Saarth
E-Journal of Research

ISSN NO: 2395-339X

Investigation On The Food-gut axis Microbiome and human health with Special Reference To Lactic Acid Bacteria and Their Link To Food.

Kavita Malhotra, Dr. R Sanjeevi, j .Anuradha*

INTRODUCTION

Lactic acid bacteria found in the human gut resemble the ones typically found in fermented foods and beverages, with some patterns shared within global populations The lactic acid bacteria (LAB) group is phylogenetically located in the Clostridia branch of Gram-positive bacteria and includes non-sporing cocci, coccobacilli or rods, and aero-tolerant anaerobes, with a molar DNA base composition of less than 50% G + C . LAB are among the most widely studied microorganisms worldwide. Given the important role that LAB play in different biotechnological processes, it is not surprising that they have received much attention from the scientific community for decades.

Using 'lactic acid bacteria' AND 'food', 'lactic acid bacteria' AND 'gut' or 'lactic acid bacteria' AND 'environment' as search terms, 11,800, 1,500 and 1,700 documents can be retrieved, respectively, which clearly indicates that food is the most widely studied environment in association with LAB.

Some LAB strains are also considered potential probiotics, and many are commercialized in probiotic preparations and/or functional foods. In addition, they are also members of the gut micro biome of human and animal hosts, although their origin, role and potential activities are still widely discussed.

In the Journal .we discussed the occurrence of LAB species in both food and the human gut. Moreover, we assess the availability and information retrievable from available genomic and met genomic data for LAB from food and humans. Finally, we discuss the effect of LAB on the gut micro biome on the basis of the currently available results from clinical trials and highlight future perspectives for exploiting the currently available genome-wide data that can help bridge the gap between food and the gut micro biome and can improve our understanding of the potential of FFs as vehicles for probiotic LAB.

Abstract

Despite the widely conducted research and extensive scientific evidence, there are still no clear-cut legal requirements, which leads to inappropriate application, or even abuse of the term "probiotic." In accordance with the current state of knowledge, probiotic organisms should show an effect of improved health in the host's body. The origin of the microorganisms from the human gastrointestinal tract is not a criterion that is indicated as essential.

Isolation, identification, and assessment of safety and probiotic properties of new, "wild" strains of microorganisms from traditional foods constitute a necessary practice,

---

*Kavita Malhotra, Research scholar,

Dr. R Sanjeevi, j. Anuradha , Department of Advance science and technology, NIMS University, Jaipur-303121, Rajasthan

Saarth
E-Journal of Research
ISSN NO: 2395-339X

particularly in order to develop the technology of production of food-dedicated vaccines. New vaccines, besides protective properties (bacteriostatic and bactericidal), may provide additional values connected with the consumer's improved health. Microorganisms isolated from foods show better viability in the food environment and guarantee more attractive sensory characteristics in comparison with microorganisms originating from intestines.

LAB (Lactic Acid Bacillus) Queries-

What is LAB pathogenic Diversity?

LAB are widely distributed in nutrient-rich habitats associated with food, plants, soil, animals and human hosts (Duar et al. 2017b; Wels et al. 2019).

What is contribution of LAB to food quality and safety?

By transforming carbohydrates provided by the raw materials to mainly lactic acid, LAB have contributed to food quality and safety for decades, although this has occurred with highly variable degrees of human awareness.

What is potential of LAB in fermentation?

The use of fermentation to well-thought-out selection and application of LAB as starter cultures for the food industry.

What is Role of LAB in probiotics?

The term "probiotic" may be used to refer to many types of microorganisms which demonstrate health benefits for the host, while remaining alive. In the document presented, this feature was emphasized particularly, and metabolites as well as dead cells of microorganisms were excluded from the definition of a "probiotic."

The Food-Origin Lactic Acid Bacteria May Exhibit Probiotic Properties.

Lactic acid-producing bacteria are the most commonly used probiotics in foods. It is well known that probiotics have a number of beneficial health effects in humans and animals.

Definitions and regulations regarding probiotics.

The definition of probiotics changes together with the development of knowledge about them. A definition of the probiotic was proposed in 2001 by Schrezenmeir and De Vrese: "a preparation of or a product containing viable, defined microorganisms in sufficient numbers, which alter the micro flora by implantation or colonization, in a compartment of the host .

*To study the occurrence of LAB in food and Human Gut.

*The effect of LAB on gut micro biome.

*.The Role of food in development of human health and well being.

The role of food in developing human health and wellbeing has been known since the times of Hippocrates, whose saying, "Let food be thy medicine and medicine be thy food," frequently repeated today, has become the slogan of supporters of "treating" with food. This correlation is particularly apparent and documented as regards the beneficial micro flora found in the human body.

Saarth
E-Journal of Research
ISSN NO: 2395-339X

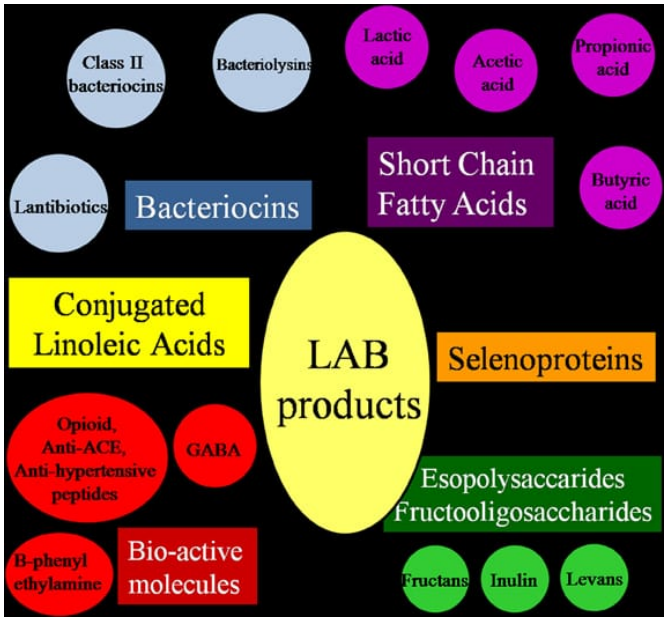
An efficiently working gut ecosystem, the so-called micro biome (quantitative and qualitative composition of various microorganisms) has a great impact on the person's ability to maintain their health. The micro flora in human intestines is the most varied ecosystem on earth in terms of species (100–1000 species). The micro biome influences many physiological systems, including immunity or mental state. Due to the growing awareness of the role that the gut micro flora has on people keeping their health, for over 20 years research work has been conducted worldwide, with regard to the possibilities of modifying positively or enriching human micro biome.

Materials And Methodology

Lactic acid bacteria (LAB) include a large number of bacterial genera among which the best known are lactobacilli, lactococci, enterococci, streptococci, leuconostoc, and pediococci. These genera differ for morphology, pH and salt tolerance, temperature optimum, habitats, and pathogenic potential. At present, it is very difficult to establish a clear demarcation line between beneficial and virulent species, being some problematic traits more linked to strain than to species. However, Lactobacilli and Lactococci are considered GRAS (generally regarded as safe).

Figure: probiotic potential of LAB (lactic Acid Bacillus)

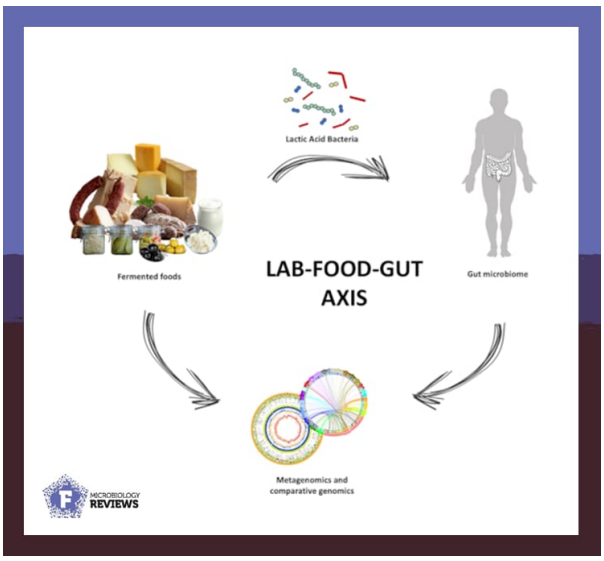
Like most bacteria, LAB can synthesize cell-wall structural polysaccharides (PS) such as peptidoglycan and lipoteichoic acids and exocellular polymers. The latter include both



capsular PS where the PS is covalently bound to the cell surface and the EPS which form a loosely bound slime layer that can also be secreted into the environment..

Limitations:

Saarth
E-Journal of Research
ISSN NO: 2395-339X



However, commensally LAB living in both gut and other mucosal ecological niches, although fed with abundant nutrients, still have a stressful life and often are compelled to cope with antagonistic host factors as well as with yeast or bacteria sharing the same habitat. These harsh conditions allowed the evolution of interesting metabolic and cross-talk features.

LAB Photolytic System

In Lactococci, proteases are prevalently cell-envelope anchored (CEP proteases), except in Lactococcuslactis cremoris which is able to secrete proteinases. In Lactobacilli some of them have an extracellular location .while others are cell-wall associated Most LAB proteolytic enzymes are synthesized as pre-pro-enzymes, whose signal peptide is cleaved upon membrane translocation: the resulting membrane bound pro-proteinase undergoes autocatalytic cleavage to obtain its mature, active, conformation. These proteases are serine proteinases, with high molecular weight and 5.5–6.5 pH optima, which is compatible with the environment in which LAB commences.

Conclusion:

In spite of their limited biosynthetic abilities (especially for amino acid and vitamin synthesis), LAB can produce molecules of in

terest among which the most studied polysaccharides (EPS) and fructose oligo saccharine (FOS), short chain fatty acids (SCFA), conjugated linoleic acids

LAB were among the first living organisms on the earth: they appeared about three billions years ago, in the transition period from anaerobiosis to aerobiosis. Apparently, they seem to be well adapted to both anaerobic and aerobic life conditions, since they bear all the necessary proteins for respiration and several enzymes involved in fermentative pathways.

Review of literature

Alard J, Lehrter V, Rhimi M et al. . Beneficial metabolic effects of probiotics on diet-induced obesity and insulin resistance in mice are associated with improvement of dysbiotic gut microbiota. Environ Microbiol. 2016;18:1484–97. [PubMed] [Google Scholar]

Saarth
E-Journal of Research
ISSN NO: 2395-339X

Alisi A, Bedogni G, Baviera G et al. . Randomised clinical trial: The beneficial effects of VSL#3 in obese children with non-alcoholic steatohepatitis. Aliment PharmacolTher. 2014;39:1276–85. [PMC free article] [PubMed] [Google Scholar]

Alkanani AK, Hara N, Gottlieb PA et al. . Alterations in intestinal microbiota correlate with susceptibility to type 1 diabetes. Diabetes. 2015;64:3510–20. [PMC free article] [PubMed] [Google Scholar]

Allen EE, Banfield JF. Community genomics in microbial ecology and evolution. Nat Rev Microbiol. 2005;3:489–98. [PubMed] [Google Scholar]

Almeida A, Mitchell AL, Boland M et al. . A new genomic blueprint of the human gut microbiota. Nature. 2019;568:499–504. [PMC free article] [PubMed] [Google Scholar]

Almeida M, Hébert A, Abraham AL et al. . Construction of a dairy microbial genome catalog opens new perspectives for the metagenomic analysis of dairy fermented products. BMC Genomics. 2014;15:1101. [PMC free article] [PubMed] [Google Scholar]

Barreto FM, Colado Simão AN, Morimoto HK et al. . Beneficial effects of Lactobacillus plantarum on glycemia and homocysteine levels in postmenopausal women with metabolic syndrome. Nutrition. 2014;30:939–42. [PubMed] [Google Scholar]

Bautista-Gallego J, Ferrocino I, Botta C et al. . Probiotic potential of a Lactobacillus rhamnosus cheese isolate and its effect on the fecal microbiota of healthy volunteers. Food Res Int. 2019;119:305–14. [PubMed] [Google Scholar]

Begley M, Hill C, Gahan CGM. Bile salt hydrolase activity in probiotics. Appl Environ Microbiol. 2006;72:1729–38. [PMC free article] [PubMed] [Google Scholar]

Cani PD. Human gut microbiome: hopes, threats and promises. Gut. 2018;67:1716–25. [PMC free article] [PubMed] [Google Scholar]

Castro-Bravo N, Wells JM, Margolles A et al. . Interactions of surface exopolysaccharides from Bifidobacterium and Lactobacillus within the intestinal environment. Front Microbiol. 2018;9:2426. [PMC free article] [PubMed] [Google Scholar]

Cavallini DCU, Manzoni MSJ, Bedani R et al. . Probiotic soy product supplemented with isoflavones improves the lipid profile of moderately

David LA, Maurice CF, Carmody RN et al. . Diet rapidly and reproducibly alters the human gut microbiome. Nature. 2014;505:559–63. [PMC free article] [PubMed] [Google Scholar]

De Andrés J, Manzano S, García C et al. . Modulatory effect of three probiotic strains on infants' gut microbial composition and immunological parameters on a placebo-controlled, double-blind, randomised study. Benef Microbes. 2018;9:573–84. [PubMed] [Google Scholar]

Saarth
E-Journal of Research
ISSN NO: 2395-339X

De Filippis F, Genovese A, Ferranti P et al. . Metatranscriptomics reveals temperature-driven functional changes in microbiome impacting cheese maturation rate. Sci Rep. 2016;6:21871. [PMC free article] [PubMed] [Google Scholar]

El Manouni El Hassani S, de Boer NKH, Jansen FM et al. . Effect of daily intake of Lactobacillus casei on microbial diversity and dynamics in a healthy pediatric population. CurrMicrobiol. 2019;76:1020–7. [PMC free article] [PubMed] [Google Scholar]

Ercolini D. High-throughput sequencing and metagenomics: moving forward in the culture-independent analysis of food microbial ecology. Appl Environ Microbiol. 2013;79:3148–55.

M. L. Marco, D. Heeney, S. Binda et al., "Health benefits of fermented foods: microbiota and beyond," Current Opinion in Biotechnology, vol. 44, pp. 94–102, 2017.View at: Google Scholar

S. Sarkar, "Efficacy of dead probiotic cells," International Journal of Food Sciences and Nutrition Diet, vol. 5, no. 1, 2016.View at: Google Scholar

"Nutrition and health claims made on foods," Regulation (EC) No. 1924/2006.View at: Google Scholar

G. Reid, "Probiotics: definition, scope and mechanisms of action," Best Practice & Research Clinical Gastroenterology, vol. 30, no. 1, pp. 17–25, 2016.

Marco ML, Heeney D, Binda S, et al. Health benefits of fermented foods: microbiota and beyond. CurrOpinBiotechnol. 2017; 44:94-102. doi: 10.1016/j.copbio.2016.11.01

Categories: Fermented Foods, Food & Ingredients, Gut Microbiota, Probiotics, Research & Practice

Tagged: Diet, Fermented foods, Gut microbiota, Lactic acid bacteria, Probiotics

[29/12, 15:45] guggluusaada: Filannino, P., Di Cagno, R., and Gobbetti, M. (2018). Metabolic and functional paths of lactic acid bacteria in plant foods: get out of the labyrinth. Curr. Opin. Biotechnol. 49, 64–72. doi: 10.1016/j.copbio.2017.07.016

PubMed Abstract | CrossRef Full Text | Google Scholar

PubMed Abstract | CrossRef Full Text | Google Scholar

Fridman, S., Izhaki, I., Gerchman, Y., and Halpern, M. (2012). Bacterial communities in floral nectar. Environ. Microbiol. Rep. 4, 97–104. doi: 10.1111/j.1758-2229.2011.00309.x

PubMed Abstract | CrossRef Full Text | Google Scholar

Garcia, E.F., Luciano, W.A., Xavier, D.E., da Costa, W.C., de Sousa Oliveira, K., and Franco, O.L., et al. (2016). Identification of lactic acid bacteria in fruit pulp processing

Saarth
E-Journal of Research

ISSN NO: 2395-339X

byproducts and potential probiotic properties of selected Lactobacillus strains. Front. Microbiol. 7:1371. doi: 10.3389/fmicb.2016.01371

PubMed Abstract | CrossRef Full Text | Google Scholar

Gevers, D., Huys, G., and Swings, J. (2001). Applicability of rep-PCR fingerprinting for identification of Lactobacillus species. FEMS Microbiol. Lett. 205, 31–36. doi: 10.1111/j.1574-6968.2001.tb10921.x

PubMed Abstract | CrossRef Full Text | Google Scholar