Probiotic effect of lactobacillus bacteria on their host A - review

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ABSTRACT *Lactobacillus species are very important probiotic bacteria and they are compatible with the human gastrointestinal system because of their innate resistance to bile, acid and interfering enzymes such as pepsin and pepsinogen. Probiotics like lactobacillus bacteria stimulate and regulate the host's immune system by initiating the activation of specific genes of host cells. They are used to manage irritable bowel syndrome and inflammatory bowel diseases, inhibition of endogenous/ exogenous pathogens from intestine, removal of food allergy symptoms from infants by immunomodulation, reduction of serum cholesterol, initiation of lactose tolerance to increase, and minimize the risk factor for colon cancer. Probiotics, prebiotics, postbiotics and synbiotics are commonly consumed as preparations with active live cultures and contain bacteria, like lactobacilli that have been isolated from natural environments. The species of the genus Lactobacillus: L. plantarum, L. fermentum and L. Salivarius, from fermented fruits and vegetables have a wide antibacterial spectrum (ZDI: 26 - 28 mm), and they prevent food borne bacterial pathogens. Prebiotics have a function to enhance both beneficial bacteria and very well administered probiotic bacteria. So as we have seen here probiotic lactobacillus bacteria's have the effect of immunity development, inhibition of pathogens and other health effect on their hosts.*

Keywords: *Probiotics; Lactobacillus; Intestinal microbiota; Immune system.*

1. Introduction

Lactic Acid Bacteria (LAB) constitutes Lactococcus, Enterococcus, Oenococcus, Pediococcus, Streptococcus, Leuconostoc and Lactobacillus. Lactobacillus bacterias are the largest class of Lactic acid bacteria (LAB) these are Gram-positive bacterias and produce lactic acid in the process of fermentation (Kandler and Weiss, 1986). Lactobacillus bacteria are found in different ecological niches such as plants, animals and raw milk (Hammes and Vogel, 1995). The diversity of Lactobacillus bacteria is observed by the considerable genotypic and phenotypic differences in the genus (Collins et. al., 1991). Lactobacilli are associated with food production because of the preservative action due to acidification, and/or enhancement of flavor, texture and nutrition. They are become the cause for rapid pH decrease in the raw material through the production of lactic acid as the main catabolic product (Leroy and De Vuyst, 2004). Lactobacillus is the most important genus in production of dairy starters, it plays a major role to sour milk and to produce fermented dairy products (Leroyand De Vuyst, 2004). Probiotics are defined as "live microorganisms which, when administered in adequate amounts, confer health benefit on the host" (FAO/WHO, 2002). *Lactobacillus* species are very important probiotic bacteria and they are compatible with the human gastrointestinal system because of their innate resistance to bile, acid and interfering enzymes such as pepsin and pepsinogen (Liong & Shah, 2005; E. Vamanu & Vamanu, 2010). Anti-microbial activity against pathogens, non-virulent, ability to adhere on intestinal tract, acid and bile tolerance and non-hemolytic activities are important characteristics of probiotics (Fao, 2001). Probiotics like lactobacillus bacteria stimulate and regulate the host's immune system by initiating the activation of specific genes of host cells. These probiotics also stimulate, regulate and modulate the gastrointestinal hormone release and regulate brain behavior with bidirectional neuronal signaling (Kristensen NB et. al., 20016). Prebiotics includes bifidogenic properties of insulin, oligofructose, and fructo-oligosaccharides (FOS) synthetically produced from sucrose, as well as galactosecontaining and xylose-containing oligosaccharides (Tanaka R et. al., 1983; Hutkins RW et. al., 2016). These prebiotics produced from vegetables, fruits, and grains consumed in our daily life. Prebiotics used as an energy source and also have several health functions like diminishing the prevalence and duration of diarrhea, they give a function to relief from inflammation and other symptoms associated with intestinal bowel disorders, and exerting protective effects to prevent colon cancer (Peña AS. 2007). The bacterial metabolic byproducts like bacteriocins, organic acids, ethanol, diacetyl, acetaldehydes and hydrogen peroxide are included in postbiotics (Islam SU 2016). Postbiotics have a function as non-toxic, non-pathogenic and resistance to hydrolysis by mammalian enzymes, they are taken as non-viable bacterial products or metabolic by products from probiotics (Giorgetti GM et. al., 2015). Synbiotics have the effect to improve the survival of beneficial microorganisms added to food or feed and additionally they are used for

the stimulation of the proliferation of specific native bacterial strains present in the gastrointestinal tract (Gourbeyre, P. et.al., 2011). Synbiotics seems promising that considering a huge number of possible combinations, the application of synbiotics for the modulation of intestinal microbiota in humans (Scavuzzi, B.M et. al., 2014). The aim of this review paper is it revised and understands different research works on probiotic effect of lactobacillus bacteria previously attempted by different scholars and institutions.

2. Probiotics, prebiotics, postbiotics and Synbiotics

Different definitions are there prostulated for probiotics, prebiotics, postbiotics and synbiotics, that they can be best explain as microbe or a group of microbes which inhabits within the gut and nourishes the host body internally (Gibson GR and Roberfroid MB 1995; Hamasalim HJ.2016). Probiotics, prebiotics, postbiotics and synbiotics are commonly consumed as preparations with active live cultures and contain bacteria, like lactobacilli that has been isolated from natural environments (Bongaerts GPA and Severijnen RSVM. 2016). Let's see these probiotics, prebiotics, postbiotics and synbiotics in detail.

2.1. Probiotics

Probiotics are living microorganisms which are used as feed supplements to supply health benefits by enhancing intestinal microbial balance in the human body (Quratulain riaz and Tariq masud, 2013). The important solution measures to prevent allergy development in future time of life are improving infection resistance of bodies, reducing the use of antibiotic, Boosting the body's ability to resist infection prevents morbidity, decreases antibiotic use minimizing infections, (Sanders ME2003). Probiotics are used as lowering cholesterol, develop lactose tolerance and controlling some cancers and antibiotic associated diarrhoea (Fitton N and Thomas JS 2009). Production of acid and/or bacteriocins, competition with pathogenic bacteria and inhibition of their adhesion to the intestine and enhancement of the immune system are the health benefits of probiotics (Chen MJ and Chen KN 2007).

Table 1 The most common species of probiotic lactobacilli (Keohane et al., 2009).

No	Name of Lactobacillus strains	No	Name of Lactobacillus strains
1	Lactobacillus acidophil	10	Lactobacillus johnsonii
2	Lactobacillus paracasei	11	Lactobacillus rhamnosus
3	Lactobacillus rhamnosus	12	Lactobacillus bulgaricus
4	Lactobacillus lactisLla	13	Lactobacillus cellobiosus
5	Lactobacillus curvatus	14	Lactobacillus fermentum
6	Lactobacillus reuteri	15	Lactobacillus brevis
7	Lactobacillus salivarius	16	Lactobacillus helveticus
8	Lactobacillus amylovorus	17	Lactobacillus crispatus
9	Lactobacillus gallinarum	18	Lactobacillus gasseri

2.2. Prebiotics

Further use and investigation of probiotics helps to transform to production of prebiotics, there are many feed types give supports to modify the gut microbial flora and have a selective activities to stimulate the growth or activity of beneficial bacterial species in the gut (Rastall RA and Gibson GR. 2015 ; Thomas LV. 2016). Prebiotics have a function to enhance both beneficial bacteria and very well administered probiotic bacteria (Gibson GR and Roberfroid MB, 1995). Prebiotics are extracted and concentrated industrially from vegetables and fruits by hydrolysis of polysaccharides from dietary fibers or starch, or enzymatic generation. Prebiotics are mixtures of indigestible oligosaccharides (Gibson RG et. al., 2000; Manning TS and Gibson GR 2004). Some prebiotics contains bifidogenic properties of insulin, oligofructose, and fructo oligosaccharides (FOS) synthetically extrcted from sucrose, as well as galactose containing and xylose-containing oligosaccharides (Tanaka R. et. al., 1983; Hutkins RW et. al., 2016).

2.3. Postbiotics

Postbiotics refers to the metabolic by products like enzymes, peptides, teichoic acid, peptidoglycan derived muropeptides, exopolysaccharides, cell surface and secreted proteins, bacteriocins and organic aids generated by a probiotic organism during its life span (Tsilingiri K et. al., 2012; Konstantinov SR, et. al., 2013). Postbiotics eradicate risks that attached with the administration of live probiotic bacteria, those risks of sepsis in premature infants, hindrance to normal colonization of other microflora and virulence factor in particular strain (Kataria J et. al., 2009). While the reverse to that, increasing number of antibiotic resistance gene, postbiotics are more important due to their clear chemical structure, safety dose parameters and longer shelf life that can control physiological function of host (Shenderov BA. 2013). Postbiotic substances have different metabolites and signalling molecules those are used to facilitate broad

antibacterial spectrum and immunomodulatory actions (Savadogo A et. al., 2006; Liasi SA et. al., 2009; Gaggìa F,et. al., 2010; Cicenia A et. al., 2014).

2.4. Synbiotics

Synbiotics refer to feed supplements with combination of probiotics and prebiotic nutrient ingredients and in a form of synergism to enhance the existence and achievement of live microbial dietary supplements in the tract, by initiating growth or facilitating the health promoting bacteria (Kaur IP, et. al., 2002). A synbiotic product influences the host in enhancing to survive and implanting of live microbial dietary supplements in the GIT by selectively initiating the growth and/or activating the metabolism of a number of health-promoting bacteria. Because the word "synbiotics" all udes to synergism, this term should be reserved for products in which the prebiotic compound(s) selectively favor the probiotic organism(s) (Cencic and Chingwaru 2010). Synbiotics were produced to solve survival problems of probiotics. Efficient implantation, stimulating effect of the growth of probiotics and ubiquitous bacteria plas major role to enhance the intestinal homeostasis and a healthy body (Peña 2007).

Table 2. Function of Probiotics, Prebiotics, Postbiotics and synbiotics

Name	Function
Probiotics	Used as feed supplements to supply health benefits by enhancing intestinal microbial balance in the human body
Prebiotics	Used to enhance both beneficial bacteria and very well administered probiotic bacteria.
Postbiotics	Used as the metabolic by products like enzymes, peptides, teichoic acid, peptidoglycan derived muropeptides, exopolysaccharides, cell surface and secreted proteins, bacteriocins and organic aids generated by a probiotic organism during its life span
Synbiotics	Used as feed supplements with combination of probiotics and prebiotic nutrient ingredients

3. Clinical significance of lactobacillus probiotics and its potential applications

Lactobacilli probiotics are in human being give a function to reduce the risk of gastrointestinal (GI) infections (Salminen et al., 2005). First clinical interest in the application of Lactobacillus probiotics were in the control and treatment for GI infections and diseases (Parvez et al., 2006). Lactobacillus inhibit diarrhea in children, or bacterial vaginal infections, resist infection from Helicobacter pylori, bowel syndromes, allergy and also develop mucosal immunity. However, it cannot prevent infections in urinary tract, ineffective against lactose intolerance, and yeast infections (Reid, G. et. al., 2003; Fijan, S. 2014). Many Lactobacillus sp. having promising therapeutic properties like anti-inflammatory, antimicrobial, anti-cancerous Anti-pathogenic, Anti-diabetic activities, Anti-obesity activity, Angiogenic activity, Brain and CNS health care and some other activities like prevents dental caries. Metabolites lactic acid, acetic acid; hydrogen peroxide that inhibits growth other micro-organisms, hence prevents infection are produced by Lactobacillus (Reid, G et. al., 2009).

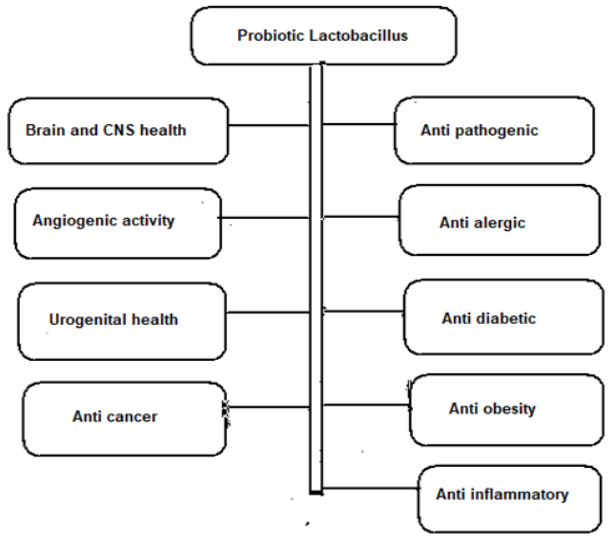

Fig 1 Clinical significance of lactobacillus probiotics and its potential applications

3.1. Anti-pathogenic activities of lactobacillus probiotics

Lactobacillus is able to prevent the growth of other microorganisms or kill them. Lactobacillus sp. and acidolin an antibiotic produced by Lactobacillus perform different activities to inhibit and remove Gram positive and Gram-negative microorganisms, including both entero-pathogens and spore formers especially human intestinal bacterial pathogens (Hamdan, I.Y. and Mikolajcik, E.M. 1974; Atta, H.M. et. al., 2009). Lactobacillus bacteria adhesion to intestinal cells is predicted to have lasting beneficial effects upon human health, i.e. exclusion of pathogens and immunomodulation (Kravtsov EG et. al., 2008). The growth of pathogenic bacteria like Staphylococcus aureus, Bacillus mycoides, Streptococcus faecalis and Proteus vulgaris is inhibited by Lactobacillus bacteriocin. Although other pathogenic bacterias like Bacillus amyloliquifaciens, Bacillus cereus, Salmonella typhi and Pseudomonas aeruginosa implies that resistant to the isolation of producing antibacterial substances (Mohankumar, A. and Murugalatha, N. 2011). Lactobacillus probiotics also have the ability to inhibit the formation of Staphylococcus sp. biofilm and they are also considerd as an antibiofilm agent (Abd-Alkareem, A.Y. 2014).

3.2 .Urogenital health care of lactobacillus proboscis

Centers for Disease Control and Prevention (CDCP) reported that there are over one billion women suffer from non-sexually transmitted urogenital infections in the world, such as urinary tract infection (UTI), bacterial vaginosis (BV) and several other yeast infections (Waigankar SS, and Patel V. 2011). The species those are cousing urogenital disease and typically associated with BV include Mycoplasma hominis, Gardnerella vaginalis and Ureaplasma urealyticum (Hanson L et. al., 2016). One of the causes of morbidity in the world is Sexually transmitted diseases (STDs) and it includes two most common diseases like gonorrhea and Chlamydia (Chan PA et. al., 2016).

Table 3 Shows lactobacillus strains and major treatment and prevention of deficiencies in hosts (Reid and Bruce, 2001).

No	*Lactobacillus* strain	Major deficiences
1	*L.acidophilus*	Weak adhesion to epithelial cells; weak prevention of pathogen Growth and adhesion
2	*L. casei*	Do not have 29-kDa biosurfactant protein that prevent pathogen binding; does not produce hydrogen peroxide
3	*L.acidophilus*	Weak adhesion to epithelial cells; weak prevention of pathogen growth; does not produce hydrogen peroxide
4	*L. johnsonii*	Do not have 29-kDa biosurfactant protein
5	*L. rhamnosus*	Do not have 29-kDa biosurfactant protein that prevent pathogen binding; weak to produces hydrogen peroxide
6	*L.casei* Short	Do not have 29-kDa biosurfactant protein that prevent pathogen binding; do not produce hydrogen peroxide
7	*L.plantarum*	Do not have 29-kDa biosurfactant protein

3.3. Anti-diabetic activities of lactobacillus probiotics

The previous studies reported that improvement of lactic acid bacterias growth like *L. lactis but* minimizing the enterance of bacteria and pathogen numbers could be beneficial for the diabetic rats (Monteagudo-Mera et al., 2012; Nuño et al., 2013). *Lactobacillus rhamnosus* GG cells mainly reduce blood glucose levels and enhanced hyperglycemia in neonatal streptozotocin-induced diabetic rats when it is compared to the control group. (Tabuchi M, et. al.., 2003). Lactobacillus fermentum ME-3 as one of lactobacillus strain were shown to improve antioxidative status (TAS) and also they reduce oxidative stress markers (Kullisaar T et. al., 2003; Songisepp E, et. al., 2005). Many studies using animal models of diabetics shown that Lactobacillus acidophilus and Lactobacillus casei that reduce oxidative stress and have antidiabetic effects (Yadav H et. al., 2007; Harisa GI et. al., 2009). At the previous study Tabuchi et al. (2003) reported that L. *rhamnosus* GG cells lowered the blood glucose level and enhance hyperglycemia in neonatal streptozotocin-induced diabetes rats than the control group. Previous studies shows that oral administration of *L. reuteri* GMNL-263 and *L. casei* Zhang enhanced glucose tolerance and insulin resistance (Hsieh et al., 2013; Zhang et al., 2013).

3.4. Anti-obesity activity of lactobacillus probiotics

More excess fat accumulation (obesity) that affects health is linked to enhance in energy availability, sedentariness and a major control of ambient temperature, it leads to abnormal condition in energy intake and expenditure (Kobyliak N et. al., 2016). Mostly weight loss is facilitated by thermogenic and lipolytic responses to stimulate the sympathetic nervous system (Karimi G et. al., 2015). Oral administration of Lactobacillus casei is the most important on insulin resistance in diet induced obesity mice has been indicated in a recent study (Naito et al., 2011). While other different studies showed that soy milk can

inhibit obesity in high-fat diet (HFD)-induced animals (Choi et al., 2011; Eller & Deimer, 2010; Pi mentel et al., 2012). The impressive effect of L. casein metabolic syndrome in obese mice has been indicated in different studies (Liu et al., 2011), and the capacity of to reduce adipocyte size in HFD-induced mice of L. plantarum has been shown (Lee et al., 2006). In other way, Lactobacillus gasseri reduce an increasing in the body weight of rats fed a high-carbohydrate diet (Takemura, Okubo, & Sono yama, 2010).

3.5. Anti-inflammatory activity of lactobacillus probiotics

The Inflammatory bowel disease (IBD) is caused by an inappropriate inflammatory action to intestinal microbes in a genetically susceptible host. There are two types of IBD Inflammatory bowel diseases like chronic intestinal dis-orders: Crohn's disease (CD) and ulcerative colitis (UC) (Shivanandaet al., 1996). Crohn's disease (CD) may attack different area of the GIT those are mucosa, sub mucosa, and serosa, and the inflammation could dispersed to the whole GIT. While ulcerative colitis (UC) involves the large bowel; mainly on the mucosa and sub mucosa of the colon (Palumbo VD et. al., 2016). Researches have reported that lactobacillus strain-specific anti-inflammatory abilities corresponded with the PGN structure (Fernandez, Pot, & Grangette, 2011). PGN may be affected beyond mucosal surfaces, and their receptor can be expressed in tissues and cells found far from the niches in those bacteria reside. Macrophages are similar to other cells and they show heterogeneity behavior (Mahida, 2000).

3.6. Anti-cancer activity of lactobacillus probiotics

Environmental and dietary changes have been identified as the main causes of noninfectious diseases globally, such as aging-related diseases and cancers (Sah et al., 2015). The preventive activity of probiotics like lactobacillus strains on cancer cell proliferation represents an essential strategy for the development of a beneficial approach for colorectal cancer (CRC) inhibition (Faghfoori et al., 2015). In the previous study it was shown that treatment of metastatic human colorectal carcinoma cells with cell-free supernatant from *L. casei* and *L. rhamnosus* GG attenuated cell invasion by minimizing the activity of matrix metalloproteinase-9 and the status of the junction protein zona occludens-1 (Escamilla, Lane, & Maitin, 2012). In the same way, it has been demonstrated presently that managing of viable *L. rhamnosus* GG caused cell cycle arrest and prevention of proliferation of Caco-2 and HT-29 human GI cancer cells (Orlando, Linsalata, & Russo, 2016). In vitro studies have showed that probiotic strains, Lactobacillus fermentum NCIMB-5221 and -8829, have maximum potent in reducing colorectal cancer cells and that enhance normal epithelial colon cell growth through the production of SCFAs (ferulic acid) (Kahouli I et. al., 2015).

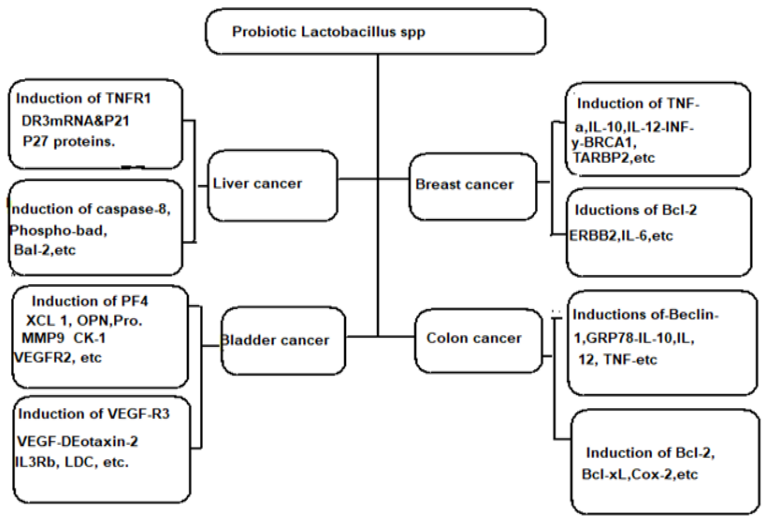

Figure 2 Shows inhibition and initiation of cancer cells by lactobacillus strains.

3.7. Anti-allergic activity of lactobacillus probiotics

Generalizing main molecular activities that give supports to the etiology of allergic diseases, and also new treatment methods is more important for the follow-up and inhibition of these diseases (Akelma AZ and Topcu ZIK. 2016). Antigen-specific immunotherapy may change the natural course of allergic disease, inhibit the increment of other allergic diseases, and reduce new allergic sensitization (P.S. Norman, 2004). Lactobacilli strains have been shown to prevent type I allergic diseases by regulating Immunity of the host (Konieczna et al., 2015). Probiotics used as safe alternatives for allergy therapy; anti-allergic effects were indcated in the case of Lactobacillus rhamnosus GG, Lactobacillus casei, and Lactobacillus reuteri DSM 122460 (Ouwehand, 2007). In vitro investigations of probiotics, like Lactobacillus plantarum L67, were

shown the potential to inhibit allergy-associated disorders with the production of interleukin-12 and interferon-g in their host (Song S et. al., 2016). The two different probiotic strains L. acidophilus LA102 and L. casei LC232 were found to show better cytotoxic deuties, with in vitro anti-proliferative activity in contrast to two colorectal cancer cell lines (Caco-2 and HRT-18) (Awaisheh SS et al. 2016).

3.8. Angiogenic activity of lactobacillus probiotics

Angiogenesis is an important process and is use full for wound healing process through delineated cellular responses to regrowth damaged tissues (Flkman J. 2006). Deregulated angiogenesis has a serious impact on the main human diseases, like diabetic retinopathy, IBD including CD and UC and cancer (Folkman J. 2007). Interleukin-8 (IL-8/CXCL-8), a CXC chemokine, is used as an angiogenic and permeability factor in non immune and endothelial cells (Salcedo R, et. al., 2000). IL-8 performs its biological process through binding to two receptors, CXCR1 and CXCR2 (1). IL-8 is also indicated in tumor angiogenesis of gastrointestinal carcinomas (Giorgini S, et. al., 2007). In human intestinal micro vascular endothelial cells (HIMECs), IL-8 enhances tube formation and distribution within its CXCR2 receptor (28). (Heidemann J et. al., 2003). *Lactobacillus rhamnosus* GG enhanced the expression of proangiogenic VEGF and therefore improved wound healing from gastric ulcers in rats (39) (Lam EK et. al., 2007).

3.9. Treatment and development of Brain and CNS system

The effect of probiotics like lactobacillus strains on the CNS has been mainly studied in clinical trials, where it was shown that gut micro biota affect human brain development function (Tillisch K. 2014). The school children with autism spectrum disorder were administerd to take a daily dose of L. plantarum WCFS1 (4.5 _ 1010 CFU/ day) it enhanced their school records and attitude towards food (Umbrello G, Esposito S. 2016). In another studies of health trial Rao AV et. al., (2009) indicated that a reduction of anxiety symptoms with administration of L. casei strain Shirota to patients suffering from chronic fatigue syndrome. The intestinal micro biota has been modulated by Lactobacillus rhamnosus GG (LGG) and also this probiotic lactobacillus strains inhibits the increasing of pathogenic bacteria and defend the intestinal barrier during chronic ethanol exposure (Bull-Otterson L, et. al., 2013). Moreover, acetaldehyde and hazardous by-product of ethanol metabolism, have been metabolized by LGG metabolizes (Nosova T et. al., 2000).

4. Commercial significance of lactobacillus probiotics

The probiotic species of Lactobacilli are very useful and are given more attention in food fermentation industry due to their biotechnologically interesting properties (Roy et al., 2000). Among the lactic acid bacteria (LAB), *Lactobacilli strains* are the principal members of the intestinal microbiota of various hosts and they are participating in fermentation of various foods to enhance the quality of food and safety (Fuller, R. 1989). Different foods and other products those are includes lactobacilli dominate the international probiotics market; produced from various sources, they are very important in biotechnology and food preservation, and are produced as therapeutics (Sun, Z et. al., 2015). In the previous study, using curd lactobacilli and commercially available lactobacilli strains, we demonstrated their antibacterial activity against Klebsiella pneumoniae, and E. coli as singlewise and also as in combination, (Halder, D. and Mandal, S. 2016). Due to high milk cholesterol content, potential milk-protein allergens functional foods containing microorganisms with probiotic potentiality highly demanded (Sanders ME *et. al*., 2010). The species of the genus *Lactobacillus: L. plantarum, L. fermentum* and *L. Salivarius*, from fermented fruits and vegetables have a wide antibacterial spectrum (ZDI: 26 - 28 mm), and they prevent food borne bacterial pathogens (Manzoor A. *et. al.* , 2016).

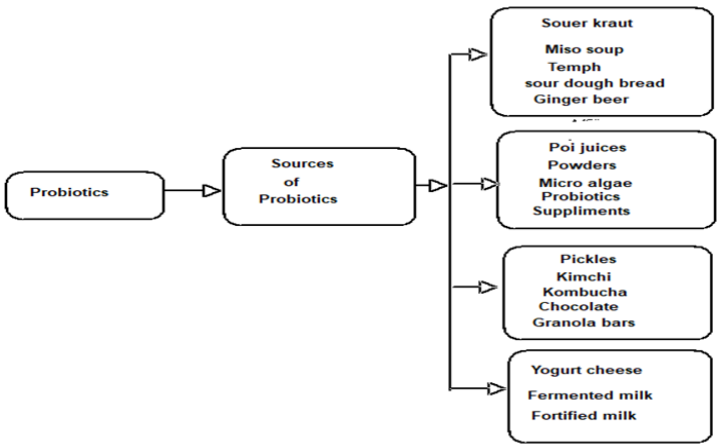

Fig 3 Various sources of Probiotics

5. Recent advancements and utility lactobacillus prebiotics

"Prebiotics are a collection of nutritionally enriched compounds grouped together with the efficiency to enhance and support the growth and sustenance of specific beneficial gut micro flora" (Kelly G. 2008). Presently the idea on complexity and usability of non-digestible compounds has increased widely because of the improvement of various 'omic' tools like proteomics, genomics, metabolomics, transcriptomics etc. (Moreno FJ et. al., 2017). Most of the time consumers use medium level of prebiotics from fruits and vegetables like leeks, Jerusalem artichokes, chicory, onion, garlic, banana, and asparagus, though the prebiotics levels from these food sources totally weak to exhibit any effect on the composition of intestinal micro flora (Manning TS and Gibson GR 2004). Prebiotics are produced by mixing indigestible oligosaccharides, but inulin is produced by a mixture of fructooligo- and polysaccharides. (Gibson RG et. al., 2000; Manning TS and Gibson GR 2004). The present studies focused on other novel lactobacillus prebiotic oligosaccharides by various enzyme-based technologies. Enzymes (bgalactosidase, fructosyltransferase etc.) from different sources like microbes and plants utilized for their synthesis (Trollope KM et. al., 2015). Enzyme engineering activities have been taken to regulate regioselectivity and to improve the yield of reaction which more increase glycodiversification and quality of the products attained (Devlamynck T et. al., 2016). The emergence of genetically engineered microorganisms more resulted in increasing yield of oligosaccharides (20 fucosyllactose) by the process of fermentation for modern industrial production (FDA. 2015).

6. Conclusion

Lactic acid bacteria (LAB) are Gram-positive bacterias and produce lactic acid in the process of fermentation. Lactobacilli are become the cause for rapid pH decrease in the raw material through the production of lactic acid as the main catabolic product. Anti-microbial activity against pathogens, non-virulent, ability to adhere on intestinal tract, acid and bile tolerance and non-hemolytic activities are important characteristics of probiotic lactobacillus. These probiotics lactobacillus also stimulate, regulate and modulate the gastrointestinal hormone release and regulate brain behavior with bidirectional neuronal signaling. Probiotic lactobacillus strains inhibit diarrhea in children, inhibit bacterial vaginal infections, resist infection from Helicobacter pylori, prevent inflammatory diseases, inhibit Bowel syndromes, resist allergy and also develop mucosal immunity. The lactobacillus prebiotics of natural origin were evaluated for their beneficiary role; therefore the different studies focused on other novel lactobacillus prebiotic oligosaccharides by various enzyme-based technologies. Postbiotics eradicate risks that attached with the administration of live probiotic bacteria. Despite of proven uses of probiotics, there are different side effects like translocation to tissues or blood, risk of sepsis in premature infants, hindrance to normal colonization of other microflora and virulence factor in particular strain. Synbiotic product influences the host in enhancing to survive and implanting of live microbial dietary supplements in the GIT by selectively initiating the growth and/or activating the metabolism of a number of health-promoting bacteria. So generally probiotic Lactobacillus strains have many positive functions to their hosts to aquire the good health through immunity development, prevention of pathogens and different therapeutic activities.

Conflict of interest

- The authors declare no conflicts of interest.

7. References

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