Galactic’s solutions for meat & poultry applications

CLEAN LABEL – TEXTURE ENHANCEMENT – FOOD SAFETY
SHELF-LIFE EXTENSION – PROCESS IMPROVEMENT

Galactic has developed a complete set of solutions for food safety in the meat and poultry industries. We guarantee shelf-life increase and targeted pathogen elimination as well as process improvement through natural solutions. Galactic combines traditional and state-of-the-art technologies to bring the best to the customer’s plate.
Galactic has acquired valuable expertise in biotechnology since its creation in 1994. The company develops natural solutions for application in food markets. Specialised in food safety, nutrition and green chemistry, Galactic offers its customers natural and innovative tailor-made solutions. In collaboration with our distributors and scientific partners, we meet the challenges of sharing together the unlimited potential of nature with a view to a safer and more sustainable future.
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Disclaimer: Notwithstanding the recommendations set out herein, Galactic advises its customers to verify local regulations and legislation when using one of Galactic’s solutions in their recipes. Our advice is based on our 20+ years of experience and knowledge which we gladly put at your service.
I. INTRODUCTION

Since 1994, Galactic has become one of the world leaders in biotechnology serving the food, feed, personal & health care, and industrial markets. Based on its valuable experience in the fermentation of lactic acid and other derivatives, Galactic continuously develops sustainable, innovative and health-friendly solutions in the field of food safety, nutrition and green chemistry. In particular, Galactic provides an extensive range of solutions for applications in the meat and poultry industry.

Over the past 20 years, Galactic has become a major player on the international stage. With headquarters in Belgium and production facilities in Europe, Asia and America, we progressively develop our portfolio of natural solutions in order to meet our customers’ needs, wherever they are located in the world.

MARKET DRIVERS

At Galactic, we focus on six major market pillars in our quest to develop a highly effective range of meat & poultry solutions, including:

- Food safety
- Shelf-life extension
- Cost reduction
- Clean-label
- Process improvement
- Texture enhancement

The demand for minimally processed, easily prepared, and ready-to-eat fresh food, as well as the globalisation of the food trade, poses major challenges. Food safety and quality have become one of the largest concerns of the 21st century. Consumers want healthy and convenient fresh food, thus the meat industry must respond in a manner which guarantees that the ingredients used are natural, effective and completely safe.

Galactic’s meat & poultry solutions represent a strong commitment to food safety. We offer bespoke solutions to meet the challenges our customers face. Our solutions are made of highly effective ingredients to promote shelf-life extension, clean-label, food safety, texture enhancement, process & health improvement.

Our natural solutions contain important, innovative breakthroughs that allow meat producers to benefit from the latest cost-effective and clean-label innovations.
II. GALACTIC'S TECHNOLOGY AND NATURAL SOLUTIONS

Galactic offers a full set of solutions for the meat and poultry markets using the best natural fermentation technology. We extract and refine various outputs such as lactic acid, to serve different needs. Our solutions come in liquid and powder form.

Figure 1: The living cell at the heart of our technology

Throughout the world, Galactic offers customized solutions and blends. We continuously develop new solutions and technologies in collaboration with our customers.

Figure 2: Galactic’s solutions overview

Our solutions ranges centered on naturality

- **Acids**
  - L+ and D-lactic acid
- **Salts**
  - Galacid™
  - **Monovalent**: Na⁺, K⁺... lactates
  - **Bivalent**: Ca²⁺, Mg²⁺, Zn²⁺, Fe²⁺... lactates
  - **Trivalent**: Al³⁺... lactates
- **Esters**
  - Galaster™
  - Galasolv™
  - Methyl-, ethyl-, propyl-, butyl-,... lactates
  - Non VOC solvents
- **Fermentates**
  - Galimax Flavor™
  - Galasolv™
  - **Preserv™**
  - All made through fermentation
- **Proteins & Enzymes**
  - Galacin™
  - **Blends**
  - Galirem™
  - Galimax™
  - Galicare™
  - **Fermentates**
  - Preserv™
  - **Natural preservatives**
  - **Antioxidants**
  - **Essential oils and flavors**
  - **Food safety**: Peptides and natural microlides: nisin, natamycin

Galactic has developed bio-based solution ranges, consisting of highly effective ingredients combining food safety and shelf-life extension, the most sustainable and cost-effective alternatives to traditional solutions.
1.1. **FLAVOURS**

**Solution range:** Galimax Flavor™ K-65, Galimax Flavor™ N-65, Galimax Flavor™ KV-55, Galimax Flavor™ NV-55, Galimax Flavor™ VK-50

Our flavours are direct products of the fermentation process. They refer to a range of natural cultured sugars able to enhance the sensory properties of the final meat and poultry products, as well as other parameters related to food safety. We also produce flavours to replace salt and thus reduce sodium levels in end-products without compromising on food safety. Our range of flavours are liquid-based products.

1.2. **VINEGARS**

**Solution range:** Galimax Flavor™ V-50, Galimax Flavor™ V-100 Powder

Natural vinegars are used alone or in synergy with lactates to provide shelf-life extension. Buffered vinegars are very efficient bacteriostatic ingredients. They have no detrimental effect on the pH nor on the taste of meat products. They are used at a low concentration enabling low cost in use. We offer liquid and powder products.

1.3. **SPICE EXTRACTS**

**Solution range:** Galimax Spice Extract™, Galimax Spice Extract™ Plus, Galimax Spice Extract™ Powder

Among its solutions, Galactic produces spice extracts also by fermentation. This allows customers to benefit from the full spectrum of freshness and preservation. By offering solutions with both antimicrobial and anti-oxidant effects, Galactic enables producers to ensure the best for their food. We offer liquid and powder solutions.

**NATURAL SOLUTIONS**

Galactic produces high-quality lactic acid through natural fermentation of beet sugar. In food applications, this organic acid is mainly used as an acidifier. We complement our range of lactic acid derivatives with vinegars, spice extracts and natural flavours. Galactic also offers a new generation of powders in pure form or in blends with their key property being shelf-life extension or controlled acidification release.

**Solution range:** Galacid™, Galaflow™, Galimax™

1.1. **ANTIMICROBIAL BACTERIAL COMPOUNDS**

**Solution range:** Galacin™

Stemming from our knowledge in fermentation, we offer special metabolites produced by bacteria. These small molecules are able to destroy different types of microorganisms known to spoil many processed meat products. Our Galacin™ range is active against Gram-positive bacteria, moulds and yeasts.
III. GALACTIC CLEAN-LABEL SOLUTIONS

Today, consumers are more than ever concerned about the quality of the food they eat. As a result, almost half of consumers worldwide read the ingredients on the labels of the food products before buying them. Therefore, the rising demand for natural and label-friendly ingredients opens up new opportunities as well as challenges for meat producers. They now have to find ingredients that meet the clean-label trend, at the same time achieving the desired taste, texture and shelf-life.

In response to this need, Galactic has developed a whole new clean-label range of solutions, Galimax Flavor™; highly effective against pathogenic bacteria and optimal shelf-life extension. These solutions are produced by specific natural fermentation processes.

NATURAL FLAVOURS
Lactate-based fermentates

Natural, healthy and tasteful are the main prerequisites in the meat industry today. In response to this need, Galactic has developed Galimax Flavor™ K, Galimax Flavor™ KV and Galimax Flavor™ VK range of flavour enhancers used to reduce sodium content without compromising on food safety.

Galimax Flavor™ K is a lactate-based fermentates range declared as "Natural Flavor" for European countries and "Cultured Sugar" for the US. It is a good alternative to E-number lactates additives. Galimax Flavor™ K has a salty sensory profile allowing producers to reduce sodium content without compromising on food safety. In some applications, it can improve the meat taste.

Galimax Flavor™ KV and Galimax Flavor™ VK are clean-label alternatives to E-number blends of lactate and diacetate.

VINEGAR
Acetate-based fermentates

Galimax Flavor™ V is a range of clean-label solutions, highly effective against aerobic, anaerobic bacteria, moulds and yeasts. Galimax Flavor™ V, developed for European markets, and ProMeat Aceto™, developed for US market, are buffered vinegar-based products, highly efficient for shelf-life extension, against aerobic bacteria and certain pathogens, such as Listeria monocytogenes as well as moulds and yeasts.

Galactic offers them in powder form, Galimax Flavor™ V-100 and liquid form, Galimax Flavor™ V-50, and can be declared as “Vinegar” according to the European Directive 2000/13/EC and European standard EN 13188:2000. They are clean-label alternatives to acetate, used alone or in blends.
Galimax Flavor™ V range does not alter the organoleptic properties of the product, ensuring optimal food safety without any impact on the organoleptical characteristics of the finished product.

**SPICE EXTRACTS**

To meet the demand for food safety and clean-labelling in marinated meat, with as few E-numbers as possible, Galactic has developed Galimax Spice Extract™ which is a natural solution obtained by fermentation of sugar and spices.

It contains lactates, organic acids, peptides, amino acids and other natural flavouring substances. These naturally-occurring components help to enhance the salty and meaty taste in a natural and healthy way.

Although their main function is to enhance the taste profile, Galimax Spice Extract™ allows to significantly prolong shelf-life and improve the protection against *Listeria* (graph on the right).

Galimax Spice Extract™ is also suited for fresh meat, emulsified meat as well as cooked products (hams, frankfurters, etc.).

**Table 1: Galactic’s solutions for clean labelling**

<table>
<thead>
<tr>
<th>Alternative to</th>
<th>Solution</th>
<th>Form</th>
<th>Colour</th>
<th>Dosage</th>
<th>pH</th>
<th>Sodium</th>
<th>Labelling</th>
<th>Taste</th>
</tr>
</thead>
<tbody>
<tr>
<td>SL</td>
<td>Galimax Flavor™ N-65</td>
<td>Liquid</td>
<td>Brown</td>
<td>1-3%</td>
<td>6.0 - 8.0</td>
<td>Yes</td>
<td>Natural flavour</td>
<td>Salty/Taste enhancer</td>
</tr>
<tr>
<td>PL</td>
<td>Galimax Flavor™ K-65</td>
<td>Liquid</td>
<td>Brown</td>
<td>1-3%</td>
<td>6.0 - 8.0</td>
<td>No</td>
<td>Natural flavour</td>
<td>Salty/Taste enhancer</td>
</tr>
<tr>
<td>SA or PA</td>
<td>Galimax Flavor™ V-50</td>
<td>Liquid</td>
<td>Transparent/pale yellow</td>
<td>1.2-1.4%</td>
<td>5.0 - 6.5</td>
<td>No</td>
<td>Vinegar</td>
<td>Neutral</td>
</tr>
<tr>
<td>SA powder</td>
<td>Galimax Flavor™ V-100 Powder</td>
<td>Powder</td>
<td>White</td>
<td>0.6-0.7%</td>
<td>5.6 - 6.6</td>
<td>Yes</td>
<td>Vinegar</td>
<td>Neutral</td>
</tr>
<tr>
<td>Blend PL/PDA or PA</td>
<td>Galimax Flavor™ NV-65</td>
<td>Liquid</td>
<td>Brown</td>
<td>1-2%</td>
<td>5.5 - 7.5</td>
<td>No</td>
<td>Natural flavour (+ Vinegar)</td>
<td>Salty/Taste enhancer</td>
</tr>
<tr>
<td>Blend SL/SDA or PA</td>
<td>Galimax Flavor™ VK-50</td>
<td>Liquid</td>
<td>Brown</td>
<td>1-2%</td>
<td>5.5 - 7.5</td>
<td>Yes</td>
<td>Natural flavour (+ Vinegar)</td>
<td>Salty/Taste enhancer</td>
</tr>
<tr>
<td>SA powder</td>
<td>Galimax Flavor™ N-65</td>
<td>Liquid</td>
<td>Amber</td>
<td>1.2-1.4%</td>
<td>5.0 - 6.5</td>
<td>No</td>
<td>Natural flavour</td>
<td>Neutral</td>
</tr>
<tr>
<td>SL, PL, SA, PA, SDA, PDA</td>
<td>Galimax Spice Extract™</td>
<td>Liquid</td>
<td>Brown</td>
<td>1.2-1.4%</td>
<td>5.0 - 6.5</td>
<td>No</td>
<td>Spice extract</td>
<td>Neutral</td>
</tr>
<tr>
<td>Galimax Spice Extract™ Plus</td>
<td>Liquid</td>
<td>Brown</td>
<td>1.2-1.4%</td>
<td>5.0 - 6.5</td>
<td>No</td>
<td>Spice extract</td>
<td>Spicy</td>
<td></td>
</tr>
<tr>
<td>Galimax Spice Extract™ Powder</td>
<td>Powder</td>
<td>White</td>
<td>0.6-0.7%</td>
<td>5.5 - 6.5</td>
<td>Yes</td>
<td>Spice extract</td>
<td>Spicy</td>
<td></td>
</tr>
</tbody>
</table>
GALACTIC SOLUTIONS
IN RAW MEAT APPLICATIONS
APPLICATIONS IN RAW MEAT

1. FRESH MINCED MEAT PREPARATIONS
BURGERS, TARTARS, FRESH SAUSAGES, MEAT LOAVES

SHELF-LIFE EXTENSION
Fresh minced beef and pork meat preparations have short shelf-life, which evokes three parameters for consideration: aerobic flora development or aerobic plate count (APC), colour retention and rancidity avoidance. Galactic offers a range of solutions that enables producers to act on shelf-life extension as a whole.

CLEAN LABEL
In addition, as a larger spectrum of efficacy against spoiled bacteria is obtained by blending lactate and (di)acetate, Galactic has developed the Galimax™ range - our latest innovation in the clean labelling. It is a natural flavour produced by sugar fermentation. This aroma produces a salty taste which enables manufacturers to reduce salt levels without impacting food safety.

Galimax Spice Extract™ Plus helps to effectively protect fresh minced meat products against oxidation and ensure a longer shelf-life, hence guaranteeing total freshness over the whole shelf-life.
Since 2010, the EU regulation allows the use of lactate and blends of lactates with di-acetates as preservatives in the preparation of fresh minced meat to control the growth of bacteria. In the US, lactates and blends of lactates are allowed in various RTE meat and poultry products as antimicrobial agents at dosages specified by local regulations. Speaking about China, lactic acid, sodium lactate and potassium lactate are allowed in variety of food products, including meat, according to the state standard GB 2760-2014.

The Galaflow™ range are liquid lactate-based solutions that help control the growth of anaerobic bacteria (Total Plate Count).

Besides aerobic bacteria, raw minced meat preparations are products with a high risk of contamination by pathogenic bacteria, such as Salmonella typhimurium, E. coli O157:H7, Listeria and many other foodborne pathogens. These bacteria are Anaerobic Facultative Bacteria (AFB), meaning that under non-oxygen containing packaging these pathogenic bacteria are able to grow. In that case, the lactate alone will not be effective, it must be combined with diacetate.

Galactic proposes the following range of natural solutions containing blends of lactate and diacetate, to compete against AFB:

Galimax Red & Fresh™ is a natural full spectrum shelf-life extender for fresh meat, containing specific blend of lactate/(di)acetate. In some applications, it acts in combination with ascorbic acid (vitamin C) to maintain the color of the meat.

ProMeat Essential™ is an advanced solution that combines organic acids with carefully selected spice extracts. This solution is very effective as an anti-oxidant on top of the APC control.

LOW COST-IN-USE
Galactic offers solutions to lower the cost-in-use (CIU) by enabling to reduce the dosage of preservative in meat formulation, thus less volume consumption. More effective solutions also reduce costs in terms of avoiding food recalls or too many food spoilages.

Galaflow™ offers cost-optimal solutions for customers for aerobic bacteria control, the products are available in liquid or powder form. A new fermentation way of processing lactates has been developed by Galactic, proposing a new generation of solutions called Galaflow™ XT. This new generation of lactates are 20% more efficient than traditional lactates, allowing users save costs in their recipe while maintaining the same shelf-life.

As a larger spectrum of efficacy against spoiled bacteria is obtained by blending lactate and diacetate, Galactic has developed the Galimax™ range - advanced blends especially designed for low cost-in-use.

Table 2: Galactic’s solutions for fresh minced meat (preparations)

<table>
<thead>
<tr>
<th>Solution</th>
<th>Main feature</th>
<th>Other key benefit</th>
<th>Liquid/Solid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galaflow™ range (lactate)</td>
<td>Traditional food safety</td>
<td>Low cost-in-use</td>
<td>L/S</td>
</tr>
<tr>
<td>Galimax™ range</td>
<td>Advanced food safety</td>
<td>Low cost-in-use</td>
<td>L</td>
</tr>
<tr>
<td>Galimax Flavor™</td>
<td>Advanced food safety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Galimax Spice Extract™ Plus</td>
<td>Advanced food safety with anti-oxidant effect</td>
<td>Easy to use</td>
<td>L</td>
</tr>
<tr>
<td>Galimax Red &amp; Fresh™</td>
<td>Advanced food safety (reinforces ascorbic acid action)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ProMeat Essential™</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. **FRESH CUTS**
MARINATED, INJECTED, TUMBLED MEATS

The challenges of fresh cuts are similar to those for fresh minced meats in terms of shelf-life extension: aerobic flora development or aerobic plate count (APC), colour retention and rancidity avoidance.

**SHELF-LIFE EXTENSION**

Galimax Red & Fresh™, Galimax ACE™ N-50 and Galimax DIACE™ N-47 are excellent solutions for injected, tumbled or marinated processes. These blends are highly effective in shelf-life extension and protection against common pathogens found in meat products.

**HEALTH IMPROVEMENT**

Cardiovascular diseases and hypertension are becoming major health problems worldwide. Sodium reduction is becoming a major challenge for meat processors to address, in particular in the fresh cuts sector. Organic salts that are based on potassium, rather than sodium, offer a clear health benefit to end-consumers. Galactic produces these salts in a pure form as well as in advanced blends. They enable producers to reduce sodium and nitrite content without compromising on food safety.

The Galimax Flavor™ K-65, K-75, KV-50 and VK-50 are solutions well-suited for meat and poultry products, offering a strong shelf-life protection, well-designed for marinated or injected meats, as well as for fine-emulsion cooked products.

Galimax ProMeat Plus™ LS, where LS stands for "low sodium", is a perfect solution for reducing sodium levels in fresh cuts. Producers can reduce sodium content by up to 40% and use this as a strong claim for consumer health.

### Table 3: Galactic’s solutions for fresh cuts

<table>
<thead>
<tr>
<th>Solution</th>
<th>Main feature</th>
<th>Other key benefit</th>
<th>Liquid/Solid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galimax Red &amp; Fresh™</td>
<td>Advanced food safety</td>
<td>Easy to use</td>
<td>L</td>
</tr>
<tr>
<td>Galimax ProMeat Plus™ LS</td>
<td>Advanced food safety</td>
<td>Low sodium added</td>
<td>L</td>
</tr>
<tr>
<td>Galimax ACE™ N-50</td>
<td>Advanced food safety</td>
<td>Low dosage</td>
<td>S</td>
</tr>
<tr>
<td>Galimax DIACE™ N-47</td>
<td>Advanced food safety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Galimax Flavor™</td>
<td>Advanced food safety</td>
<td>Low cost-in-use</td>
<td>L</td>
</tr>
</tbody>
</table>
APPLICATIONS IN CARCASS, OFFAL AND CASINGS
BEEF, POULTRY, CASING

CARCASS SPRAYING
During slaughtering, fresh beef carcasses are extremely vulnerable to bacterial surface contamination, such as aerobic (total germs) and anaerobic facultative bacteria (E. coli, Salmonella, Listeria).

Galacid™ solutions reduce bacteria load by 5-logs (elimination of 99,999% of the flora) through carcass decontamination and allow carcasses to gain up to 2% weight when frozen. Adding Galacin™ Nisin to the solution achieves even stronger results. Nisin is generally offered in powder form.

It is important to note, that Nisin is not allowed in meat and poultry in the EU (European Commission 1995). While in the US, Nisin has been accepted as GRAS (generally recognised as safe) as an antimicrobial agent for use on casings for frankfurters and on cooked meat and poultry products. China, Russia and Ukraine allow the use of Nisin in the meat industry at levels stipulated by local regulations.

Since 2013, in the EU, lactic acid is allowed only for beef carcasses decontamination, while in the US and Canada as well as China, it is allowed in any kind of meat.

POULTRY OFFAL DECONTAMINATION
Galacid™ is used in the decontamination process of poultry offal. It is applied in spray or in a bath, and is able to significantly decrease the total germs count and protect against pathogenic bacteria. Standard offal mostly includes chicken legs and skins. Depending on the country regulation, lactic acid is also used to decontaminate poultry carcasses by a spraying system. The blend of lactic acid and Nisin shows a stronger bactericide effect.

CASING DECONTAMINATION AND PROTECTION
Galactic offers solutions to protect natural and artificial casings against aerobic bacteria and against moulds & yeasts to ensure safety and freshness in finished meat and poultry products.

Galimax™ Acidal is a liquid blend based on 4 organic acids, which is able to decontaminate natural casings before the sausage embossment process begins.

Galacin™ Natamycin is a solution against moulds and yeasts. Natamycin is mainly applied on the surface of dry, semi-dry and cured fermented sausages to avoid the growth of moulds & yeasts. Galactic also offers Natamycin in powder as well as stable liquid suspension which is easier to handle and to dilute with clear water.

Table 4: Galactic’s solutions for carcass, offal & casings

<table>
<thead>
<tr>
<th>Solution</th>
<th>Main feature</th>
<th>Other key benefit</th>
<th>Liquid/ Solid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galacid™</td>
<td>Carcass and offal decontamination</td>
<td>Positive impact on carcass weight</td>
<td>L</td>
</tr>
<tr>
<td>Galacin™ Nisin</td>
<td>Carcass decontamination</td>
<td>Ultra effective (bactericidal)</td>
<td>S</td>
</tr>
<tr>
<td>Galimax™ Acidal</td>
<td>Casing decontamination</td>
<td>Ultra effective</td>
<td>L</td>
</tr>
<tr>
<td>Galacin™ Natamycin</td>
<td>Casing protection</td>
<td>Active against yeasts &amp; moulds</td>
<td>L/S</td>
</tr>
</tbody>
</table>
GALACTIC SOLUTIONS
IN PROCESSED MEAT APPLICATIONS
APPLICATIONS IN FERMENTED & DRY MEAT
SALAMIS, DRY SAUSAGES, DRY HAMS

NATURAL FERMENTATION
Galactic has developed a unique lactic acid based powder to replicate fermentation naturally: **Galacid ProMeat Adagio™**. "Adagio" allows customers to control the acidity release in the product over a period of time.

**Galacid ProMeat Adagio™** can complement or replace traditional starter cultures for the acidification function. This opens new horizons for salami and fermented sausage recipes, allowing an optimisation of cost, standardisation and flavour profiles. **Galacid ProMeat Adagio™** can naturally and effectively replace coated organic acids, GDL or acidifying starter cultures.

SHELF-LIFE EXTENSION
**Galacin™ Natamycin** is a metabolite produced by fermentation using *Streptomyces natalensis*. Natamycin is a high effective product against spoiled moulds and yeasts. In meat applications, Galactic have developed a powder using salt as carrier, it is use for washing casings of dry, semi-dry sausages. Galactic proposes also Natamycin in suspension allowing a longer stability in aqueous solutions.

PROCESS IMPROVEMENT
**Galacid ProMeat Adagio™** is a cost-effective solution for acidity controlled processes. The process time compared to starter cultures is much shorter and the lower dosage (cost-in-use) offers a real advantage over chemical acidifiers such as coated citric acids (GDL).

TARGETED FOOD SAFETY
Protective cultures are well suited to fresh cuts preservation they target specific pathogens such as *Listeria*. These cultures offer the double advantage of being very narrowly focused against a particular pathogen whilst offering a clean label at the same time. Fresh cuts can be subject to contamination and these targeted solutions are highly appreciated by producers for solving specific challenges regarding food safety.

Table 5: Galactic’s solutions for fermented & dry meat

<table>
<thead>
<tr>
<th>Product</th>
<th>Main feature</th>
<th>Other key benefit</th>
<th>Liquid/ Solid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galacid ProMeat Adagio™</td>
<td>Controlled release of natural lactic acid</td>
<td>Replaces acidification cultures, GDL, SAPP, SALP, coated acids</td>
<td>S</td>
</tr>
<tr>
<td>Galacin™ Natamycin</td>
<td>Surface protection against yeasts and moulds</td>
<td>Ultra-effective</td>
<td>S</td>
</tr>
</tbody>
</table>
ENHANCING THE GENIUS OF NATURE

APPLICATIONS IN COOKED PROCESSED MEAT
FRANKFURTERS, MORTADELLAS, LIVER PÂTÉS, SOUR SAUSAGES, HAMS, BACON

SHELF-LIFE EXTENSION
The main challenges for fine emulsified cooked products, like frankfurters, wieners, hot-dogs or mortadellas, and for injected/tumbled cured meat products, like luncheon hams, is to ensure a good microbiology protection during the required shelf-life, as well as to guarantee the optimal texture. Galactic offers an array of natural solutions based on organic acid salts blends produced by fermentation.

**Galimax ProMeat™ Plus** is the most effective liquid solution in Galactic's range for these applications. Due to the well-defined blend of sodium lactate and diacetate, it brings a strong shelf-life improvement without impacting the sensory profile of the finished meat products. In addition, **Galimax ProMeat™ Plus LS** is also available which is a potassium lactate-based solution.

Galactic has developed the **Galimax ProMeat™ Essential**. It is the ideal solution when producers need an anti-oxidant action to maintain the right colour during shelf-life. Its natural composition, using spice extract, appeals to customers because of its clean-label approach.

For customers needing solutions in powder forms, Galactic offers different solutions in its **Galaflow™ SL98** (pure Sodium Lactate Powder) and **Galimax™ ACE N-50** and **DIACE N-47** (blends of sodium lactate with acetate and/or diacetate).

SAFETY
Meat producers face high safety expectations. These days, special attention is required in the fight against pathogens, such as *Listeria monocytogenes*, *Salmonella typhimurium* or *E. coli. 0157/H7* Galactic offers specific solutions to target these pathogens.

**Galimax™ ACE Powder**, based on blends of organic salts, is a very effective powder solution for the safety of cooked meat. This product combines superior performance with a lower dosage and efficiently safeguards against common meat pathogens.

**Galacin™ Nisin** is an advanced biotech solution for addressing Gram positive pathogens. It is permitted in a growing number of countries. More information can be found in our Galacin brochure (available on request).

Today, blends of **Galimax™ ACE Powder** and **Galacin™ Nisin** are becoming the most sophisticated solutions for ultimate food safety in processing cooked meat products.

TEXTURE ENHANCEMENT
Creating the right texture is of particular importance in emulsion products. Galactic has developed **ProMeat Texture RSTM** a powder solution that improves the product’s texture and viscosity together, improves the shelf-life and enables a reduction of polyphosphates and fat in recipes. **ProMeat Texture RSTM** helps manufacturers to obtain a better yield during stuffing.
HEALTH IMPROVEMENT

SALT AND NITRITE REDUCTION

As cardiovascular disease and hypertension are becoming major health problems worldwide, sodium reduction is becoming a considerable challenge for meat and poultry processors to address.

Salt and nitrite reduction is a significant challenge for meat processing R&D teams. Galimax ProMeat™ Plus LS is particularly efficient in cured cooked meats products. Its low sodium content combined with its high food safety action enables producers to reduce sodium or curing salt by up to 40% without impacting the taste. There is also no compromise on Clostridium botulinum protection despite the nitrite reduction.

MINERAL ENRICHMENT

Enrichment of food products is widely developed in non-meat sectors. However there are already some ideas that the next food sector proposing these types of claims would be the meat sector. Galactic propose a large range of lactate derived minerals.

Galaxium™ Pearls is an excellent solution for calcium fortification as well shelf-life and texture improvement. Galactic’s Galanium™ range includes minerals for fortification, such as Iron, Zinc and Magnesium.

LOW COST-IN-USE

Galactic offers solutions for lower cost-in-use through simplified yet highly efficient blends. Galimax ProMeat™ Plus, developed for European markets, or Galimax ProMeat™ One, developed for the US market, is our main recommendation to control APC and pathogenic bacteria at low concentration.

Table 6: Galactic’s solutions for cooked processed meat

<table>
<thead>
<tr>
<th>Solution</th>
<th>Main feature</th>
<th>Other key benefit</th>
<th>Liquid/Solid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galaflow™ range</td>
<td>Traditional food safety</td>
<td>Low sodium (up to 30%)</td>
<td>L/S</td>
</tr>
<tr>
<td>Galimax™ range</td>
<td>Advanced food safety</td>
<td>Low cost-in-use</td>
<td>L</td>
</tr>
<tr>
<td>Galimax ProMeat™ Plus Galimax ProMeat™ One</td>
<td>Advanced food safety</td>
<td>Easy to use</td>
<td>L</td>
</tr>
<tr>
<td>Galimax ProMeat™ Plus LS Galimax ProMeat™ One LS</td>
<td>Advanced food safety</td>
<td>Low sodium (up to 40%)</td>
<td>L</td>
</tr>
<tr>
<td>ProMeat™ Texture RS</td>
<td>Advanced food safety</td>
<td>Texturing agent</td>
<td>S</td>
</tr>
<tr>
<td>Galimax™ ACE N-50 Galimax™ DIACE N-47</td>
<td>Advanced food safety</td>
<td>Low dosage</td>
<td>S</td>
</tr>
<tr>
<td>Galimax ProMeat™ Essential</td>
<td>Advanced food safety with Anti-Oxidant effect</td>
<td>Added natural spice extracts</td>
<td>L</td>
</tr>
<tr>
<td>Galacin Nisin™</td>
<td>Gram positive food anti-microbial</td>
<td>Bactericidal</td>
<td>S</td>
</tr>
<tr>
<td>Galaxium™ Pearls</td>
<td>Calcium enrichment</td>
<td>Shelf-life improvement</td>
<td>S</td>
</tr>
<tr>
<td>Galanium™ range</td>
<td>Mineral enrichment (Fe, Zn, Mg)</td>
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<td>S</td>
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APPLICATIONS IN POULTRY PRODUCTS
CHICKEN, TURKEY, MECHANICALLY DEBONED MEATS

SHELF-LIFE EXTENSION
Fresh minced poultry preparations are products with a short shelf-life. Galactic offers a large range of solutions allowing producers to control Aerobic Plate Count as well as pathogenic bacteria. The Galaflow™ and Galimax™ ranges are solutions to protect against the whole spectrum of bacteria in poultry products.

FOOD SAFETY
Raw meat preparations, like marinated chicken breast, are products with a high risk of spoilage and contamination by pathogenic bacteria, such as Salmonella typhimurium, E. coli 0157:H7, Listeria and many other foodborne pathogens. Maximum food safety without impacting on the tender taste of poultry products is best obtained with Galimax ProMeat™ Plus, developed for European markets, or Galimax ProMeat™ One, developed for the US market, used in the brine.

Galacin™ Nisin is an innovative food safety solution that is very effective against Gram-positive pathogens. More information on regulation and how-to-use can be found in our Galacin brochure (available on request).

HEALTH IMPROVEMENT
As cardiovascular disease and hypertension are becoming major health problems worldwide, sodium reduction is becoming a considerable challenge for meat and poultry processors to address. The customer’s choice in this instance is Galimax ProMeat™ Plus LS, Galimax Flavor™ K, as natural flavour, can also reduce meat salt content.

The Galimax Flavor™ K-65, K-75, KV-50 and VK-50 are solutions well-suited for poultry products, offering a strong shelf-life protection together with mild flavour, well-designed for marinated or injected meats, as well as for fine-emulsion cooked products.

LOW COST-IN-USE
Galactic offers solutions to reduce the cost-in-use (CIU) by offering more efficient solutions. This enables a meat formulation dosage reduction leading to less volume consumption.

Galimax ProMeat™ Plus, developed for European markets, or Galimax ProMeat™ One, developed for the US market, offers a liquid solution to optimize the cost-in-use of preservatives in poultry. Dry versions are also available.

Table 7: Galactic’s solutions for poultry

<table>
<thead>
<tr>
<th>Solution</th>
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<td>L</td>
</tr>
<tr>
<td>Galacin™ Nisin</td>
<td>Gram-positive food antimicrobial</td>
<td>Bactericidal</td>
<td>S</td>
</tr>
<tr>
<td>Galimax Flavor™ range</td>
<td>Advanced food safety</td>
<td>Low cost-in-use</td>
<td>L</td>
</tr>
</tbody>
</table>
IV. INNOVATIVE SERVICES: GALACTIC FOOD DOCTOR™

At a time when consumers express concern about the content of their food, companies are striving to provide better product quality and safety by using the best technical analysis available and choosing the best solutions to fit their needs.

Galactic’s dedicated team of experts with strong experience and knowledge in formulation chemistry, develops tailor-made solutions together with its customers knowing that many of them have requirements that are particular to their applications and production processes.

Galactic proposes a set of tools in order to help its customers have a better control of the bacterial content and protection of their finished products.

1. PREDICTIVE MODELLING TOOLS

As today the food industry faces the challenges of meeting ever higher quality and safety standards, Galactic has developed a reliable predictive modelling tool that accurately predicts *Listeria monocytogenes* growth in several food applications under specific conditions.

With the aim to help meat and seafood producers predict the shelf-life of their products without having to go through costly and lengthy safety studies, Galactic created three models:

- The most probable (percentile 50) model
- The safe (percentile 95) model (available on our web site)
- The super safe (percentile 99.5) model

As the reliability of the models depends on the environment, Galactic has taken account of variety of factors that are very important in food production, such as moisture, salt, temperature, 

pH, water activity and the use of antimicrobials.

Thanks to the predictive modelling tool, customers are able to identify the right solutions and prevent potential future risks. This is the most efficient way for food producers to save R&D resources and speed up their time to market.

2. METAGENOMICS

Galactic introduces an innovative technology that identifies the DNA of all microorganisms in food products with the help of one single analysis: Metagenomics. Initially destined for the medical market, this revolutionary technique is now applied to the study of food. It enables the identification of microorganisms responsible for the alteration of a product and thus provides an opportunity for professionals in the food industry to find the exact solution immediately.

Our technical support team is on hand to assist you with any questions you may have on the application of our solutions. We would advise consulting the appropriate local authorities to ensure compliance with the latest legislation regarding the use of our applications.
Since 1994, Galactic has become one of the world leaders in biotechnology serving the food, feed, personal & health care, and industrial markets. Based on its valuable experience in the fermentation of lactic acid and other derivatives, Galactic continuously develops sustainable, innovative and health-friendly solutions in the field of food safety, nutrition and green chemistry. With headquarters and an innovation campus in Belgium, production facilities in the United States (Milwaukee), China (Bengbu) and Europe (Escanaffles), high-performance labs in China (Bengbu) and the United States (Milwaukee) and sales offices in Belgium (Brussels), Japan (Tokyo) and Brazil (Curitiba), Galactic employs more than 380 people worldwide and is active in 65 countries.