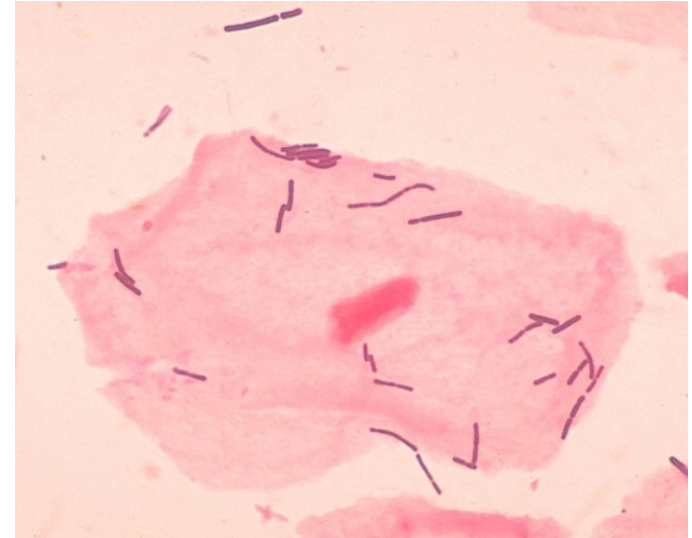


Lactobacillus



- ***Lactobacillus*** is a genus of Gram-positive, aerotolerant anaerobes or microaerophilic, rod-shaped, non-spore-forming bacteria.
- Until March 2020, the genus *Lactobacillus* comprised over 260 phylogenetically, ecologically, and metabolically diverse species
- A taxonomic revision of the genus in 2020 assigned lactobacilli to 25 genera



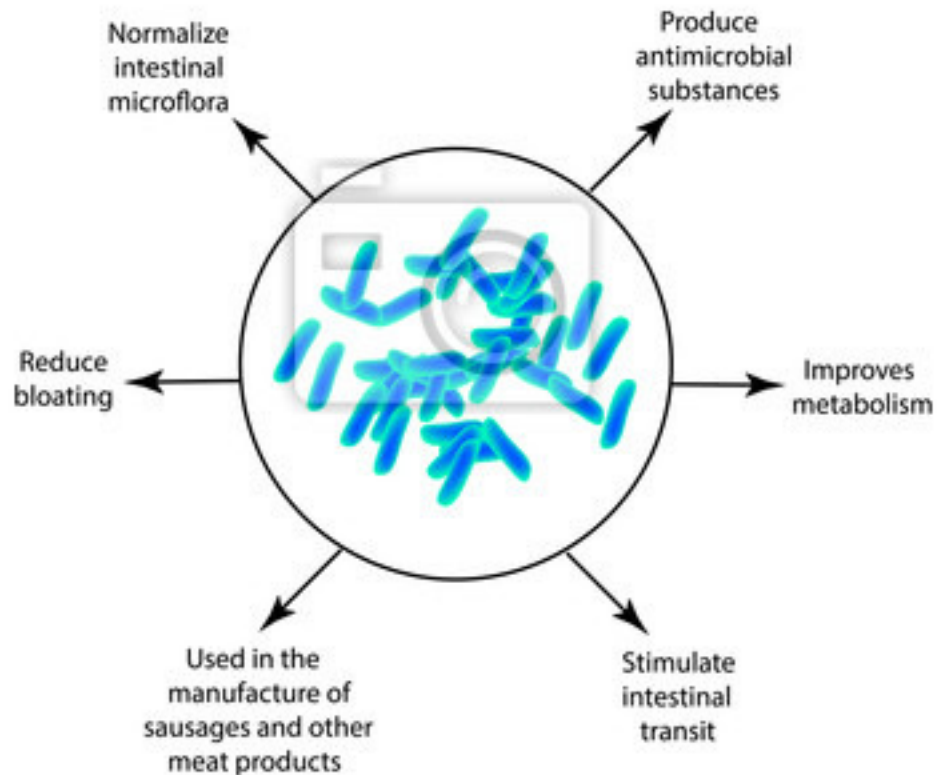
Bacterial residence sites

- *Lactobacillus* species constitute a significant component of the human and animal microbiota at a number of body sites, such as the digestive system, and the female genital system.
- *Lactobacillus* forms biofilms allowing them to persist during harsh environmental conditions and maintain its populations.
- *Lactobacillus* exhibits a mutualistic relationship with the human body, as it protects the host against potential invasions by pathogens, and in turn, the host provides a source of nutrients.

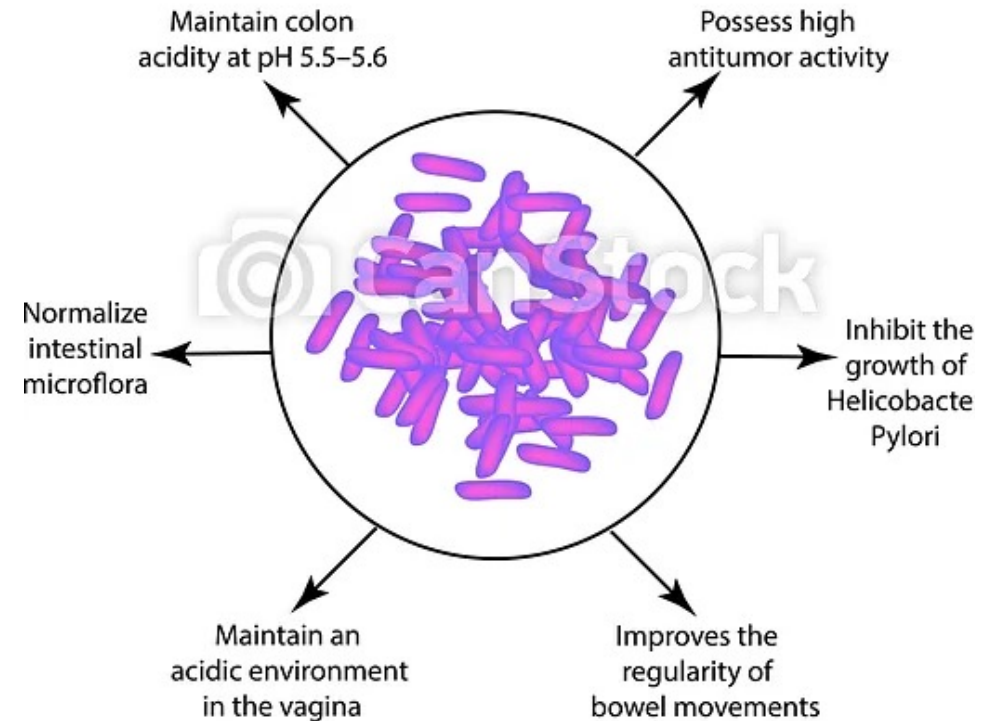


- Lactobacilli are among the most common probiotic found in food such as yogurt, and it is diverse in its application to maintain human health, as it can help treat diarrhea, female genital system, and skin disorders such as eczema.

Lactobacillus plantarum



Lactobacillus casei



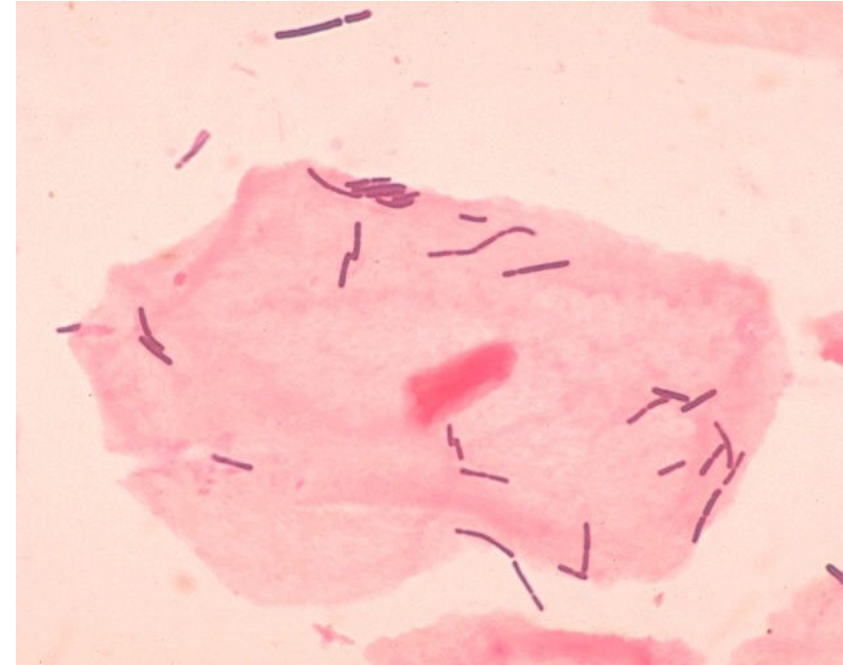
Bacterial Metabolism

- Lactobacilli are homofermentative, i.e. hexoses are metabolised by glycolysis to lactate as major end product, or heterofermentative, i.e. hexoses are metabolised by the Phosphoketolase pathway to lactate, CO₂ and acetate or ethanol as major end products.
- Most lactobacilli are aerotolerant and some species respire if heme and menaquinone (Vitamin K2) are present in the growth medium.



Human health - The female genital tract

- The female genital tract is one of the principal colonisation sites for human microbiotic, and there is interest in the relationship between their presence and human health, with a domination by a single species being correlated with good outcomes in pregnancy.
- In around 70% of women, a *Lactobacillus* species is dominant, although that has been found to vary between American women of European origin and those of African origin, the latter group tending to have more diverse vaginal microbiota. Similar differences have also been identified in comparisons between Belgian and Tanzanian women



Human health - Probiotics

- Lactobacilli administered in combination with other probiotics benefits cases of irritable bowel syndrome (IBS).
- The probiotics help treat IBS by returning homeostasis when the gut microbiota experiences unusually high levels of opportunistic bacteria.
- In addition, lactobacilli can be administered as probiotics during cases of infection by the ulcer-causing bacterium Helicobacter pylori



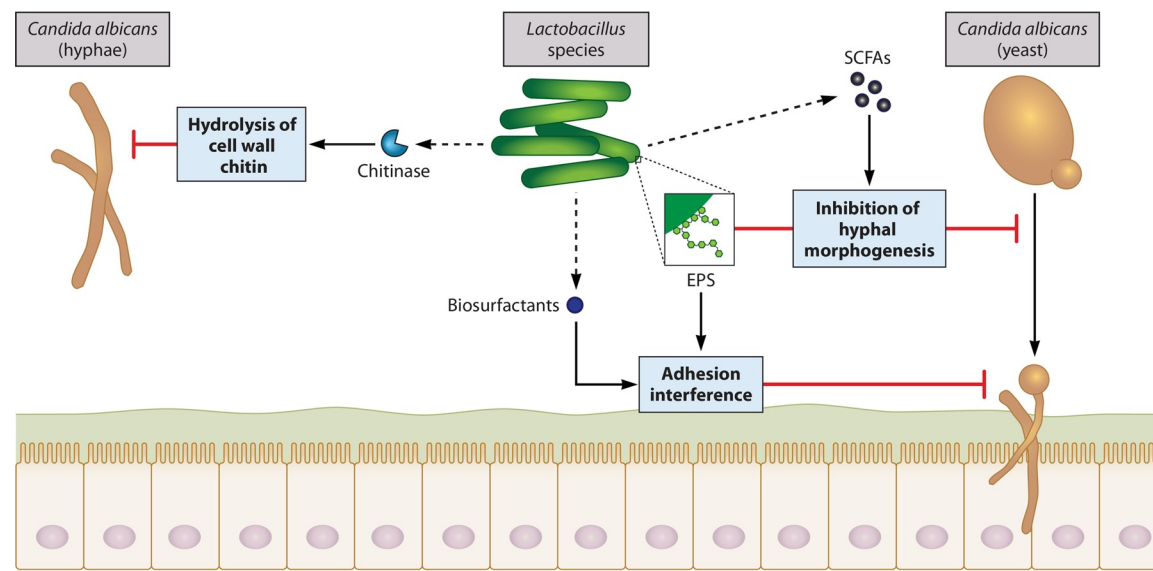
Human health - Oral cavity

- Some lactobacilli have been associated with cases of dental caries (cavities).
- Lactic acid can corrode teeth, and the *Lactobacillus* count in saliva has been used as a "caries test" for many years.
- Lactobacilli characteristically cause existing carious lesions to progress, especially those in coronal caries.
- On other hand, probiotics can allow **beneficial** lactobacilli to populate sites on teeth, preventing streptococcal pathogens from taking hold and inducing dental decay.
- here is also evidence of certain *Lactobacilli* that are beneficial in the defense of periodontal disease such as gingivitis and periodontitis



Interactions with other pathogens

- Lactobacilli produce hydrogen peroxide which inhibits the growth and virulence of the fungal pathogen *Candida albicans* *in vitro* and *in vivo*.
- In vitro studies have also shown that lactobacilli reduce the pathogenicity of *C. albicans* through the production of organic acids and certain metabolites.
- Both the presence of metabolites, such as sodium butyrate, and the decrease in environmental pH caused by the organic acids reduce the growth of hyphae in *C. albicans*, which reduces its pathogenicity.



Interactions with other pathogens

- Lactobacilli also reduce the pathogenicity of *C. albicans* by reducing *C. albicans* biofilm formation
- In addition to its effects on *C. albicans*, *Lactobacillus* sp. also interact with other pathogens. For example, *Ligilactobacillus salivarius* which interacts with many pathogens through the production of bacteriocin called salivaricin B.

Food production

- Lactobacilli are used as starter cultures in industry for controlled fermentation in the production of:
[wine](#), [yogurt](#), [cheese](#), [sauerkraut](#), [pickles](#), [beer](#), [cider](#), [kimchi](#), [cocoa](#), [kefir](#), and other [fermented](#) foods, as well as [animal feeds](#).

Human diseases:

- Dental caries
- Rheumatic vascular disease
- Septicemia
- Infective endocarditis (IE)

Diagnosis

- Lactobacillus are usually identified based on colony and Gram stain morphologies and catalase reaction (negative).
- Differentiation from viridans streptococci may be difficult, but the formation of rods in chains rather than cocci in thioglycollate broth is helpful.
- Serodiagnostic techniques are not generally used for the laboratory diagnosis of infections caused by the lactobacillus.

Culture:

- Lactobacillus grow best under microaerophilic condition in presence of 5% CO₂ and at pH 6.0. Better growth is obtained in media enriched with glucose or blood.
- Colonies on agar media are usually small, 1–3 mm in diameter, with clear margins. Some species form rough colonies.