The Enteromammary 
Secretory Host 
Immune System: 
How a Mother’s Immune System 
Works to Protect Her Baby

Serena Meyer, El Sobrante, California, USA

As La Leche League Leaders, we are presented occasionally with a situation that requires us to reexamine the collective knowledge available on the immune system. Simple questions about what protection breast milk offers may lead to a complex query about how exactly a mother’s body is able to share the antibodies it has. “Can I nurse while sick?” further compounds this aspect of the mother-child nursing relationship: a mother may wonder whether her baby will get sick if she shares any pathogens through her milk. Depending on what level of information we consider, our answers can get complicated.

Information about the immune system has been available to scientists and students for many years; it has changed shape along with the deeper understanding that has occurred in past years. Paired with the scrutiny of the immune system, a great deal of attention has been spent on studying the enteromammary pathway. In other words, we understand now in greater detail how the milk-making process works and exactly how the immune system is shared between mother and child.

What Is the Purpose of the Shared Immune System?

A strong starting point for our inquiry would be to ask ourselves what is the purpose of the shared immune system? Why is it necessary in the first place? Dr. Armond Goldman addresses these questions in his research paper “Immune System in Human Milk and the Developing Infant” and speaks on the topic of delayed maturity of the neonatal immune system: “[F]urther analysis suggested that such developmental delays allowed considerable energy and nutrients to be diverted to the growth and development of other systems such as the central nervous system, skeleton, and skeletal muscles as long as the mother was providing the necessary defense agents through her milk.” (Goldman 2007, p. 202) Essentially, the augmenting of the immune system allows the baby to prioritize growth, working on areas that must be developed in order to survive. Due to limited space in the womb, these survival-linked modifications in the baby must happen after birth. Continued skeletal and neurological growth cannot be done prenatally and must continue antenatally (after birth) at a rapid pace. The mother fundamentally assists her newborn baby during these phases of accelerated growth by sharing her immune system through her breast milk. In an article appearing in the Journal of Nutrition, we see more conversation about how important breast milk is in relation to the baby’s immune system: “The unfavorable effects of neonatal immunodeficiency are limited by some naturally occurring compensatory mechanisms, such as the introduction of protective and immunological components of human milk.” (Chirico et al. 2008, n.p., paragraph 4)

How Exactly Does the Shared Immune System Work?

When addressing a mother’s concerns about how the enteromammary secretory host immune system works, the preliminary information shared might begin with how the maternal immune system works to protect her baby from “germs” in the environment.

A pathogen is defined as “a specific causative agent (as a bacterium or virus) of a disease.” (Merriam-Webster 2003, p. 908) Pathogens are responsible for illness and disease, and they are present everywhere. From the soil to our desktop, pathogens lurk and wait for an entrance into our bodies. Once entry is made, the mother’s body creates a response. Her immune system begins an elaborate system of protection that starts with taking hold of the pathogen, trapping it, degrading it, then manufacturing specific antibodies. These antibodies exit in the lymph nodules, transit through the lymph into the thoracic duct (the main trunk of the lymphatic system), then into the blood stream. Once in the blood, the antibodies are shared with distant sites all over the body, protecting it from further infection. As the blood travels into the breast, some of the antibodies are attracted to the exchange layers in the breast tissue (basolateral membranes of the mammary epithelium) and from there enter the milk. Some cells originating from the Peyer’s patches in the digestive tract turn into plasma-making cells, which stay in the breast and produce their own specific type of antibody to donate to the breast milk.
What If a Mother Is Exposed to Serious Illness?

If a mother is continuously exposed to pathogens/antigens/disease, her baby will also have a measure of exposure. Diseases travel in similar ways: we contract them from the environment, then we may share them through our saliva, mucous, sneezing/coughing, feces exposure or vomit, less commonly through blood or breast milk. In some instances, pathogens can be shed through breast milk. Generally, however, it is common that the mother has already primed her baby’s immune system by that point with large amounts of antibodies as her own body fights off the infection. (This is often the case with cytomegalovirus, CMV.) Breastfeeding is recommended during most illnesses, and only in rare cases is a mother told to avoid nursing while sick. At this date and time, these instances might be if the mother has contracted human immunodeficiency virus (HIV), has active tuberculosis, human T-cell leukemia virus type 1 (HTLV-1), or is in an acute phase of hepatitis C. In some areas of the world, a mother is still encouraged to breastfeed despite having a positive test for HIV, primarily due to geographically intensified childhood mortality risks centering around the lack of a safe alternative to breastfeeding. Some new research has pointed out that instead of total weaning in the case of serious illness a short break from nursing would suffice: “In a few situations, temporary cessation of breastfeeding or the avoidance of breast milk may be required for a limited time (24 hours for N. gonorrheae, H. influenzae, group B streptococci, and staphylococci, and longer for others including T. pallidum (syphilis) and M. tuberculosis).” (Chirico et al. 2008, n.p., paragraph 8)

What Main Lymph Areas Share Information About Infection?

A good portion of the information that our bodies receive about pathogens (organisms that cause illness) come from these areas:

- Gut-associated lymphoid tissue (GALT)
- Bronchus-associated lymphoid tissue (BALT)
- Mucosa-associated lymphoid tissue (MALT)

MALT includes the more diffuse mucosal lymphoid tissue known as the gut, lungs, mammary glands, salivary and lacrimal (tear secreting) glands, and the genital tract. “The parts of the body that harbor the largest and most diverse populations of microorganisms are the respiratory and gastrointestinal tracts. The most heavily infected site is the oral cavity. The extensive mucosal surfaces of these tissues make them particularly vulnerable to infection and they are therefore heavily invested with secondary lymphoid tissue.” (Parham 2005, p. 19) Mucosal tissue traps pathogens with the help of specialized M cells (microfold-cells recognize “not-self” antigens and work together with the Peyer’s patches) and the presence of the antigen then activates a special cell called a lymphocyte, which transfers the pathogen into the lymph node where it is degraded.

What Makes GALT, BALT and MALT Areas So Important?

These lymph areas are important because they are closely tied to the common illnesses that typically impair a newborn’s ability to survive, particularly in regions of the world where adequate clean water and health care are in short supply. Diseases such as rotavirus can cause severe diarrhea and death in infants, while respiratory syncytial virus (RSV) can cause intense bronchial congestion often
resulting in bronchiolitis and pneumonia. In the United States, cases of RSV are treated with hospital visits, and they strike a population mostly under six months of age. An easy-to-understand conclusion about the maternal lymph system is that the primary areas of maternal antibody sharing are geared toward protecting the baby from the most dangerous of diseases.

The Traffic of Immunological Information Between the Mother and Child.

All normally functioning human bodies are set up to protect and defend against intruders in part by manufacturing secretory IgA. A study by Ronald E. Kleinman and W. Allan Walker, “The Enteromammary Immune System, an Important New Concept in Breast Milk Host Defense,” discussed the conclusion that IgA was the main immunoglobulin in “external secretions.” (Breast milk is included as one of these secretions.) The study went on to remark, “There is a continuous traffic of plasma cells between the gut-associated lymphatic tissue into the systemic circulation” (Kleinman and Walker 1979, abstract). This documents that there is communication between lymph sites; paired with our prior knowledge that the mammary gland is part of the system, we have reproducible evidence that a mother’s milk receives new antibodies as they show up. In addition, evidence of the lymph system in the breast shows that any pathogen that might enter the mammary gland from the baby’s mouth or body would be trapped in the secondary lymphoid tissues in the breast (axillary lymph nodules). This would mean that the antibodies to this pathogen would be secreted back into the milk as part of the enteromammary secretory host immune system, as was researched by Arnaldo Cantani in *Pediatric Allergy, Asthma, and Immunology* 2008. In terms of physiology, a woman’s breast milk is thus suited to all her baby’s needs and also tailored to protect the infant from the pathogens in the mother’s individual environment. I think it is best put by Cantani in his study: “The Enteromammary Axis is the system that shares the information it has about past and current infections, and passes it through the lymph nodes, then the thoracic duct and into the blood where it transfers ultimately into human milk.” (Arnaldo Cantani 2008, p. 246)

Serena Meyer is a La Leche League Leader and a freelance writer living in El Sobrante, California, USA. She is the Assistant Area Professional Liaison LLL of Northern California/Hawaii, USA. Since becoming a wife and mother, Serena is conducting research on breastfeeding topics, is interested in medical journalism, and is studying to pursue a second career in the nursing profession.

**Bibliography**


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