

DOI: 10.21767/2394-3718.100043

Lactobacilli as Probiotics and their Isolation from Different Sources

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Received Date: September 07, 2018; Accepted Date: September 25, 2018; Published Date: September 30, 2018

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Citation: Arshad F, Mehmood R, Hussain S, Khan MA, Khan MS (2018) *Lactobacilli* as Probiotics and their Isolation from Different Sources. Br J Res 5 (3): 43.

Abstract

Probiotics play a pivotal role in health maintenance and prevention of many disorders. They are microbial feed supplements that confer the health effect on the host. Probiotics protects the body itself from infection, especially gastrointestinal tract. *Acidophilus* is a probiotic microorganisms that have a beneficial effect on the host. *Lactobacilli acidophilus* are "friendly" bacteria that normally live in our digestive, urinary and genital systems without causing disease. The therapeutic benefits have been investigated in women having vaginal and urinary tract infections. In this review, we studied about previous 15 years articles in which the isolation of *Lactobacilli* bacteria from different sources was mentioned. It has been found that they may be isolated from fruits and vegetables, human stool culture, natural antimicrobial agent, cheese, kefir grains, dairy and non-dairy products, fermented and raw milk, feces of breast fed infants, lactating milk, sheep, buffalo and cow milk, yogurt, beverages, poultry sources, animal rumen contents, pengging duck's caecum, chicken intestine and fecal samples, chicken feed, enzymes, fermented rice, curd, meat and yeast extracts, glucose and sucrose, human gut, human colonial epithelial cells, human and animal vagina and mouth extraction, diapers of human babies, pineapples wastes, industrial sausages, ice-cream, small intestines of piglets, corn slurry, crop and intestinal ducks. Hence the paper reviews the current scenario of isolation of *Lactobacilli* from different sources, their proposed mechanisms and health benefits for human beings along with their future perspectives.

Keywords: *Lactobacilli*; Probiotics; Supplements; Health benefits; Antimicrobial agents

Introduction

L. acidophilus is a probiotics, microorganisms that exert a beneficial effect on the host. Recent studies investigate that some species that produce hydrogen peroxide have been found

in normal vaginal flora. Consequently, the beneficial products have been investigated in women with urinary and vaginal tract infections while its value in treating lower urinary tract infections remains unclear. It has also been used to cure sore mouth caused by *Candida* infections [1].

Lactobacillus is a species of friendly bacteria that live normally in our digestive, urinary, and genital systems without causing disease. It is also found in some fermented foods like yogurt and in dietary supplements [2].

Lactobacilli preserve the natural balance and maintenance of natural stability of micro flora present in the intestines of chickens. They reduce the body and serum fat contents and develop the better poultry performance. They can also be used in the form of supplements as an alternative for antibiotics [3].

Valuable effects deliberated by *Lactobacilli* include the inhibition of pathogenic organisms such as *Salmonella*, *Shigella* and *Helicobacter*. Furthermore, *Lactobacilli* have been associated with various other health benefits e.g., enhanced immune response and lactose intolerance reduction. A beneficial role for *Lactobacilli* has also been obscure in colon cancer [8]

Lactobacilli boost-up the immune system and treat Cancer, Canker sores, Fever blisters, Hives, General digestion problems. Necrotizing enter colitis (NEC) in babies born prematurely. High cholesterol, sensitivity to milk (lactose-intolerance), Common cold, preventing infections in people on ventilators, Lyme disease [4].

Probiotics: Probiotic term derived from Greek word Pro (favor) and bios (life). They can be advantageous for its host by improving the microbial balance in the gut tract [5] and are non-pathogenic bacteria that has a beneficial health effect on adequate quantity consumption in their host [6].

Probiotics are followers of the commensally bacteria present in the gastrointestinal tract of animals and human. A great number of lactic acid bacteria (LAB) were obtained from various naturally fermented foods [9]. Various LAB, particularly strains of

recognized as security (GRAS) microorganisms have been shown to have healthy beneficial functions [7]. Breast milk is the best food for infants not only because it justifies all the required nutrients but also protects the new born against many infectious diseases [10]. Moreover it contains probiotic substances that influences the growth of the beneficial bacteria in the neonatal gut [10,11]. In a general view human breast milk contains

carbohydrate, fat, protein, minerals and microbiologically point of view; it is really an essential factor in the development, initiation and composition of the neonatal gut micro flora (Martin et al.). Daily consumption of 800 ml breast milk, infant ingests approximately 1×10^5 - 1×10^7 commensal bacteria [11-13]. *Lactobacilli* considered most attractive probiotic organisms in human milk [11,14] (Table 1).

Table 1 Definitions of `probiotics.

Sr. No	Published Definitions	References
1	Probiotics are the "live microorganisms that confer a health benefit on the host when available in adequate quantity." The most frequently used as probiotics agents are the lactic acid bacteria i.e., <i>Enterococcus</i> and <i>Ifidobacterium</i> sp. and antibiotic-resistant, nonpathogenic, ascosporic yeasts i.e., <i>Saccharomyces boulardii</i> .	[7,16]
2	Probiotics being a live microbial feed supplement improves host's intestinal microbial balance. Most commonly, <i>acidophilus</i> , <i>L. casei</i> , <i>Bifidobacterium bifidum</i> , <i>B. longum</i> and the east <i>Saccharomyces boulardii</i> have been used as probiotics in humans.	[17,18]

Table no. 1 explained the most proposed definitions of probiotics by different authors as probiotics are living microorganisms that are beneficial for human as well as animal's health that are naturally occurring in the body. Their supplements can also be used as an alternative of antibiotics.

Lactobacilli

Lactobacilli help in maintenance of natural balance of micro flora in the intestines as well as healthy digestive system. The focus on the use of *Lactobacilli* has following reasons: (1) *Lactobacilli* exhibit "competitive exclusion", (2) *Lactobacilli* easily adhere to the epithelial cells of intestine and (3) *Lactobacilli* influence the immune system and also recognize as safe symbionts with the host [3].

The microbial antagonism applied by *Lactobacilli* has promoted their use for protection of the intestinal and vaginal mucosae. The prominence of *lactobacilli* in the human vaginal microbiota was noted as early as 1892, by Doderlein. The pH of

the vagina is 4, which is inhibitory to most microorganisms associated with vaginal pathology these microflora protects vagina from urinogenital infections [15].

Lactobacilli in Different Food Stuffs

To comprehend the emerging needs of supplements, probiotics used in health food industry moreover many investigations are focusing on probiotics potential LAB isolation from different resources of fermented milk, foods, Taiwanese pickled cabbage and feces of breast-fed infants [19-23].

Hoque et al showed that in the food industry, LAB is broadly used as starter cultures and has been quoted to be part of human microbiota. In dairy products such as cheeses, yoghurts and fermented milks and raw milk, *Lactobacilli* are naturally present to generate a health profit for the consumer or can be used as supplements. The isolation of *Lactobacilli* from different sources and their proposed mechanism in our body are shown in the table below (Table 2).

Table 2 Numerous studies have reviewed about the isolation of *Lactobacilli* from different sources and have their various beneficial effects on the body of organisms.

Target source and Media	Properties	References
Apple, Grape and Banana (MRS agar)	<ul style="list-style-type: none"> <i>Lactobacilli</i> is non-pathogenic and safe to use with the status of General Recognize as Safe (GRAS), bile tolerant, acid resistant, and produce antimicrobial substances that are biologically active protein. LAB is used in the formation of food stuffs prepared by lactic fermentation such as fermented vegetables, dairy products, sourdough bread and fermented meat. 	[24]
Stool culture of Human (MRS agar)	<ul style="list-style-type: none"> <i>Lactobacilli</i> due to their beneficial and effective role in the gut ecology; they are gaining more attention in biomedical researches. This organism is endowed with sets of genes essential for survival in GIT gastrointestinal tract, interactions with other organisms in the gut, also with the host epithelial barrier and immune system. <i>L. plantarum</i> found in a variety of ecological environments is a well characterized probiotic species. 	[25]
Local Environment (raw and fermented dairy products, sausages and silage) (MRS and M17 agar)	<ul style="list-style-type: none"> Antimicrobial agents are of enormous value for combating infectious diseases. Have been tried not to use in treating gastrointestinal disease only, but also to use in food industry as natural antimicrobial substances that many have a bacteriostatic or bacteriocidal effect against many food borne pathogens. 	[26]

Iranian Koozeh Traditional Cheese(MRS) broth and (brain heart infusion soft agar (BHI agar))	<ul style="list-style-type: none"> Enhanced immune response, alleviation of symptoms of lactose intolerance, diarrhea treatment, serum cholesterol reduction, vitamin synthesis and anti-carcinogenic and anti-microbial activities. Constitute one of the most developed segments and represent a major branch of the functional foods industry. Cheese is an interesting food-based delivery vehicle of probiotics to the gastro-intestinal tract because of a higher pH, fat content and solid consistency as compared to yoghurt. 	[27]
Kefir Grains	<ul style="list-style-type: none"> Considered a multi-functional starter culture in the food industry since they have been applied in various fermented systems such as bread, cheese and milk with very promising results. Can be successfully used in the treatment of vaginal infections, as they are able to produce a range of anti-microbial compound indicated by many studies. Successfully applied to a specific population suffering from lactose intolerance. 	[28]
Poultry farms (GYP medium contained 1% glucose (w/v), 1% yeast and 1% peptone)	<ul style="list-style-type: none"> Used in food products as probiotic organisms. Production and preservation of a many variety of fermented product. 	[29]
Fermented Milk (Maasai)	<ul style="list-style-type: none"> Having high phenotypic, genomic and metabolic diversity which shows its success in industrial application. 	[30]
Raw milk (MRS medium)	<ul style="list-style-type: none"> Produce various compounds such as bacteriocins which can antagonize the growth of some pathogenic bacteria in foods. LAB has been successfully used in the treatment of acute infantile diarrhea and other diarrheal illnesses. Probiotics enhance good digestion, increase resistance to infection; boosts immune function, inhibit the harmful bacterial growth and favor the intestinal micro flora balance. 	[31]
Dairy and non-dairy products (MRS agar)	<ul style="list-style-type: none"> In the research of strains with probiotic potential, for finding new probiotic strains for functional food products. Produce bile salt hydrolase (BSH) that helps to reduce serum cholesterol and hence BSH activity is also considered as an additional criterion for the selection of probiotics. 	[32]
Non-dairy and non-fermented beverages and foods such as fresh vegetables and fruits, human breast milk and feces of breast-fed infants. (MRS agar)	<ul style="list-style-type: none"> Promote the human and animal health from last 10 years. Probiotics offer an alternative to various antibiotics. 	[33]
Mammary areola, milk, and breast skin of 8 healthy mothers, oral swabs and feces of their respective breast-fed infants (MRS agar)	<ul style="list-style-type: none"> Can be one of the most effective therapies for the prevention of several disorders in the newly born infants. Play a beneficial role in the ecosystem of the human gastrointestinal (GI) tract. Protects the newborn against infectious diseases. 	[34]
Poultry sources (agar and broth MRS)	<ul style="list-style-type: none"> Bacterial species able to produce lactic acid as a main end-product of the of carbohydrate fermentation. Widely used as probiotics in efforts to reduce the pathogen colony in the intestinal tract and to maintain a balanced microbiota. 	[35]
Milk products (MRS, M17 agar)	<ul style="list-style-type: none"> Improving the nutritional food value, improving digestion of lactose, controlling serum cholesterol levels, controlling gastrointestinal infections and controlling some types of cancer. Used in different medical and health-related areas including the treating infections during pregnancy; control of antibiotic related diarrhea control of intestinal inflammation; management of allergic diseases; and prevention of urinary tract infections. Reduce cholesterol level, stimulate the immune system and also able to stabilize the microflora of the gut. 	[36]
Plants and vegetable matrices (MRS agar and Kanamycin AesculinAzide agar)	<ul style="list-style-type: none"> Include the most important groups of microorganisms usually used in food fermentations. Inhibit the food Spoilage and contribute to the texture and taste of fermented products. Control of cholesterol level, prevention of anti-carcinogenic activity intestinal infections. 	[37]
Dairy Food Products and Animal Rumen Contents (MRS broth)	<ul style="list-style-type: none"> Incorporated into foods for use as probiotics or functional foods. Commercially available in the form of powder, liquid, gel, paste, granules or even as capsules, sachets, etc. Dairy isolates are capable of growing in the food processing conditions whereas rumen isolates are well adapted to grow in the gastro-intestinal tract (GIT) environment. 	[38]
Tvorog curd cheese (MRS broth)	<ul style="list-style-type: none"> Microorganisms with beneficial effects for human health. Many researchers have been conducted on the isolation and evaluation of probiotic potential bacteria and in turn establishment of a biobank to save them from destruction, for future applications in medicine and food industry. 	[39]
Yogurt (MRS agar)	<ul style="list-style-type: none"> Confer a health benefit for the host. Boosting immune system, decreasing GIT infections, decreasing cholesterol level, cancer and diarrhea. May additionally provide nutrients e.g., calcium and protein. 	[40]

Dairy products (MRS agar and broth)	<ul style="list-style-type: none"> • Help in activation of the immune system, prevention of carcinoma cell growth, maintenance of mucosal integrity. • Presentation of an antagonistic environment for pathogens. • An increase of interest about the commercial utilization of strains isolated from traditional and naturally fermented dairy products, which possess health-promoting effects. 	[41]
Duck's caecum (MRS media)	<ul style="list-style-type: none"> • Low pH and high concentration of bile salt is used in vitro to evaluate their potential as probiotic agent. • Promotes the colonic environment by decreasing carcinogenic material, pathogenic bacteria, and improving immunity. • Act as restrainer of the damage. 	[5]
Ileum and caeca of healthy 6 and 11 years chicken (MRS agar)	<ul style="list-style-type: none"> • Health of host animals by improving their intestinal balance and preventing ingested pathogens. • Important sources of animal protein for humans and an important economic activity in many countries. 	[42]
Healthy 6 and 11 years old chicken's Fecal sample (MRS agar)	<ul style="list-style-type: none"> • These microorganisms with a competitive advantage over the other species as an excellent probiotics. • Help to maintain the chicken products and prevent economic losses. • Important and major normal microbial population in chicken. 	[42]
Chicken feed from 2 broiler chicken (MRS agar)	<ul style="list-style-type: none"> • Chicken's body weight, feed conversion ratio and egg weight in poultry improvement. • Beneficial health of host animals and source of animal protein for humans. • Ability to tolerate acid, bile and also adhere to the intestinal epithelium of the hosts. 	[42]
Traditional dairy product "katak" (Potato Dextr-ose Agar (PDA))	<ul style="list-style-type: none"> • Filamentous moulds and yeasts are the main spoilage organisms of various products such as stored crops fermented dairy foods, bread, silage and feed hay. • Possesses a strain-specific spectrum and mechanism of inhibitory activity against the different mould and yeasts. 	[43]
Hydrolase (enzyme)Bile salts	<ul style="list-style-type: none"> • Widely detected in several bacterial genera in the gastrointestinal microbiota of animals. • Isolated from the intestines or feces from mammals, which are a natural environment rich in conjugated and unconjugated bile acids. • Isolated from human and animal sources to maximize the likelihood of compatibility and to ensure their survival in the GIT. 	[44]
MRS agar, M17 (Difco) agar (sheep milk)	<ul style="list-style-type: none"> • Represented by dairy products e.g., yogurts and fermented milks. • Sheep milk represents only 1.3% of total global milk production, but is mostly used for cheese production. 	[45]
MRS broth (fermented rice)	<ul style="list-style-type: none"> • Traditional fermented food products e.g., fermented rice are known to possess probiotic potential. • Provide a myriad of health benefits. • Parameters tested in the assessment of potentially probiotic microbes. 	[46]
Fermented Milks and Yogurts (human GIT)	<ul style="list-style-type: none"> • Increased interest in the role of probiotic bacteria in human health from the last 2 decades. • Improve the intestinal microbial balance. • Reduce or eliminate ailments i.e., colon irritation, constipation and diarrhea. 	[47]
MRS medium (mother's milk)	<ul style="list-style-type: none"> • Exert various health welfares beyond the inherent basic nutrition. • Probiotics products contain at least 10^7 living microbes per g. • Reduce or eliminate ailments such as colon irritation, constipation and probiotic diarrhea. • Safe use in the dairy industry, beneficial effects by balancing the intestinal flora and ultimately competing with pathogens for gut colonization. 	[48]
MRS medium (curd)	<ul style="list-style-type: none"> • Very good source for species. • Potentially beneficial to the macrobiotic ecosystem of humans and other animals. 	[49]
Yogurt	<ul style="list-style-type: none"> • Confer a health benefit on the host. • Lactic acid and short-chain fatty acids contribute to several positive effects on the host. • Decreased lactose intolerance, increased resistance to intestinal pathogenic bacterial species, enhanced immune system, increased bioavailability of minerals, positive action on lipid metabolism, and decreased risk of cardiovascular diseases intestinal infectious diseases, obesity, osteoporosis, some cancers and non-insulin-dependent diabetes. 	[50]
(Dairy products) Yeast Azide Aesculin Agar(YAE), Kanamycin Aesculin Azide Agar (KAA) medium	<ul style="list-style-type: none"> • Use as a culture. • May play an important role in determining cheese ripening and flavor development. • Produce bacteriocins against pathogens or food spoilage bacteria. 	[51]
Columbia blood agar plates, Yeast-cysteine blood agar plates, MRS agar plates.(vaginal and oral)	<ul style="list-style-type: none"> • Protect the habitat from unwanted invaders. • Balance microbial flora. • The human body hosts various species in different anatomic regions having different interactions with the host: e.g. the oral cavity, the female genital tract and the intestines. 	[52]

MRS broth (pineapple waste)	<ul style="list-style-type: none"> Second most consumed and created fruit after bananas, contributing to more than 20% of the world production of tropical fruits. The economical production of nutrient rich culture medium could be achieved by using locally available agro wastes that are abundant in nutrients that meet the microbial requirement. 	[53]
Tibetan Kefir Grains (MRS and difco agar)	<ul style="list-style-type: none"> Natural starter for fermented milk in Tibet, China. A variety of health claims in addition to its nutritional value. 	[54]
MRS broth (cocoa fermentation, fermented food caum and industrial sausage.)	<ul style="list-style-type: none"> Have been used as food supplements and are highly worthier for their probiotic properties. Numerous naturally fermented products from Brazil harbor lactic acid bacteria. 	[55]
2-months of lactating mother (MRS agar)	<ul style="list-style-type: none"> Best feed for infants having all the nutritional requirement. Protects the newly born infant against infectious diseases. Stimulate the growth of the beneficial bacteria in neonatal gut. 	[14]
Paocai (MRS media)	<ul style="list-style-type: none"> The indigenous beneficial bacteria perform a fermentation process in which vegetables develop a pleasantly sour taste and remain rich in vitamins. Restrain gut flora, reduce gastrointestinal syndrome, diminish diarrhea disease, soften an irritable bowel, and enhances the immune system, anti-food allergy, immunomodulatory activity, anti-mutagenic / anti-carcinogenic activity and cholesterol lowering effect. 	[23]
Curd (MRS media)	<ul style="list-style-type: none"> Fermented foods with specially added active live cultures; such as in soy yogurt, or as dietary supplements. 	[56]
Sweet potato (Sweet potato medium (SPM))	<ul style="list-style-type: none"> Commonly found in a diversity of ecosystems including human, animal, plants and soil. Help in the digestibility of complex carbohydrates such as indigestible fibers and benefit the human health. Plays a major role in the food industry and human nutrition. 	[57]
Healthy women	<ul style="list-style-type: none"> Unsterile and can be contaminated with saprophytic and pathogenic microorganisms. High antimicrobial activity against pathogenic (causing food toxics infections and toxemia) and saprophytic microorganisms. Ability to increase the natural defenses of the host against enter pathogens by the production of antimicrobial substances. 	[58]
Buffalo milk and cheese human gut, (MRS broth)	<ul style="list-style-type: none"> Inhabits the oral cavity, gastrointestinal tract (GIT), skin, upper respiratory tract, vagina and the major part of this micro flora resides in human gut. 	[59]
Fermented food (MRS broth)	<ul style="list-style-type: none"> Sources for production of several extracellular enzymes for industrial applications. Widely used as starter cultures in several fermentation processes that been increasing globally. Advantageous as these organisms are generally regarded as safe (GRAS) by the WHO. 	[60]
Fermented milks (MRS media and broth)	<ul style="list-style-type: none"> Exert health benefits to the consumer, other than those related to nutritional effects. The useful effect of probiotic bacteria to the host is related to its concentration in the lumen of the intestine. Grants a claim for health promotion. 	[61]
Yoghurt (Man Rogosa and sharp media (MRS) broth)	<ul style="list-style-type: none"> Have been used in processing the fermented food for centuries. Fermented milk products i.e., yoghurt. Have an inhibitory activity against common human pathogens. 	[62]
Human feces, Ewe, cow milk, cheese. (MRS)	<ul style="list-style-type: none"> Increasing interest in "health" foods in recent years has stimulated innovation and new product development in the food industry worldwide. Confer a health benefit in the host. May harbor resistance genes which may be transferred to pathogenic bacteria. 	[63]
Breast milk (MRS agar)	<ul style="list-style-type: none"> Large variety of fields relevant for human and animal health. Consists of different capsules, vitamins, enzymes, tablets or some fermented foods containing microorganisms which have beneficial effect on the health of host. Confer a health benefit on the host is accepted by FAO/WHO. 	[64]
Traditional White Cheese (MRS media broth)	<ul style="list-style-type: none"> Have been associated with various health benefits such as the reduction of lactose intolerance and increased immune response. 	[8]
Cheese and ice-cream (Rogosa agar and MRS agar , broth)	<ul style="list-style-type: none"> Quantities confer a health benefit on the host. Resists the rigors of the human GIT and helps to improve the gut flora balance. Persist in the GIT influencing metabolic activities like cholesterol accumulation, lactose activity and vitamin production. 	[65]
Fermented vegetables (brain heart infusion (BHI) agar medium, De Man Rogosa Sharpe (MRS) media and potato extrose agar (PDA) media and nutrient agar.)	<ul style="list-style-type: none"> Increase advantageous bacteria called "probiotics" in the intestinal tract. Ability to provide specific health benefits beyond their basic nutritional value. Currently, the largest segment of the functional food market is conquered by healthy food. 	[66]

GI tract (agar dilution and broth microdilution, commercial methods, Etest, Minimal Inhibitory Concentration (MIC test,))	<ul style="list-style-type: none"> Used as starter cultures in industrial food production, as well as in the production of probiotic products due to their potential health benefits to consumer. 	[67]
GIT of broiler chicken (MRS media)	<ul style="list-style-type: none"> Potential of preventing the growth of intestinal pathogen bacteria e.g., salmonella. Preserve and maintain the balance and natural stability of micro flora in the intestine of chickens. Reduce the number of Salmonella enteritidis and Clostridium perfringens in the treated chickens. 	[3]
Human colonic epithelial cells (MRS broth)	<ul style="list-style-type: none"> Inhabits the oral cavity, skin gastrointestinal tract (GIT), upper respiratory tract, vagina and the major part of this microflora resides in human gut. Conferring numerous health benefits. Ability to adhere the epithelial cells and mucosal surfaces. 	[59]
human milk (agar, TPY Trypticase Phytone Yeast agar and MRS-cysteine agar Man, Rogosa and Sharp MRS)	<ul style="list-style-type: none"> Maintain the intestinal microbial balance. Recommended as food to provide for the balance of intestinal flora. Used for long time in food ingredients for human and also to feed animals without any side effects. 	[68]
Yoghurt (MRS broth MRS media)	<ul style="list-style-type: none"> Decreasing GIT infections, decreasing cholesterol level. Fermented food production quality. Naturally present or added intentionally, for technological reasons or to generate a health benefit for the consumer and yogurt is one of the best-known foods that contain probiotics. 	[69]
Mammalian digestive tract	<ul style="list-style-type: none"> Exert health benefits (on their host) beyond inherent nutrition. 	[70]
GI tract (MRS broth and the culture)	<ul style="list-style-type: none"> Ferment a variety of nutrients primarily into lactic acid products constitutes a major functionally related group of enteric organisms. Implicated in a number of health promoting functions that affect general health and well-being of the host. Confer a health benefit on the host. 	[71]
Vagina (Chocolate agar MRS media MRS broth)	<ul style="list-style-type: none"> At least 70% of the total bacteria are responsible for vaginal protection. Promoted their use for protection of the intestinal and vaginal mucosae. 	[15]
Human stomach (man-ragosa sharp MRS agar)	<ul style="list-style-type: none"> The human stomach was considered to be microbiologically sterile because of factors including low pH and digestive enzymes. 	[72]
Small intestines of piglets (media MRS broth)	<ul style="list-style-type: none"> Strengthen the barrier function of the gut microflora and for a non-specific enhancement of the immune system. Maintain microbiota balance, preventing or remedying the appearance of gastrointestinal infections. 	[73]
Vagina of healthy women (lactic agar and MRS broth)	<ul style="list-style-type: none"> Used in the fermentation of food industry. Absence of these bacteria is related to the increase in the recurrent of urinary tract infections. Have protective effect against vaginal pathogenic species. 	[74]
Vagina of healthy animals, intestines of just slaughtered animals and the diapers of human babies (MRS broth)	<ul style="list-style-type: none"> A wide range of products for human and animal nutrition have been produced over the past decades. Avoid misleading and health risks. 	[75]
Parmigiano Reggiano cheese (MRS agar)	<ul style="list-style-type: none"> Have been utilized in dairy products such as milk or yoghurt. Milk enhances its efficacy by providing lactose as a substrate. 	[76]
Maasai Yogurt (MRS media)	<ul style="list-style-type: none"> Contains some factor which influences cholesteremia in man. A very large daily intake of fermented cow's milk lowers the level of serum cholesterol in men. 	[77]
Corn slurry (MRS agar)	<ul style="list-style-type: none"> Beneficial for growth promotion of farm animal, alleviation of lactose intolerance, protection from pathogens, relief of constipation, anti-cholesterolaemic effect and immune stimulation. Restore a healthy gut flora. Intestinal microbial ecosystem maintenance. 	[78]
Intestinal ducks and Crops (MRS broth)	<ul style="list-style-type: none"> Antimicrobial substances such as lactic acid and bacteriocins production. Oral dosing of poultry with native gut micro-organisms prevents infections. Adherence to the mucosa and co-aggregation to form a barrier for preventing colonization by pathogens. 	[79]

Lactobacilli as Probiotics for the Cure of Disorders

Bio-therapeutic agents

Lactobacilli work as a biotherapeutic agents in humans such as: treatment of vaginitis, diarrhea, and prevention of antibiotic-

associated diarrhea, urinary tract infections (UTIs), lactosemal absorption, immune system stimulation, cholesterol reduction, and anti-mutagenic effects. As Cheplin HA et al, Alm L, et al and Graf W, [80-82] have favorably encouraged the use of acidophilus milk for constipation treatment whereas Bogdonovi G, et al., Reddy GV, Goldin BRaGL, Rowland IRG [83-86] found

that *L. Bulgaricus* produced anti-carcinogenic substances. The anti-carcinogenic features of *Lactobacilli* have three categories:

- Tumor cells inhibition
- The suppression of bacteria which are responsible for the release of carcinogens
- The carcinogen destruction

Skimmed and fermented milk, feeding yogurt to humans produced lower blood cholesterol concentrations illustrated by Mann GV, Nair CRaMGV, Grunewald K, [77,87,88] whereas Vaginal *Lactobacilli*, or bifidobacteria protect the female urogenital tract from pathogen, thus playing a role in the maintenance of a healthy state, proposed by McCarthy DM, et al, Morishita T, et al, [89,90]. The figure summarizes the bio-therapeutic agents of *Lactobacilli* given (Figure 1).

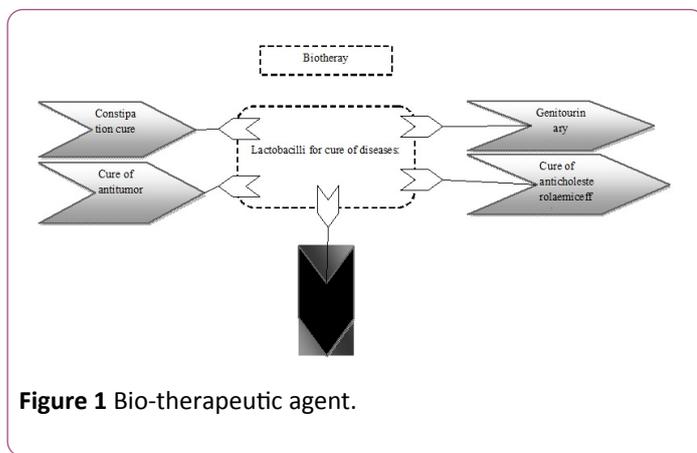


Figure 1 Bio-therapeutic agent.

Lactobacilli strains and products

Some of the *Lactobacilli* species in the industries are used in the manufacturing of beer, cocoa, kefir, sauerkraut, cheese, cider, kimchi, pickles, yogurt and other fermented food as well as animal feeds. The antifungal and antibacterial activity of species rely on bacteriocin production and low molecular weight compounds that inhibits these microorganisms activity moreover these bacteria metabolize sugars into lactic acid that lowers the pH of their environment [91].

The genus contains over 180 species and some important strains are *L. acetotlerans*, *L. acidifarinae*, *L. acidipiscis*, *L. acidophilus*, *L. agilis*, *L. algidus*, *L. alimentarius*, *L. amyolyticus*, *L. amyophilus*, *L. amylophilus*, *L. amylophilus*, *L. amylophilus*, etc. [91] (Figure 2).

Safety for human beings

Lactobacilli are generally used in probiotic production. *Lactobacilli* increases soon after the birth when gut flora has developed, as the other components of the flora decrease [92] similar in the case of pigs when *Lactobacilli* was supplemented in their food consequently *E. coli* got reduced in the stomach [93]. Experiments with chicks have proved the effect of *Lactobacilli* on *E. coli* colonization [17].

Probiotic *Lactobacilli* are appropriate for infants and children because several investigations have illustrated those products containing *Lactobacilli* and *Bifidobacteria* spp. are well tolerated

in this age profile [94-96]. Food products containing such strains for infants generally are restricted to l-lactic acid producers [97]. There are also specific compositional legal requirements e.g., electrolyte loading and nutrient contents for food products [98,99]. Recently, there have been several documented case reports of fungemia that are associated with a *Saccharomyces cerevisiae* (yeast) probiotic due to indwelling catheters contamination [100]. Dietary carbohydrates and antibiotic therapy appear to be the most essential predisposing factors [101] (Figure 3).

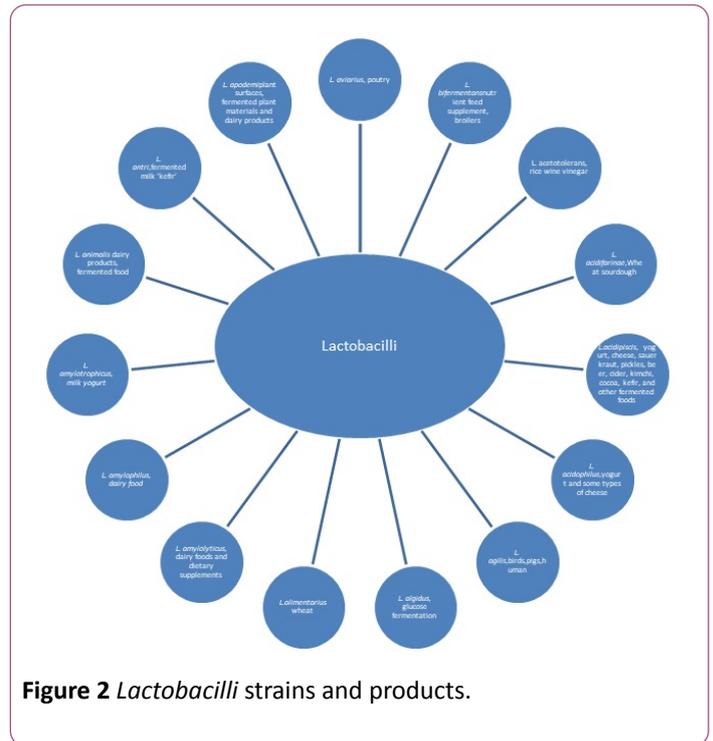


Figure 2 Lactobacilli strains and products.

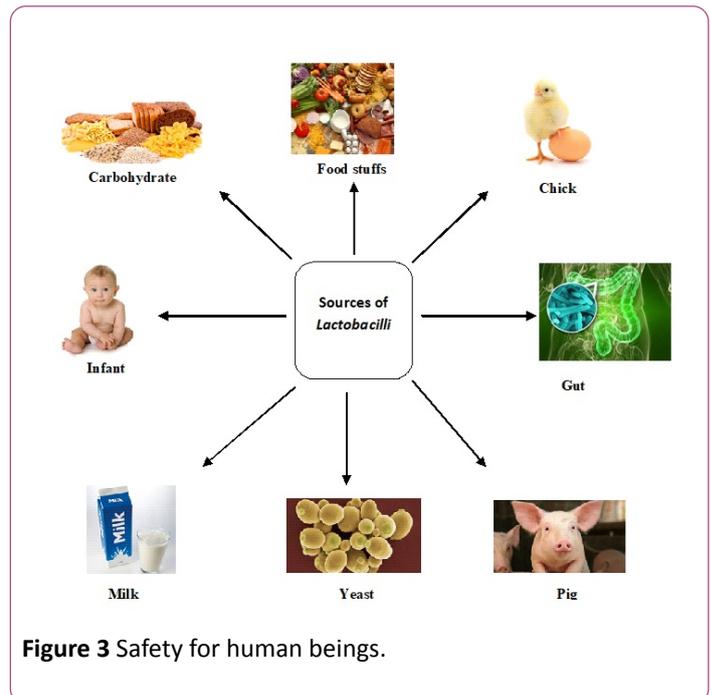


Figure 3 Safety for human beings.

Future perspectives

Probiotic are recently recommended for dietary supplements. Future developments will discover more effective strains to bring together the ability to survive in the gut and to develop the metabolites, responsible for the probiotic effect. Recent work by McCarthy DM [89] suggests that these techniques are available. They showed that *L. acidophilus* isolated from pigs could be genetically transformed to colonize the mouse gastric epithelium. Although the technology is equipped but we still need to know more about the probiotic efficiencies. The current potential of this approach has been reviewed by Tannock GW [102-106].

Conclusion

Probiotics as biotherapeutic agent have already been started and in the coming future it is conceivable that they will become more effective tools in the treatment of different disorders like immune system stimulation, anti-mutagenic effects, cholesterol level fluctuations, diarrhea, oral and urinary tract infections (UTIs), vaginitis, lactosemal absorption etc. as an alternative or complement to other usual treatments. It is the natural treatment for rearing young animals and human babies as well as in nourishment and cure of disease therapy. Probiotic restore the natural balance of the animal growth, gut flora, health and nutrition status. Besides treatment, there usage in infant diet and milk is in now daily practice. At my suggestion, isolation of *Lactobacilli* from fermented sugar cane can be beneficial for regulating the liver enzymes. They can also be helpful in lowering the bilirubin level in dehydrated patients.

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