



Common
Dissemination
Booster

GeLACTO Policy Brief

Experimental Microbiome & GENOLACT

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Disclaimer

The GeLACTO Project Group is made up of two (2) projects funded under the European Commission’s Horizon 2020 Research and Innovation programme.

The information, views and recommendations set out in this publication are those of the CDB Project Group and cannot be considered to reflect the views of the European Commission.

Executive Summary

Following the consolidation of the Experimental Microbiome and GENOLACT research projects into the GeLACTO research partnership, it was revealed that key policy changes have to be enacted from low-level industrial regulations to national policies across Europe and beyond.

GeLACTO is a research partnership that specialises on the study of lactobacilli with results that include an extensive taxonomy of more than 200 lactobacilli species, and a comprehensive analysis of the properties of lactobacillus Plantarum and its effects on nutrient absorption.

In light of this, GeLACTO has come out with the following policy recommendations which can be carried out based on the research partnership's extensive lactobacilli research:

- Food safety regulators should adopt a more updated lactobacilli taxonomic framework
- Agriculture ministries should exploit GeLACTO's research in technology to improve agricultural yields and livestock output
- Humanitarian agencies should explore the use probiotic strains for use in medical applications such as the use of probiotics for the treatment of malnutrition
- Define new guidelines for safety assessment and for the definition of health claims of novel starter cultures and probiotics

1 Topic Overview

The expanded knowledge achieved on the taxonomy and the resistome of Lactobacilli [1] (GENOLACT Project) coupled with the identification of the Lactobacillus genes and molecules capable to promote animal growth (Experimental Microbiome Project) greatly impact not only the scientific community, different research companies and industries, but also has wide applicability for regulatory bodies, agriculture and industrial policy, and even science diplomacy.

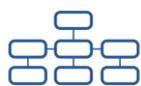
Several food and agricultural policy sectors may benefit of the research carried out in GENOLACT and Experimental Microbiome, including the whole chain of the probiotics and of the food and feed regulatory bodies and policy development sectors.

This policy brief proposes **alignment of newly identified lactobacilli species to the overall taxonomy record for research, academies and market data**. Then, based on the available body of knowledge and intended use, legislative bodies and consultancy agencies can then align food and policy development sectors that incorporate lactobacilli in their policy, regulations and standard rules such as food and nutrition, pharmaceuticals, and agriculture.

1.1 Topic

Lactobacilli are microorganisms encountered in a wide variety of habitats. They constitute a significant component of human and animal microbiota and they are widely used in medical and food industries as both probiotics and starter cultures due to their broad applicability.

ExperimentalMicrobiome and GENOLACT are two H2020 projects which focus on the study of *Lactobacillus* under complementary perspectives. Below are the results produced by the project group:



Created by David Christensen
from Nofax Project

Comprehensive Lactobacillus Taxonomy

A more stable taxonomic framework for providing more information on their antimicrobial resistance



Created by Ben Davis
from Nofax Project

Lactobacillus Plantarum Comparative Genomics Database

In-depth analysis of the properties of *L.plantarum*'s influence on the growth of its animal host

1.2 Policy challenges

The need for taxonomic 'correction' has been known for a long time, but until recently, the **methodologies needed to reliably group the current *Lactobacillus* species into new genera were not available**. The result of the GeLACTO projects directly addresses this challenge.

Dependence on outdated fundamental knowledge of lactobacilli taxonomy by agricultural and industrial policy makers, regulators and the market across the world means GeLACTO's research results has applications for the following areas that involve lactobacilli:

- Agricultural development policies
- Food safety assessment regulations
- Food and beverage industry labelling regulations
- Pharmaceutical safety testing and regulations
- Animal feeds regulations
- Probiotics regulations

2 Recommendations

Based on the challenges above, we propose the adoption of a new, unified list of *Lactobacillus* species where applicable, thereby leading to:

- Reclassification/subdivision of the genus *Lactobacillus* into more uniform taxonomic nuclei providing accurate molecular markers that can be used for regulatory approval applications.
- Reclassification for facilitating scientific communication related to lactobacilli and preventing misidentification issues, which are still the major cause of mislabelling of probiotic and food products reported worldwide

Here are the recommendations for policy and regulatory changes:

2.1 Adopt the more updated lactobacilli taxonomic framework for safety food regulations

The increased use of food cultures to ferment perishable raw materials has potentiated the need for regulations to assess and assure the safety of food cultures and their uses. These regulations differ

from country to country, all aimed at assuring the safe use of food cultures which has to be guaranteed by the food culture supplier.

GeLACTO's research, under GENOLACT, has produced a taxonomy identifying a nearly 200 *Lactobacillus* and related (e.g., *Pediococcus*, *Leuconostoc*, *Fructobacillus*, *Oenococcus*) species and showed that the *Lactobacillus* genus comprises 10 phylogroups (see table below), a paper by [Salveti et al \(2018\)](#).

The 10 phylogroups Salvetti et al (2018)
<ul style="list-style-type: none">• <i>Lactobacillus delbrueckii</i> group (which contains <i>L. acidophilus</i>)• <i>Lactobacillus alimentarius</i> group (which contains <i>L. farciminis</i>)• <i>Lactobacillus perolens</i> group• <i>Lactobacillus casei</i> group (which contains <i>L. rhamnosus</i> and <i>L. paracasei</i>)• <i>Lactobacillus sakei</i> group• <i>Lactobacillus coryniformis</i> group• <i>Lactobacillus salivarius</i> group• <i>Lactobacillus reuteri</i> group or <i>Lactobacillus fermentum</i> group• <i>Lactobacillus buchneri</i> group (which contains <i>L. brevis</i>)• <i>Lactobacillus plantarum</i> group

Table 1: The *Lactobacillus* genus comprises 10 phylogroups, Salvetti et al (2018)

This paper proposes adoption of newly identified lactobacilli species to the overall taxonomic framework for food safety regulations. At present, the information used by the food processing and labelling industry is outdated and based on a less comprehensive taxonomy. Partially, this is caused by difficulty in changing a system that has already been in place for a long time.

This currently results in mislabelled products which can prevent effective information exchange and confusion when communicating the contents of processed food products. This presents a problem as the food industry is characterised by an interdependent chain of processes and systems.

The Labelling guidelines were developed to provide information that will help consumers make informed choices. Probiotic products on the market must meet label claims regarding the numbers and types of viable microbes present in the product and maintenance of viability (as indicated by colony-forming units, or CFU), dosage, but more importantly - **using the current nomenclature to identify the genus, species, and strain of all organisms included in the product.**

The improvement and refinement of lactobacillus taxonomy (an important result of the GENOLACT project) is important not just for the industrial applications, for the correct labelling of products and components, but especially for the FC safety assessment sectors. See table 2 below for reference of the main entities involved in the FC safety assessment in the European Union (EU) [2].

In the EU, this is set out in the General Food Law, where FCs are treated similarly to all other ingredients used in food, which need to be safe. Key entities involved in the FC safety assessment in the EU such as European Food Safety Authority, International Dairy Federation, and European Food and Feed Cultures Association have proposed **additional tools and methods to evaluate the safety of FC** with the unique target of keeping a high level of food safety and to protect human life and health, and these can be updated to take into account GeLACTO's results.

On the market side, FC suppliers have also implemented **control points** to evaluate if the FC produced are safe and used in a safe way. This is where the updated taxonomic framework can be applied.

2.2 Agriculture ministries should exploit GeLACTO's research in technology to improve agricultural yields and livestock output

We propose the exploitation of GeLACTO research to explore the role of lactobacillus in **improving agricultural yields and livestock output**. Some benefits of this research can result in:

- Improved **crop performance**
- **Accelerated large scale composting** efforts
- **Odour control** in large scale composting operations
- Enriched soil for **promoting plant growth**
- **Improved livestock yields**

The research and results of the two projects may contribute to explore the growing concern with the sub-therapeutic use of Antibiotic Growth Promoters (AGP) in animal feed, greater appreciation of the role of the microbial ecology of the gastro-intestinal tract in determining animal productivity, increasing numbers of probiotic products which reduced morbidity or mortality, and benefits for the consumer through improved product quality.

2.3 Development of probiotic strains for use in medical applications such as malnutrition treatment

While strides have been made in uplifting more families out of poverty and there are disaster and conflict relief systems that are generally in place, another avenue that could be explored is the **use probiotics for improving the nutrient absorption for humans** suffering from malnutrition.

Using GeLACTO's research, (specifically the outputs of Experimental Microbiome), **probiotics could be further improved and geared towards treating malnutrition** and alleviating famine.

This can then be achieved through **public-private partnerships**, where food or pharmaceutical industry players can use the improved understanding of lactobacillus to **produce and supply improved probiotic products** to government agencies, or non-governmental humanitarian organisations that deal specifically with famine and malnutrition.

2.4 Definition of new safety assessment guidelines and evaluating health claims of novel starter cultures and probiotics

A more accurate designation of the specific Lactobacillus species, resulting from GeLACTO's research, can be used to formulate probiotic products can help communicate ingredients' specific benefits.

Alternatively, governments can also utilise the results of **GeLACTO for effective science diplomacy**, facilitating **technology transfer across borders** to help build economic and technological links between countries and markets.

Since numerous types of microbes are used as lactobacillus, **safety is intricately tied to the nature of the specific microbe** being used. From a scientific perspective, a suitable description of a probiotic product as reflected on the label should include:

- Genus and species identification, with nomenclature consistent with current scientifically recognized names
- Strain designation
- Viable count of each strain at the end of shelf-life
- Recommended storage conditions
- Safety under the conditions of recommended use
- Recommended dose, which should be based on induction of the claimed physiological effect
- An accurate description of the physiological effect, as far as is allowable by law
- Contact information for post-market surveillance

Considering the constant need for the improvement and definition of safety assessment guidelines of novel starter cultures and probiotics and that the taxonomy used in the industry is outdated, organisations on both the regulators and industry side can benefit from GeLACTO.

Medical and Pharmaceutical industries can benefit from **better selection of starter cultures** for specific food preparations, probiotic strains and bacterial molecules to be used as a **treatment of malnutrition**, to enhance the potential of specific dietary regimes, through GeLACTO's research.

3 Project Group

ExperimentalMicrobiome investigated the properties of one defined species of Lactobacillus (L. plantarum) closely to analyse how it influences the growth of its animal host, opening avenues for future usage of this bacterial species in the field of pharmaceuticals or probiotics for the treatment of undernutrition.

GENOLACT provided a more stable taxonomic framework and to provide more information on the molecular basis of their antimicrobial resistance. This is fundamental not only for academic studies, but also for the commercial, legal and regulatory aspects of probiotics and food and feed industry.

Want to utilise GeLACTO's outputs?
CONTACT US NOW!

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Appendix

[1] Comparative genomics of the genus Lactobacillus reveals robust phylogroups that provide the Basis for reclassification. E. Salvetti 2018. [\[CrossRef\]](#)

[2] Regulatory and Safety Requirements for Food Cultures [\[CrossRef\]](#)