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■ Prevention of Lactational Mastitis for a Successful Breastfeeding

Epidemiology of Mastitis

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Epidemiology of Mastitis

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Key Messages

- Mastitis is one of the most common problems encountered by the breastfeeding mother
- Many women stop breastfeeding due to mastitis or breast abscesses
- Prevention of mastitis is very important in supporting of breastfeeding

Breastfeeding and lactation are an integral part of reproductive physiology. Breastfeeding is recommended as the exclusive source of nutrition for infants in the first 6 months of life by many international bodies, including the American College of Obstetricians and Gynecologists, WHO, and FIGO. Furthermore, continued breastfeeding is recommended along with appropriate complementary foods up to two years of age or beyond [1, 2]. However, many women stop breastfeeding due to mastitis or breast abscesses. As obstetricians, it is important that we not only support breastfeeding mothers to achieve successful breastfeeding but also that we should be aware of the common complications that can occur as a result of breastfeeding and the most appropriate management of these conditions. This is important for the health and well-being of both the mother and the child, but also as women who experience breastfeeding difficulties are at higher risk of postpartum depression, and should be screened, treated, and referred appropriately [1].

Mastitis is one of the most common problems encountered by the breastfeeding mother. It is an inflammatory

condition of the breast and may occur with or without infection. It is also commonly termed lactational mastitis or puerperal mastitis. Lactational mastitis has been estimated to occur in approximately 2–10% of all breastfeeding women [3, 4], though the reported incidence varies from one population to another, with some studies quoting rates as high as 30% [4]. The most common time of occurrence of mastitis is in the second or third week postpartum [4]. The development of a breast abscess is a severe complication of mastitis. This is a localized collection of pus within the breast, and the incidence is approximately 0.1–3% [5, 6]. The occurrence of a breast abscess is also commonest in the first 6 weeks postpartum, but may also occur later [4], and it can occur with or without preceding mastitis.

The incidence of mastitis requiring hospitalization is low; one study by Stafford et al. [7] included 136,459 new mothers, and found 127 women required hospitalization for mastitis, which resulted in an incidence of 9 per 10,000 deliveries. Although generally easily treatable with antibiotics, it can occasionally be fatal if inadequately treated. Research suggests that mastitis also



Lactation mastitis: an inflammatory condition of the breast

increases the risk of transmission of HIV to the infant through breastfeeding [8]. Although complications can occur, it is typically easily treated with antibiotics; and with the appropriate support and education, breastfeeding can be continued.

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The Human Milk Microbiome – An Important New Twist in Infant Nutrition

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Key Messages

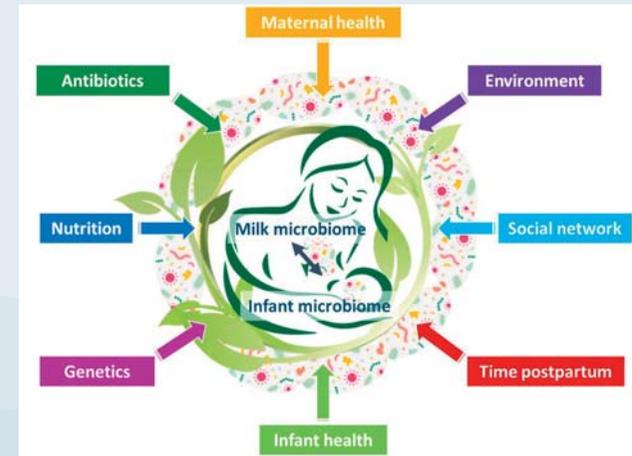
- Human milk microbiomes vary across women, geographies, and cultures
- Factors such as maternal diet, maternal health, and use of antibiotics might have important effects on milk microbiome variation
- The origin of breastmilk's microbiome and its potential impact on maternal and infant health still require much more research

Experts have historically assumed that human milk was sterile unless produced by a woman with mastitis or contaminated. However, with the emergence of high-tech methods whereby scientists can now identify bacteria via their genetic profiles rather than having to grow them in the laboratory, researchers now agree that human milk contains a unique and rich variety of not only bacteria but also viruses and fungi.

Interestingly, the most abundant bacteria present in the human milk microbiome, even when produced by healthy women, are not what one might expect, they are *Staphylococcus* and *Streptococcus*. Furthermore, and in line with the microbiomes of other biological niches like the vagina and skin, every woman appears to have her own signature milk microbiome – seemingly a reflection of her own life-long experiences and exposures –, and typical milk microbiomes vary across geographies and cultures. Scientists know almost nothing about what factors drive this variation, but mounting evidence suggests that maternal diet, maternal health (for instance, obesity), and antibiotic use might be important. In addition, fascinating work stemming

from small-scale hunter-gatherers and farmers living in the Central African Republic suggest that seasonality, an infant's social life, and variation in child-care patterns among mother-infant dyads might also help to shape both the diversity and composition of the bacteria that find their way into breastmilk.

There are several hypotheses as to the origin of breastmilk bacteria. One is that bacteria in the mother's intestines are selectively taken up by immune cells and trafficked to the breasts. This possibility is supported by studies showing that when lactating mothers consume probiotic supplements, the bacteria in the supplements show up both in the milk they produce and their infants' feces. Controlled animal studies also support a direct link between a mother's gut bacteria and the bacteria found in her milk. In addition, it is possible that bacteria present in the infant's mouth help colonize the breast (and, thus, become incorporated into the milk) during suckling. This possibility is supported by findings that the bacterial communities found in a breastfed infant's mouth are very similar to those found in human milk. Indeed, ultrasound images have



shown that the contents of an infant's mouth move back into the breast with each suckle. Testing these hypotheses, which might actually both be true, will require additional controlled human intervention studies. In addition, the question as to how variation in these bacteria impact maternal and infant health has not been answered.

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Etiology of Mastitis: The Role of Infection and Microbiota

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Key Messages

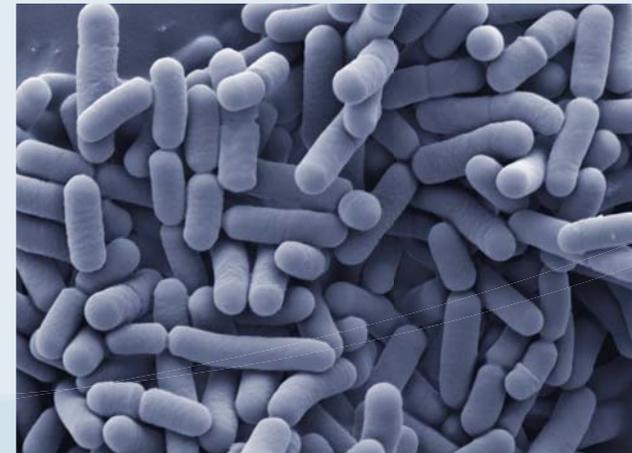
- A diverse microbiota may be observed in human milk
- Dysbiosis of human milk microbiota could be related to the onset of mastitis
- Probiotic treatment may help to balance this microbiota and to prevent mastitis

Human milk contains a diverse microbiota. Studies about this microbiota show a complex bacterial community in which species of the genus *Pseudocillium* in milk microbiota of women suffering from mastitis was first observed in a study performed by Jiménez et al. [4]. They proved that a high level of *Staphylococcus* spp. in milk was accompanied by a decrease in *Lactobacillus* spp. However, when a combination of *Lactobacillus* strains originally isolated from breast milk of healthy women was provided to these women, the load of *Staphylococcus* spp. in milk was significantly reduced, and *Lactobacillus* could be detected. Along with the changes observed in the milk microbiota, *Lactobacillus* administration induced a very significant improvement in the symptoms related to mastitis. Subsequently, different studies have demonstrated the capability of certain probiotic strains to balance the microbiota of human milk by reducing the load of bacterial groups related to mastitis and thus improving the associated symptomatology [4–8].

The *Lactobacillus* strain with more scientific evidence in the field of human mastitis is *L. fermentum* CECT5716. This is a probiotic strain

Faecalibacterium, *Ruminococcus*, *Roseburia*, *Eubacterium*, and *Propionibacterium* [3]. The loss of *Lactobacillus* in milk microbiota of women suffering from mastitis was first observed in a study performed by Jiménez et al. [4]. They proved that a high level of *Staphylococcus* spp. in milk was accompanied by a decrease in *Lactobacillus* spp. However, when a combination of *Lactobacillus* strains originally isolated from breast milk of healthy women was provided to these women, the load of *Staphylococcus* spp. in milk was significantly reduced, and *Lactobacillus* could be detected. Along with the changes observed in the milk microbiota, *Lactobacillus* administration induced a very significant improvement in the symptoms related to mastitis. Subsequently, different studies have demonstrated the capability of certain probiotic strains to balance the microbiota of human milk by reducing the load of bacterial groups related to mastitis and thus improving the associated symptomatology [4–8].

The *Lactobacillus* strain with more scientific evidence in the field of human mastitis is *L. fermentum* CECT5716. This is a probiotic strain



The administration of some strains of *Lactobacillus* to lactating women might help to prevent mastitis. Image source: "Particle Systems" Groups, Nestlé Research Center, Lausanne.

isolated from breast milk of healthy women endowed with a powerful anti-infectious activity probably related to its antibacterial activity and immune-enhancing activity [9, 10].

Two different trials conducted in women suffering from mastitis showed a significant improvement in mastitis condition by decreasing the *Staphylococcus* spp. load in breast milk [5, 6]. Additionally, a trial conducted in healthy women showed that the consumption of *L. fermentum* CECT5716 during breastfeeding reduces the incidence of mastitis by approximately 50% relative to its capability to control the proliferation of *Staphylococcus*

spp. in milk [8]. These results prove that probiotic treatment is an effective strategy to control the proliferation of *Staphylococcus* in breast milk, helping to prevent the development of mastitis.

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Mastitis Prevention Strategies

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Key Messages

- Mastitis prevention strategies include general recommendations to protect the women's immune system and milk microbiota
- Breastfeeding counselling on adequate lactation practices and the correct breastfeeding technique are of crucial importance to promote frequent and effective milk extraction and reduce any risk associated with mastitis
- Counselling must also include information on breast care and mastitis sign recognition in order for women to seek professional help on time when needed

Clinical mastitis is often a cause of breastfeeding cessation, but other earlier or more subtle manifestations such as pain when feeding and perceived reduced milk flow are also causes for early weaning and breastfeeding termination [1], therefore mastitis prevention is an important measure to promote continued and successful breastfeeding.

Previous studies have documented risk factors for mastitis, which need to be considered in order to put forward adequate preventive measures. Some of these factors fit into a non-modifiable category, placing women with these characteristics in a high-risk group that needs extra attention and support [2]. However, most of the factors associated with the occurrence of mastitis are modifiable. Some of them may directly alter the microbiota, such as the irrational use of antibiotic therapy associated with Caesarean delivery or recurrent throat infections [3], unnecessary antifungal medications and nipple ointments [2], or even the use of not properly sterilized breast pumps that could be the source of pathogenic bacteria [2]. Other factors induce changes in the maternal immunological system that may predispose

for mastitis. For instance, in women living in underprivileged communities in Africa, reduced plasma levels of some micronutrients including vitamin A, zinc, and antioxidants, such as vitamin E and selenium, have been associated with subclinical mastitis [4, 5]. Also, psychological stress and fatigue have consistently been associated with this condition [6].

Additionally to the above-mentioned factors, breastfeeding practices and techniques that women choose, as well as factors that hinder appropriate ones such as milk oversupply, the separation of the mother from the baby, or factors that may hurt the breast or nipple such as the use of a tight bra, the presence of tongue or lip tie in the baby, and the improper use of breast-pumps create conditions or a breastfeeding environment that may cause blocked ducts, engorgement (build-up of milk in the breast), and increase the risk for mastitis [7]. Some inadequate practices that lead to infrequent and incomplete milk removal are [8]: scheduled feedings, purposely short duration of feeding, missed feedings, early introduction of formula milk or food (mixed feeding), and pacifier use. An incorrect breastfeeding

Adequate practices and correct techniques that may help prevent mastitis

Adequate practices	Correct techniques
<ul style="list-style-type: none"> • Initiate breastfeeding very soon after birth (no longer than 24 hours) • Exclusive breastfeeding • Free demand, not scheduled feedings • Let baby finish suckling and extracting milk from one breast before changing to the other one • Delay the use of pacifier 	<p>Woman's position:</p> <ul style="list-style-type: none"> • Teach correct and comfortable positions to sit or lie for breastfeeding <p>Baby's position</p> <ul style="list-style-type: none"> • Head and body are aligned • Face facing the chest, nose opposite the nipple • Whole body facing the mother <p>Position of the mouth on the breast (correct latch):</p> <ul style="list-style-type: none"> • Way in which the woman takes and presents the breast • Recommendation: hand forms a "C" • Stimulate the search reflex and to open mouth widely • It is not necessary to place a finger near the nose

technique may not only cause nipple damage, but also prevent optimal milk drainage from the breast. At the same time, it has been hypothesized that nipple cracks and nipple injuries may not only provide a point of entry for microorganisms, but could also be early clinical signs of mastitis [3].

In terms of mastitis prevention, there are some general recommendations that protect women's immune system and their milk microbiota, these may include: strategies that improve or maintain an adequate nutrition status; provide guidance on how to cope with stress and fatigue [9]; promote the rational use of antibiotics during pregnancy, parturition, and postpartum, and limit the unnecessary use of breast ointments during

lactation. Additionally, the use of selected probiotics has recently been proposed as a novel preventive intervention especially for the high-risk group of women [10].

Nevertheless, a crucial intervention to prevent mastitis, even in the more susceptible women, is to promote the best conditions for breastfeeding and provide pertinent counselling on important matters such as: (I) adequate breastfeeding practices, (II) the correct technique to comfortably sit or lie and place the baby to the breast, (III) how to take care of the breasts, and (IV) very importantly, information on how to recognize early signs of mastitis, so affected patients get proper treatment if needed.

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Published by S. Karger AG, Switzerland for Nestlé Nutrition Institute. Wyeth Nutrition Science Center is part of Nestlé Nutrition Institute CH-1800 Vevey Switzerland

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ISSN 1270-9743

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