together with various fast or traditional fermenting cultures from the Bactoferm™ RANGE of Chr. Hansen. The graphs show that addition of B-LC-20 does not alter the acidification profile of neither fast or traditional fermented sausages (i.e. it is possible to add B-LC-20 on top of the existing sausage recipe without altering the fermentation pattern). In addition, internal sensory evaluations showed that the sensory quality of the sausages was unchanged by addition of B-LC-20.

Figure 2. pH-development during the fermentation period of sausages applied with or without B-LC-20 on top of the normal starter culture (IRTA-trials).



**Conclusion**

B-LC-20 is an *adjunct* culture to be added to the existing dry sausage recipe in order to reduce the presence of *Listeria monocytogenes* in the final product without altering the acidification profile or the sensory quality. The sausage manufacturer does not need to change his present recipe or processing conditions but will get the advantage of reduction in *Listeria* numbers.

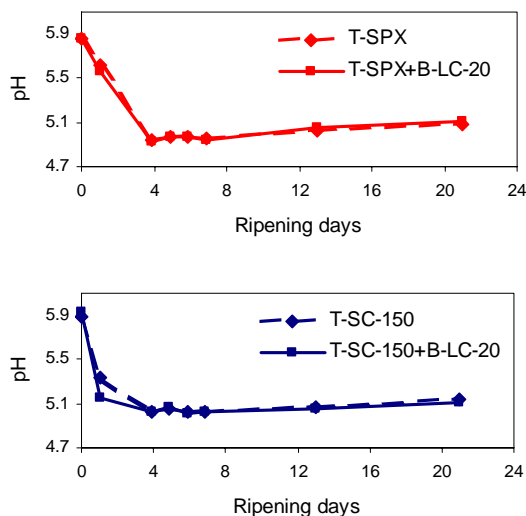


Figure 3. (above) pH-development during ripening of sausages applied with or without B-LC-20 together with a Chr. Hansen *fast* fermenting starter culture. Sausages were fermented at 24-20°C for 3 days, followed by ripening at 18 to 16°C for 11 days.

Figure 4. (to the right) pH-development during ripening of sausages applied with or without B-LC-20 together with a Chr. Hansen *traditional* fermenting starter culture. Sausages were fermented at 24-20°C for 4 days, followed by ripening at 18 to 14°C for 17 days.