



## Comprehensive Analysis of Bio-G-Lacto: Mechanism of Action, Applications, and Advantages

### 1. Introduction

Bio-G-Lacto, an enzyme-based product developed by BGA-Dictum GmbH, is specifically designed for microbial stabilization in food. Utilizing the lactoperoxidase system (LPS), Bio-G-Lacto enhances the shelf life and safety of raw milk, sauces, dressings, and egg-based products. Its significance lies particularly in regions with limited refrigeration or pasteurization infrastructure. The product's unique functionality and natural properties meet modern consumer demands for clean-label solutions that combine safety and sustainability.

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### 2. Mechanism of Action of the Lactoperoxidase System (LPS)

The LPS in Bio-G-Lacto operates through an enzymatic reaction that generates antimicrobial compounds. This process is activated by the presence of thiocyanate ions ( $\text{SCN}^-$ ) and hydrogen peroxide ( $\text{H}_2\text{O}_2$ ), naturally found in many foods or easily added. The reaction produces hypothiocyanite ( $\text{OSCN}^-$ ), a compound with strong antimicrobial effects.

#### Antimicrobial Mechanisms:

- **Membrane Disruption:**  $\text{OSCN}^-$  interacts with microbial cell membranes, inducing oxidative stress and rendering the cells inactive.
- **Broad-Spectrum Action:** LPS is effective against Gram-positive and Gram-negative bacteria, yeasts, and molds, targeting pathogens like *Escherichia coli*, *Listeria monocytogenes*, *Salmonella*, and spoilage organisms like *Pseudomonas spp.*
- **Selectivity:** The reaction specifically affects microorganisms without altering the sensory or nutritional properties of the food.

#### Advantages of LPS in Bio-G-Lacto:

- Effectiveness under suboptimal conditions, such as lack of refrigeration.
- Antimicrobial compounds degrade quickly, leaving no residues in the final product.
- Targeted microbial action ensures maximum safety with minimal impact on food quality.

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### 3. Applications and Specific Benefits

#### 3.1 Raw Milk

Raw milk is particularly susceptible to microbial growth, especially in regions with limited refrigeration. Bio-G-Lacto provides a safe alternative to pasteurization:

- **Effectiveness:** Studies show that Bio-G-Lacto, at a dosage of 5 g/L, can completely inhibit *E. coli* growth even at 12°C.
- **Shelf Life Extension:** The time to reach critical bacterial levels is doubled or tripled compared to untreated milk.
- **Health Protection:** The inhibition of pathogens like *Listeria monocytogenes* and *Salmonella* significantly reduces the risk of foodborne illnesses.

### 3.2 Sauces and Dressings

Bio-G-Lacto effectively controls microbial growth in perishable liquid foods like sauces and dressings, extending their shelf life:

- **Preservation of Taste and Quality:** No alteration of delicate flavors, crucial for high-quality products.
- **Natural Preservation:** The antimicrobial properties eliminate the need for artificial preservatives, aligning with clean-label trends.

### 3.3 Egg-Based Products

Liquid and solid egg-based products greatly benefit from Bio-G-Lacto, especially in environments with inadequate refrigeration:

- **Microbial Safety:** Pathogens like *Salmonella* are effectively inhibited.
- **Extended Stability:** Enhanced shelf life minimizes supply chain losses.

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## 4. Comparison to Chemical Preservatives

Chemical preservatives, such as potassium sorbate, exhibit moderate effects in microbial growth inhibition. In direct comparison, Bio-G-Lacto offers clear advantages:

- **Complete Growth Inhibition:** At a concentration of 300 ppm, microbial stability is maintained for seven days, while chemical alternatives show only limited effects.
- **Residue-Free:** Unlike chemical additives, Bio-G-Lacto leaves no active substances in the final product.
- **Environmental Friendliness:** Its natural composition supports sustainable production methods.

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## 5. Additional Benefits of Bio-G-Lacto

### 5.1 Clean-Label Attributes

- Free from genetically modified organisms (GMO), compliant with international standards such as Codex Alimentarius and FDA guidelines.
- Classified as a processing aid, eliminating the need for labeling on end products.

### 5.2 Superior Enzyme Quality

- Stringent quality controls ensure enzyme stability and activity throughout the product's shelf life.
- Optimized enzyme composition guarantees effectiveness even at low dosages.

### **5.3 Safety and Flavor Neutrality**

- Bio-G-Lacto is flavor-neutral and does not affect the sensory characteristics or quality of the treated products.
  - Leaves no residues, meeting all food safety requirements.
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## **6. Conclusion**

Bio-G-Lacto represents an advanced solution for microbial stabilization in food. By combining high antimicrobial efficacy, sustainability, and clean-label attributes, it provides an ideal alternative to chemical preservatives. Especially in markets where pasteurization is not widespread, Bio-G-Lacto offers indispensable benefits to ensure food safety and quality.

This report underscores that Bio-G-Lacto is an innovative product that fulfills the current needs of the food industry for safety, quality, and sustainability.

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