FOR MEAT
INTRODUCTION

WHAT IS 4PROTECTION LINE AND WHY USE IT

HOW 4PROTECTION LINE WORKS

4PROTECTION APPLICATIONS FOR MEAT

STUDIES ABSTRACTS

ABOUT SACCO

4PROTECTION, THE NATURAL GUARD FOR YOUR PRODUCT IDENTITY
No additives, no preservatives, 100% natural are the most prevalent trends that also guide the choices of consumers; safety and durability and high quality standard level of foods is as important as ever. Sacco has the right ingredients for the success of your products and the satisfaction of your customers.

**Protection Special Cultures** help to enhance the quality and protect your brand image, allow the product to get to the end of shelf life ensuring a structural and sensorial stability, help to maintain freshness and do not change the taste, aroma and texture. Your ally for a much more genuine product till the consumer table.
Since 1998 Sacco has selected yeasts and bacteria for protection against spoiling unwanted microorganisms in dairy products such as yogurt, fermented milk, fresh cheese, semi-hard cheese, meat and fish. The cultures of 4Protection Lines help to control and preserve the final product from alterations, fighting in a completely natural way any possible unwished bacteria and thereby maintaining a “clean label” product.

Many of the selected strains used were chosen among probiotic microorganisms which has been studied and shown to be effective through specific studies, microbiological tests and sensorial analysis of the products.
Today it is known that microorganisms produce a diverse range of microbial defense molecules including exotoxins, lytic agents, metabolic by-products and bacteriocins (from EFFCA position PFC-2016). The process is based on a competitive effect for space against microorganisms in general, including pathogens, on the production of anti-microbial metabolites such as organic acids and peptides with specific mode-of-action.

The selected 4Protectionferments do not acidify, nor alter the organoleptic characteristics of the product and are easily adapted even at refrigeration temperatures.

The different applications are studied as a function of the characteristics of the technological process and of the desired performance of the products. Sacco’s technologists are committed to working alongside our customers to find the best solutions and production process, working together with clients offering a product and a customized service.

4Protection line is compatible and complementary to all the Sacco’s starter cultures, they are used by direct inoculation or surface treatment. Sacco is glad to help customers in finding the best solutions for their specific purpose, according with the characteristics of the products, the technological process and the activity needed from the use of our protective cultures.

HOW 4PROTECTION LINE WORKS
## 4PROTECTION LINE FOR MEAT

<table>
<thead>
<tr>
<th>Product</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lyocarni BXH-69</td>
<td>Fresh meat, cooked and sliced products with nitrite salt added after cooking and cooling</td>
</tr>
<tr>
<td>Lyocarni BMX-37</td>
<td>Fresh meat, cooked and sliced products with nitrite salt added and with anti-listerial properties after cooking and cooling</td>
</tr>
<tr>
<td>Lyocarni BOM-13</td>
<td>Fresh meat products without nitrite salt added or on cooked and sliced meat products after cooking and cooling</td>
</tr>
<tr>
<td>Lyocarni BOX-74</td>
<td>Fresh meat products without nitrite salt added or on cooked and sliced meat products after cooking and cooling, and with anti-listerial properties</td>
</tr>
<tr>
<td>Lyoflora FP-18</td>
<td>Fresh meat, cooked and sliced products after cooking and cooling only with anti-listerial properties</td>
</tr>
</tbody>
</table>

Contamination of meat products with *Listeria monocytogenes* is an increasing problem. Therefore Sacco has developed a product range of protective cultures. Protection with Sacco cultures for meat application can be achieved by competitive exclusion, most efficient against spoilage bacteria, bacteriocin production efficiently killing *Listeria monocytogenes* and a combination of both principles.
<table>
<thead>
<tr>
<th>Action</th>
<th>Product</th>
</tr>
</thead>
<tbody>
<tr>
<td>Competitive exclusion with <em>Lactobacillus sakei</em></td>
<td>Lyocarni BOM 13</td>
</tr>
<tr>
<td></td>
<td>Lyocarni BXH-12</td>
</tr>
<tr>
<td></td>
<td>Lyocarni BXH-69</td>
</tr>
<tr>
<td>Bacteriocin producing <em>Carnobacterium</em> culture</td>
<td>Lyoflora FP-18</td>
</tr>
<tr>
<td></td>
<td>Lyoflora FP-50</td>
</tr>
<tr>
<td>Combination of both principles</td>
<td>Lyocarni BOX-74</td>
</tr>
<tr>
<td></td>
<td>Lyocarni BMX-37</td>
</tr>
</tbody>
</table>

**Articles and studies:**

- Challenge test with Lyocarni BOX-74 used on cured, cold smoked filet (2015)
- Challenge test with Lyocarni BOX-74 used on emulsion sausage (2014)
- Challenge test with Lyocarni BOX-74 used on cooked ham (2014)
- Challenge test with Lyoflora FP-18 used on a meat emulsion sausage (2014)
- Application of bacteriocin producing lactobacilli for the control of *Listeria* in Italian salami – Andersen, Cislaghi, Cocconcelli (2005)
APPLICATION OF BACTERIOCIN PRODUCING LACTOBACILLI FOR THE CONTROL OF LISTERIA IN ITALIAN SALAMI

Lone Andersen†*, Simona Cislaghi‡, and Pier Sandro Cocconcelli§, ¶

1Sacco S.r.L., Cadorago, Italy. *Contact Email: l.andersen@saccosrl.it
2Istituto di Microbiologia, Università Cattolica del Sacro Cuore, Piacenza, Italy. E-mail: pier.cocconcelli@unicatt.it
3Centro Ricerche Biotecnologiche, Università Cattolica del Sacro Cuore, Cremona, Italy

Key Words: Fermented sausage, starter culture, acidification, staphylococci, LAB, bacteriocin, Listeria, PCR

Introduction
All over the world Listeria contamination is a potential hazard in fermented, dry sausages produced without heat treatment. As heat treatment alters the meat structure such a product is not perceived as a traditional fermented, dry sausage by consumers. Normally, if present, the level of Listeria in fermented, dry sausages is relatively low and should not cause health problems when fermented sausages are consumed. Nevertheless, regulation in food requirements, as safety criteria, calls for absence of Listeria monocytogenes in 25 g food, and consequently, efforts are accomplished to prevent Listeria being present in traditionally produced fermented sausages. Commercial bacteriocin producing lactic acid bacteria (LAB) have successfully been tested on applied L. monocytogenes in fermented sausages (Andersen, 1999) but few data on effect on indigenous Listeria with such LAB strains are available (Hugas et al., 2003).

Some of the characteristics of Italian salami are high final pH, moulded surface, and pronounced meaty flavour. It is well-known that staphylococci enhance the development of meaty flavour but also that they are inhibited by lowering in pH (Tjener, 2003). Therefore, an adequate anti-listerial LAB starter culture should not lower pH so much that it influences the development of required flavour compounds and the sensory assessment.

Objectives
The aim of this work was, in commercially manufactured sausages, to test the inhibition of indigenous Listeria by a class II bacteriocin producing Lactobacillus plantarum BG-112 (called Code 2) in parallel with a non-bacteriocin producing culture blend consisting of Lactobacillus sakei Ls and Pediococcus pentosaceus Pp MIX (called Code 3). Both cultures were applied with Staphylococcus xylosus (called SX) as well. Additionally, a control product without bacteria cultures applied was followed (called Code 1). The growth of staphylococci, LAB, pH, weight loss, and the presence of indigenous Listeria were monitored.

Methodology
As the experiment was conducted at a commercial manufacture all details in composition of the ingredients used were not revealed. Neither were the details in the production procedure. The sausages were produced with the normal recipe and processing procedure used for production of big calibre Milano type salami.
TRADITION, PASSION
INNOVATION