

## Lactic Acid's Role in maintaining the Vaginal Health

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### Abstract:

*The vagina of human is preserved by different microbes of 50 species. In women health, the most effective, widespread, and frequently dominant micro-organism is Lactobacilli which protect the vagina from the infection. The diversity of anaerobic and aerobic micro-organism contains healthy women's vaginal microbiota and due to this microbiota, the composition is changed rapidly which are not completely vibrant. This microbiota cause the infection at the level in which organisms have pathogenic prospective with other mutual bacteria. In vaginal epithelium, the capability of lactobacilli to stick and participate for bond sites and produce the antimicrobial composites like hydrogen peroxide, bacteriocin, and lactic acid like components which are very important. In some condition, probiotics are used to inhabit the vagina and also treat the infection, it has the efficiency as antimicrobial treatment's supplementation for improving the cure rates and prevent reappearances. In this paper, discuss lactic acid role for marinating the vaginal health and use of probiotics.*

**Keywords:** Lactobacilli, Probiotics, Antimicrobial, Microbiota

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## Introduction

Vagina is an important organ of woman as it give pleasure as well as the source of pain. The vagina is open at outside and placed near the anus. At this place, the pathogenic bacteria growth is large. It is necessary for the protection system of vagina for the prevention of creation of pathogen in the body. In some cases, when vagina is present in discomfort zone because of frequent causes before visiting gynecologists. This protection system work on the upkeep of acidic pH 3.5- 4.5 where they do not have the satisfactory environments to proliferate by common and potentially pathogenic saprophytes while in an ideal environment, acidophilus bacilli are found. The large amount of lactic acid is produced by the metabolization of acidophilus bacilli through the anaerobic fermentation of glucose. Preventing the abandoned growing of bacteria that are existing in the vagina by using the acidic pH of lactic acid that's creating a virtuous circle.

Lactobacillus species is a variety that is dominated the healthy human vagina which plays a vital role in caring the females from genital contamination. In the shortage of lactobacilli, the microbial balance is disturbed in the vagina which show the disorder of bacterial vaginosis (BV) that is connected to the measureable as well as qualitative move from usually happening lactobacilli to an assorted microflora controlled by anaerobic bacteria. It is seem as a natural portion of vaginal region and helpful to maintain its healthy status. The vagina is protected contrary to pathogens by generating antimicrobials like bacteriocins, hydrogen peroxide, acetic acid and lactic acid (weak organic acid).

Microbial population is described by the idea of "normal microbiota" as a fixed that is in the requirement of review, mainly as better evidence (containing the established molecular procedures that are not reliant on cultural) which changes the existing model. With the capability to uphold the health of vagina, it is documented that a band of bacterial outlines can develop a steady vaginal ecology deprived illness. These microbial species inhibit the vaginal region that have a vital role in maintaining the health and in the prevention from infection. In the vagina, the existence of great figures of lactic acid bacteria (LAB) shows the healthy vagina and low number or absence of LAB is considered as abnormal.

By the addition of antibiotics, urogenital infections can be treated with the unwanted effects that

decrease the number of lactobacilli due to which it cannot repair the urinary tract normal obstacle to contaminations and increase drug resistance. Around 1940, the antibiotics were introduced which have many pathogens and settled antimicrobial drug resistance mechanisms. In clinical isolates, there are various mechanisms of resistance for example modification of drugs, alteration of drug and compact administration of drug to the intracellular target. Through the result of active drug efflux systems, many micro-organism produce condensed access form of drugs. These systems are called multi-drug resistance systems (MDRs) that are mainly accountable for inherent or developed resistance of micro-organisms to anti-microbial drugs. The drug can show the side effects like distraction of the defensive vaginal microbiota that generates the high threat of urinary tract infections (UTI) and yeast vaginitis.

Antibiotic therapy could have a good alternative source that is vaginal probiotics because of their feature to stick to uroepithelial cells and develop inhibitors of pathogenic progress and bio surfactant excretion.

## Vaginal Microbiota

In the human body, species lodge sites that can alter grounded on intrinsic host features like phase of life cycle, response of immune system, levels of hormone, nourishing position and illness conditions. The peripheral features can also change the the vaginal microbiota like commensalism and microbial interspecies completion, environmental exposures, and sanitation actions. In 1892, Doderlein published about the primary widespread study of human vaginal microbiota. This scientist stated that the vaginal microbiota consists only gram positive bacilli and homogenous in nature. And this bacilli was connected as the member of genus lactobacillus species. Only single species that is vaginal Lactobacillus acidophilus was described by him. This species belonged to the heterogeneous group of diverse microbial species. Till now there are more than 20 vaginal Lactobacillus present in which 6 actually important for the vaginal ecosystem that is *L. buchneri*, *L. iners*, *L. jensenii*, *L. gasseri*, *L. vaginalis*, *L. crispatus*,. In vaginal microbiota, *Peptostreptococcus*, *Staphylococcus epidermidis*, *Bacteroides*, *Corynebacterium*, *Eubacterium*, *Atopobium vaginae*, *Mycoplasma* and *Leptotrichia* *Megasphaera* can be established.

Lactobacilli bacteria produce lactic acid that may be more ample in healthy females and specifically in dyed and Hispanic females. The lactic acid and acidic pH are used to maintain the vaginal health. This type of microorganisms was seen in the vagina that has shown their capability to hinder the in vitro progress of several pathogenic microorganisms.

Within 24h, vaginal vault is colonized by the birth of female child and occupied until death. At the time of puberty, lactobacilli become predominant inhabitants of the vagina, apparently because of the impact of estrogens on the content of glycogen present in the vaginal epithelial cells. Estrogen production level was reduced that is marked by menopause and give the result in aeration and decay of the vaginal epithelium. In case of decreasing the levels of estrogen, the content of glycogen was also decrease in vaginal epithelium as well that leads in the decrement in the lactobacilli. When decreasing the quantities of lactobacilli, resulting in a successive increase in vaginal pH, but glucose is not changed to lactic acid. Increasing the values of pH promote the evolution of pathogenic bacteria, mainly immigration by entire bacteria.

**Defense Mechanisms of Vagina**

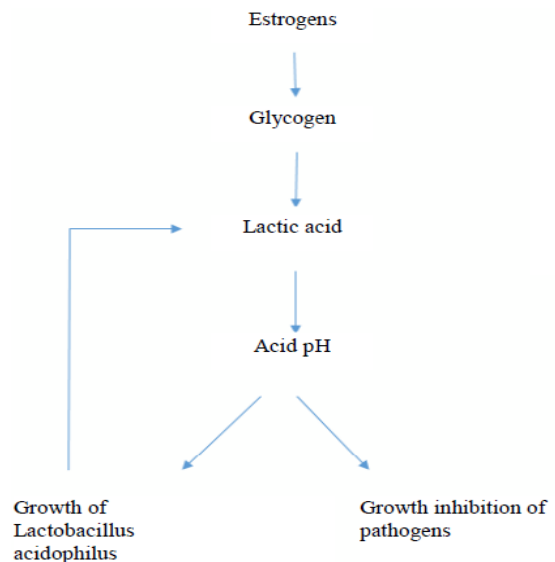
**Vaginal Acid pH**

In the vagina, coexisting the earlier division attempted the large quantity and variety of microorganisms. In this content, explain the key for upkeep of vaginal health in existence of lactic acid that produces Lactobacillus acidophilus as well as an acidic pH. Through a mechanism, vagina hinders the development of pathogens that a arresting because of its easiness and efficiency.

The pH is maintained by the Lactic acid that is around 3.5-4.5 but it is not responsible for the growth of protozoa, fungi, Haemophilus and other undesirable bacteria, which normally require a pH larger than 6.0. Lactobacilli sense relaxed in an acidic situation because it is acidophilic, which permits their maximal explosion. Lactic acid is formed and physical state of acidity has following landmarks:

- Estradiol is produced by ovaries.
- The multidimensional epithelium of vaginal mucosa flourishes recognitions to estradiol which also encourages the glycogen filling of these cells.

- In the vaginal lumen, vaginal epithelial cells slowly fragmented out.
- Desquamated cells release of glycogen that are allowed by a lytic process which is contained in them.
- The glycogen is metabolized by the Acidophilus bacilli in anaerobic condition (without oxygen). Glucose anaerobic fermentation produces the waste product that is lactic acid, is the keystone for the acidification of vaginal environment.



**Figure: Production of Virtuous circle in Vagina in the Physiological Condition**

**Antimicrobial activity**

In a functional equilibrium, the vaginal ecosystem play a role to maintain the vaginal health which is an important factor. Through the overproduction of pathogenic organism, the vaginal tract works as a barrier to new colonization that is else commensal. The procedure through which lactobacilli steady the vaginal microbiota which are the invention of antimicrobial composites (lactic acid, hydrogen peroxide, bacteriocin-like substances) and the ability to participate and stick at adhesion sites in the vagina.

**Hydrogen Peroxide (H<sub>2</sub>O<sub>2</sub>)**

It is an oxidizing agent that is toxic in nature and catalase negative bacteria especially most anaerobic micro-organisms. H<sub>2</sub>O<sub>2</sub> may also aid to avoid the attacks in the vagina. This hydrogen peroxide is

produced by species of *Lactobacillus*. By doing some research, propose that the women that have lactobacilli and produce  $H_2O_2$  have less chances to be affected by the HIV-1, pathogens and herpes simplex virus type 2. By  $H_2O_2$ , producing some stresses that are critical for vaginal protection and stimulate HIV-1 and increase invention of complete virions.

In vagina of healthy women,  $H_2O_2$  producing microorganisms that have been recommended as the bacterial cluster which is accountable for maintaining the ecologic balance, generally in prenatal women. In some studies, shown is not in case of vivo, the dissolved oxygen in the vagina are low and inhibit the generation of hydrogen peroxide in the vagina produced by lactobacilli to sub-inhibitory stages. This product is used most widely in medicinal field as an active sterilizer and give the negative effect on the species of microbial without any catalase enzyme that destroy this molecule. The building of germs is extremely damaged and they disappeared without this enzyme.

#### Bacteriocins

All genera of Lactic Acid Bacteria (LAB) are produced by the bacteriocins that can be categorized into diverse classes on the basis of their biochemical properties. This type of bacteria has a range of killing procedures in which interfering in the reactions of cellular enzymatic (cell wall synthesis), formation of cytoplasmic membrane pore, and nuclease activity. World health organization (WHO) approved only one bacteriocin that is Nisin; a lantibiotic formed by particular strains of *Lactococcus lactis*. It is used as a food preservative. Nisin is not appropriate for the vaginal use as it is powerfully bactericidal for fit vaginal *Lactobacillus* classes. For bacteriocins production, LAB strains was selected to grow the vaginal probiotics. It is still used today.

**Adherence:** In the vaginal epithelium, the capability of lactobacilli to stick and participate at adhesion sites which can contribute in the inhibition of immigration by a pathogen. Equilibrium of vaginal microbiota can be affected by regeneration of superficial epithelium of vagina. The ability of lactobacilli is affected by the features like vaginal pH, change in hormones changes (especially estrogen), and content of glycogen stick to epithelial cells and inhabit the vagina. In vaginal microbiota, the changes are also occur due to menstrual cycle with high amounts of estrogen growing devotion of lactobacilli to epithelial cells of vagina.

#### Capability of LAB as Vaginal Probiotics

The word probiotic is derived by the Greek/Latin word “pro” and the Greek word “bios” that has the sense for life. The probiotic idea was first presented by Elie Metchnikoff, Russian Nobel in 1907, where he stated that the ingestion of microbes by human being could have the beneficial effects for treating digestive diseases. The probiotics were used by Lilly and Stillwell in 1965 for the first time which defines materials secreted by one organism that inspires the development of another. According to Food and Agriculture Organization of United Nations and World Health Organization probiotics refers as “live microbes, which is taken in sufficient amounts, advise a fitness assistance on the host”. The probiotic may perform incidentally over treating and avoiding recurring bacterial viruses or directly by secreting materials such as lactic acid, hydrogen peroxide, bacteriocins which inhibit the sexually transmitted infection.

Urogenital infections contain antimicrobial treatment that is not effective at all the time in which issues persist because of the yeast and bacterial resistance, repeated infections and side effects, substitute drugs are used for patients and also their guardians. It is expected that repetitions are because of the failing of antimicrobials in the elimination of pathogens or may be due to biofilm opposition, or the infectious organisms again come from their origin (gut of person or a sex partner) and outbreak a host whose defenses are suboptimal.

Numerous medical judgements have to be achieved to inspect the particular strains of lactobacilli, taken either verbally or intra-vaginally that make it capable to inhabit the women’s vaginas with asymptomatic or suggestive BV, to decrease the immigration of pathogens and to recover sign and symptoms of BV when they are in existent. Probiotics can be entered vaginally or orally because lactobacilli can increase inertly from the path between rectum and vagina, which can be an important improvement that make able to supply probiotics in dietary supplements and foods.

#### Negative effects of the Probiotic use

Around the world, approximately one billion dosages of probiotics are managed and those managed have been bearing for urogenital. *Lactobacillus* inhibits the entrance, GI tract and also the female genitourinary tract. *Lactobacilli* caused

the endocarditis and bacteremia that are very rare. In most of the cases, shown with the long-lasting diseases or incapacitating circumstances that offer with uninterrupted access to the blood circulation from a leaking gut. According to Cribby, 1.7% out of 241 cases regarding bacteremia, localized infection and endocarditis are connected with lactobacillus in which it is considered of having a possible connection with heavy ingesting of dairy products.

### Review of Literature

**Dover et.al 2008**, stated that against the bacterial vaginal infection, best handling and prophylaxis should rather be acceptable, biodegradable, non-toxic for human or healthy vaginal microflora, and cost-effective. From antimicrobials, preparation is that which is produced by Lactobacillus species in mishmash with other safe and operative materials.

**Gill et.al 2009**, dictated that every year worldwide, millions people are affected by urogenital infections. By using the antimicrobial agents, the diseases are treated and through the usage of cultures of probiotic lactic acid bacteria (LAB), the vaginal infections is managed. According to this paper, 11 vaginal lactobacilli separates that are acquired from healthy patients previously and he also studied about to monitor the micro-organisms with probiotic characteristics in contradiction of Candida species. For their capability of co-aggregation and auto-aggregation, they tested the LAB with *C. krusei*, *C. albicans*, *C. glabrata*, and *C. tropicalis*, construction of lactic acid and hydrogen peroxide and adhesion to coca-2 epithelial cells. All lactobacilli segregate verified were capable to auto-aggregate and co-aggregate with 4 candida species into diverse grades.

**O'Hanlon, Moench and Cone 2013**, dictated that lactic acid is a potent microbicide at sufficiently acidic pH and it is formed by vaginal lactobacilli that may help guard in contradiction of reproductive tract infections. In this paper, 56 females with low Nugent marks were showed (representing a Lactobacillus-dominated vaginal microbiota) and showed no generative disease or contamination which delivered 64 cervicovaginal fluid tasters using a gathering technique that evaded to need the taster watering and thoroughly reduced aerobic exposure.

**Petricevic et.al 2014**, in early pregnancy, the existence of an irregular vaginal microflora is a threat feature for preterm distribution. By lactic acid bacteria, there is no examination on vaginal flora and

possible connotation with preterm distribution. In healthy pregnant women, vaginal Lactobacillus species in early gestation in relation to gestation result. According to this paper, detected 111 low-risk prenatal women with ordinary vaginal microflora 11+0 and 14+0 weeks of gestation without personal protests. By using denaturing gradient gel electrophoresis (DGGE), vaginal smears were booked for documentation of lactobacilli.

**Wedajo 2015**, in last two decades, tremendous increasing the usages of probiotics LAB and their uses which contain many dares when demanding the health welfares. Probiotics can help to increase the profits to the hominid, faunae, and florae. The strain collection, treating, and immunization of appetizer cultures must be measured in addition to the feasibility and sensual approval. It cannot be assumed that number of probiotics bacteria are added to the food product that will result in the transferring the health to the subject. In addition to recovery levels, revealed that the feasibility of probiotics through the storage time in the gastrointestinal tract are important factors.

**Ghazzewi and Tester 2016**, for preventing/treating vaginal health, have a partial information concerning the practice of bio-therapeutic agents (pre and probiotics). Most vaginal infection is cured with drugs but regular reappearances and long-lasting contagions are mutual due to the contrary impacts on the original lactobacilli. Bio-therapeutic agents have the possible to optimize, uphold and reinstate the microflora of vaginal ecology. In reducing vaginal infection, bio-therapeutic agents provide an alternative approach and promoting consumer health.

**Tachedjian et.al 2017**, lactic acid is produced by probiotic lactobacilli with desire D-to-L lactic acid fractions that may be measured "lactic acid" plants and it distribute constant quantities of this metabolite to the cervicovaginal mucosa. Through regulatory pathways, tests continue with respect to the progression of probiotics as "bio-therapeutics" that are approved in mainstream medical exercise. A positive signal was shown through the several clinical trials for the capability of lactic acid to rebuild vaginal eubiosis and release signs in women with BV.

**Valenti et.al 2018**, stated that in the woman mucosal genital tract, Lactobacillus species and Lf are essential constituents of a first-line guard that

contribute in defense in contradiction of a crowd of microbial infections and a most effective and accepted device to reduce inflammatory procedures. To hinder the cervicovaginal infections, an ideal drug should hinder such as microbial linkage and entrance into host cells, microbial growth, microbial intracellular repetition and by microbes extracellularly released, infection of new host cells from infected cells. Inhibitions of microbial growth through the production of antibacterial constituents by competition or by lactobacilli among Lf and microbes for iron attainment that denotes an effective accepted protection mechanism in a vaginal atmosphere of women of reproduction age.

## Conclusion

The important role of lactic acid is to control the vaginal infected disease in vaginal healthy women. The vagina is abundant in the saprophytes which is important acidophilic bacteria because it produce lactic acid. This paper concluded that defense mechanism affects and also regulate the vaginal microbiota which is incomplete still. It also analyzed the vaginal region as a microbial system to recognize the full range of mechanism that affects the risk of disease. By using the probiotics, which treat and prevent the infection that has been reflected for some time and use for safety record. It is also recognized that LAB is very useful for maintaining the women's vaginal health.



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