www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277- 7695
ISSN (P): 2349-8242
NAAS Rating: 5.03
TPI 2020; 9(10): 340-342

www.thepharmajournal.com
Received: 15-08-2020
Accepted: 19-09-2020

Meenakshi
RIMT University, Delhi-Jalandhar GT Road (NH-1), Sirhind Side, Mandi Gobindghar, Punjab, India

Corresponding Author:
Meenakshi
RIMT University, Delhi-Jalandhar GT Road (NH-1), Sirhind Side, Mandi Gobindghar, Punjab, India

The human milk microbiota-origin, probiotics properties and its benefits for Newborns babies

Meenakshi

DOI: https://doi.org/10.22271/tpi.2020.v9.i10e.5251

Abstract
Human Milk has been considered sterile and It helps to create the right environment for gut development and maturation of newborns babies. Current research is focusing on bacterial diversity and the influence of the maternal environment as well as the mode of delivery on human milk microbiota, the pathway of bacterial transfer to milk ducts, possible benefits of specific bacterial strains to new born baby. The presence of immunomodulatory factors in human milk like exosomes and microRNAs have been found. Breast milk contains many complex proteins, lipids and carbohydrates, the concentration of which alter dramatically over a single feed as well as over lactation, to reflect the infants need. Probiotics as a substance and organisms which when administered in proper amount confer health benefits for newborns babies. However, their potential benefits remain now days unexplored, as long as they are included in genera with pathogenic representatives.

Keywords: Human microbiota, probiotics, human breast milk

1. Introduction
The human microbiome development is a complex process that has been start at time of birth when newborns baby is exposed to the maternal antibodies and it is followed by diet of baby mainly breast feeding. Human milk is generally accepted to be the best nutrition for neonates. Breast milk contains the needed nutrients and antibacterial factors protecting the infants against infection [1, 2]. Probiotics in human milk are a very recent field of research. Current research is focussing on bacterial diversity and the influence of the maternal environment as well as mode of delivery on human milk microbiota, the pathways of bacterial transfer to milk duct [3]. Traditionally a study on the microbiology of human milk has been restricted to potential pathogenic bacteria. There is surprisingly lack of studies on the isolation and analysis of commensal or potential probiotic bacteria from milk of healthy women. As neonates are susceptible to infection because of under develop of immune system. If bacteria with ability to confer good health benefits to human hosts were isolated from breast milk, they well considered attractive probiotic organisms. Recently microbial identification techniques based on 454 pyrosequencing of the 16S rRNA gene have been used to analyse the bacterial community in human milk in more depth. *Streptococcus* and *Staphylococcus* are the major genera in human milk representing together with Serratia more than 5% of the retrieved 16S rRNA gene sequences. Breast milk contains prebiotic substance, which may selectively increase the growth of limited number beneficial bacteria in the gut [4-6]. Most species of probiotics are in the group of lactic acid bacteria. Several studies have reported that Lactic acid bacteria such as *Streptococcus*, *Lactococcus*, *Leuconostoc* and *Lactobacillus* were isolated and characterized from human breast milk.

2. Bacterial diversity of human milk
Human milk is a complex species-specific biological fluid adapted to satisfy all types of nutritional requirement of the newborns infant [7]. Molecules present in colostrum and milk including immunocompetent cells, fatty acids, antimicrobial peptides which activate pathogens [8]. Colostrum and breast milk are continuous sources of commensal, mutualistic and potentially probiotic bacteria to the infant gut [9]. Beneficial microbes may be isolated from human milk oral cavity or vagina have been suggested for very specific health target. Beneficial bacteria could also be found in genera encompassing members considered as potential or opportunistic pathogens such as the probiotics strain *Escherichia Coli* [10].

For decades, neonatal gut has been considered sterile at birth, but new evidence suggests different points. Studies based on culturing microbial invasion of the amniotic cavity in spontaneous labor at term with membranes [11]. During the first day of life, the gastrointestinal tract of healthy full term newborns is colonized by facultative anaerobic species *Escherichia Coli*. Oxygen consumption and oligosaccharides in human milk to the predominance of anaerobic bacteria, such as Bacteroides. In healthy full-term breast fed newborns there is a strong relationship between specific microbial strains found in mother new-born. Human milk Microbiota also seems to be influenced by geographical factors. The geographical variations show that the human milk Microbiota is adapted to the mother's environment and life style, preparing the infant for specific conditions that he or she will be born into. The research results also suggest that in spite of great inter-individual variations in bacterial species, there is a core microbiome; that is, there are certain bacterial species with DNA that seems to be present in most or all human milk sample.

3. Functions of human milk bacteria for infant gut

Independent from the origin of bacteria in human milk, its relevance may lay in the potential implications on the health of women and their infant. The milk microbiome may be regarded as an inoculum for infant gut. The exposure of the breastfed infant to the bacterial richness in milk is one factor contributing to the differential faecal Microbiota between breastfed and formula-fed infant [12]. The study of Donnet-Hughes suggests that the milk microbiome plays a key role in programming the neonatal immune system [13]. Human milk is the gold and super food for nourishment of early infants because it contains several bioactive components, such as human milk oligosaccharides, amino acids, vitamins, minerals and other essential nutrients that promote the development of gut microbiota during early infancy. These compounds provide significant benefits to newborns, such as lowered risk of sudden infant death syndrome. Human milk like other body fluids secreted by body indeed contains bacteria that are play important role in colonization of infant gut and help to grow maturation of mucosal immune system [14]. As such human milk is considered as a good source of probiotic food for infant. It also provides protection to mammary glands and to promote development of immunocompetence in the infant. It benefits via phagocytosis, secretion of antimicrobial factors and antigen presentation in the breasts of lactating mothers. In addition, Studies performed in germ-free mice have taught us that early life colonisation is required for the development of fully functional immune system and affects many physiological processes within the host. The origin of bacteria present in human milk has been come a controversial and attractive issue in the past years [15]. Absence of this wonderful fluid makes them susceptible to gastrointestinal and respiratory infections and inflammatory diseases [16]. Human milk is composed of bacterial genera such as *Bifidobacterium, Clostridium, and Bacteroides, Faecal bacterium* that is strict anaerobes and is usually associated with human gut. Even though breast milk is a complete food for infant, there are many factors that influence its nutritional and microbial composition. Such changes can change the composition of infant gut microbiota in terms of diversity and number which might have an adverse effect on the long-term health of infants. Intrapartum antibiotic exposure of the mother enriches the bacterial diversity in milk but reduces the number of initial infant gut colonizer, *Bifidobacterium* in mother's milk. It is also associated with emergence of antibiotics resistance phenotype in the infant gut microflora.

Antimicrobial resistance is a good sign which severely impacts treatment outcomes and decreases the diseases related mortality. Many factors that could modulate the microbiota of the mother's skin, oral cavity, vagina and intestine, and the microbiota of the infant are potentially able to modulate the human milk microbiota. Therefore, the lactation period, maternal dietary habits and nutritional status, mode of delivery, gestational age, geographical location and the use of antibiotics or other medicines can all have an influence on the milk Microbiota.

4. The Effects of Probiotics on infant health

Beneficial microbes may be isolated from any location of the human body. In fact, some microbes isolated from human milk, oral cavity or vagina. Members of the genus *Bacteriods* are most abundant microbes in the human gut, their presence being indispensable for the proper development of the intestinal mucosa [17]. Probiotics bacteria can have positive effects of probiotics on immune system stimulation. Some *in vitro* and *in vivo* searchers have been carried out in mice and some with human. Probiotics affect the immune system in different ways such as producing cytokines, stimulating macrophages, increasing secretory IgA concentration. Some of these effects are related to adhesion while some of them are not [18]. Diarrhea is many causes and having many types so it is difficult to evaluate the effects of probiotics on Diarrhea. But there are lots of searches and evidence that probiotics have beneficial effects on some types of Diarrhea. Human milk contains relatively high counts of bacterial strains of the genera *Enterococcus*, *Staphylococcus* and *Streptococcus.* These bacteria provide a continuous source of microbial inoculation for the breast-fed infant gut, and might play a key role in its correct development. Some of these micro-organisms survive passage through the infant gastrointestinal tract and can be isolated in the feces of breast-fed infants. Usually, *Streptococci* and *Staphylococci* strains isolated from human milk lack the genetic determinants coding for virulence factors, and are susceptible to most antibiotics [19]. The composition of the intestinal microbiota may be associated with the development of humoral immunity in infants. As humoral immunity is involved in allergic reactions, it was postulated that there may be an association between the composition of the intestinal microbiota and the occurrence of allergies. Probiotics also help to prevent atopic dermatitis in infants, influence intestinal motility and sensory neurons as well as contractile activity of the intestine and to exert anti-inflammatory effects [20].

5. Conclusion

Human milk is a complex fluid with multitude of components, each of which may contribute substantially to infant and maternal health. The presence of bacteria and maternal cells in milk is only now realized as an important route of communication between mother and infant. The human milk microbiome is a very recent field of research. The presence of non-pathogenic microbes in human milk was acknowledged about 13 years. Since then, numerous studies have been performed to determine the source of bacteria in the mammary glands and the effects of the human milk microbiota on maternal and infant health. Human milk receives bacteria from a multitude of source, including the

mother's intestine. As imbalance in the composition of the mammary and intestinal microbiota may be responsible for a number of diarrhoeal diseases as well as atopic dermatitis. There is evidence that some lactobacilli can be used as an effective alternative to antibiotics for the treatment of infectious mastitis. The commensal microbiota of human milk is dominated by members of the genera *Enterococcus, Streptococcus* and *Staphylococcus.* In contrast to *bifidobacteria* and *lactobacilli*, the influence of these major commensal groups on, for instance, the proper development of the gut of breast-fed infants is unknown. It is quite relevant to extend the research to this major microbiota, establishing their physiological roles. For this purpose, it is necessary to acquire depth knowledge of the genetic variability of these bacteria as well as characterization of potential virulence factors and antibiotic resistance.

6. References

1. Petherick A, Development: Mother's Milk: a rich opportunity. Nature, 2010; 468:S5-7.
2. Walker A. Breast milk as the gold standard for protective nutrients. J Pediatr 2010; 156:S3-7.
3. Wright AL, Bauer M, Naylor A, Sutcliffe E, Clark L. Increasing breastfeeding rates to reduce infant illness at the community level. Pediatrics 1998; 101:837-44.
4. Dai D, Walker WA. Protective nutrients and bacterial colonization in the immature human gut. Adv Pediatr 1999; 46:353-82
5. Drasar BS, Roberts AK. Control of the large bowel microflora. In; Hill MJ, Marsh PD, editors. Human microbial ecology. Boca Raton: CRC Press (FL); 1990; 87-111.
6. McKellar RC, Moddler HW, Metabolism of fructologosaccharides by *Bifidobacterium sp.* Appl Microbiol Biotechnol 1989; 31:537-41.
7. Morrow AL, Rangel JM. Human milk protection against infectious diarrhea, implication for prevention and clinical care. Seminars in Pediatric infectious diseases. 2004; 15:221-8.
8. Newburg DS. Innate immunity and human milk Journal of Nutrition. 2005; 135:1308-12.
9. Isaacs CE. Human milk inactivates pathogen individually, additively and synergistically. Journal of Nutrition. 2005; 135:1286-8.
10. M.de Vrese J. Schrezenmeir, Adv Biochem Eng Biotchnol. 2008; 111:1-66
11. Di Giulio DB, Gervasi MT, Romero R *et al*. Microbial invasion of the amniotic cavity in pregnancies with small for gestational age fetuses J. Perinat Med. 2010; 38:495-502.
12. Fanaro S, Chierici R, Guerrini P, Vigi V. Intestinal microflora in early infancy: composition and development. Acta Paediatrica 2003; 92(s442):48-55.
13. Donnet-Hughes A, Perez P, Dore J, Leclerc M, Levenez E, Benyacoub J *et al*. Potential role of the intestinal Microbiota of the mother in neonatal immune education. Proceedings of the Nutrition Society. 2010; 69:407-415.
14. Hunt KM, Foster JA, Forney LJ, Schutte UME, Beck DL, Abdo Z *et al*. Characterization of the diversity and temporal stability of bacterial communities in human milk. PLoS One. 2011; 6:e21313.
15. Fernandez L, Langa S, Martin V, Maldonado A, Jimenez E, Martin R, Rodriguez JM. The human milk microbiota: Origin and potential roles in health and disease. Pharmacol Res. 2013; 69:1-10.
16. Qin J, Li R *et al*., Nature, 2010; 464:59-65.
17. Blanton LV, Charbonneau MR, Salih T, Barratt MJ, Venkatesh S, Iikaveya O *et al*. Gut bacteria that prevent growth impairments transmitted by microbiota from malnourished children. Science 2016; 351:3311.
18. Quwehand AC, Kirjavainen PV, Shortt C, salminen S. Probiotics mechanisms and established effects. International Dairy Journal. 1999; 9:43-52.
19. Delgado S, Arroyo R *et al*., BMC Microbial. 2009; 9:82.
20. Osborn DA, Sinn JK. Probiotics in infants for prevention of allergic disease and food hypersensitivity. The Cochrane Database Systematic Reviews, 2007, 4, CD006475.