Supporting the Infant Microbiota for a Healthy Future

Many factors, such as nutrition, healthcare access, and the home environment, affect how children grow and develop later in life. Research also suggests that an infant's gut microbiota, the trillions of beneficial bacteria and other microbes in their gut, also plays a vital role in physical and mental health throughout childhood and beyond.

An infant's gut microbiota matures during the first few years of life, and there is a short window of opportunity to shape it. Learn what parents and caregivers can do to support infant gut health and give young children the best start in life.

Stages of Microbiome Development

Each person's gut microbiota is as unique as their fingerprint. The exact mix of bacteria, yeasts, viruses, and other microbes that colonize the digestive tract is largely shaped by one's diet and environmental exposures. However, the microbiota begins to form even before birth.[1]

Some evidence suggests that the mother's microbiome impacts how a fetus develops. Before birth, an infant's microbiota closely resembles the mother's.[1] Immediately after birth, a newborn's microbiota is influenced by their mode of delivery (vaginal vs. cesarean), their gestational age, and the mother's age and overall health.[1,2,3]

During the first few months of life, an infant's gut microbiota develops quickly, becoming richer and more diverse. It remains dynamic during the first two years, shaped by factors such as:

- The infant diet (breastmilk, formula, solid foods)
- The mother's diet if breastfeeding
- Medication use, especially antibiotics
- Geographic location (city vs. rural)
- The home environment
- Other family members and pets

By age three, a child's microbiota matures, becomes more stable, and resembles an adult's.[1,4] It can change to some degree, depending on outside influences or pathogenic exposures, but it is more resistant to change.

The Gut Microbiota and Health

The gut microbiota plays a crucial role in health and well-being starting in infancy. Beneficial gut bacteria are known to influence nutrient metabolism and immune health by:[5]

- Producing many of the B vitamins and vitamin K

- Metabolizing proteins, fats, fibers, vitamins, minerals, and polyphenolic compounds from plant foods
- Producing short-chain fatty acids (SCFAs) such as acetate, butyrate, and propionate, which serve as an energy source for cells in the colon lining
- Protecting against pathogenic bacteria and other microbes
- Activating immune cells

Besides these well-established functions, a growing body of research suggests that the gut microbiome plays a vital role in certain aspects of mental health through the gut-brain axis.[1] Compounds called short-chain fatty acids produced by gut bacteria help regulate the sympathetic nervous system. This system is responsible for the fight-or-flight response. Other metabolites of gut bacteria promote the synthesis, breakdown, and regulation of serotonin, dopamine, and other neurotransmitters that affect mood, behavior, and attention.[1,6]

Links Between the Microbiota and Children's Health

Scientists can't say whether there is an ideal mix of microbes that should colonize the gut. However, it appears that healthy individuals have greater microbial diversity and more significant numbers of SCFA-producing bacteria.[7] In adults, a less diverse microbiota is linked with a higher risk of digestive or metabolic disorders, like obesity or diabetes.[7]

In infants, children, and adults, these and other factors can alter the gut microbiota composition, causing it to become less diverse:

- Weaning from breastmilk to formula and solid foods
- A diet low in fiber and high in sugar and ultra-processed foods
- Infections
- Use of certain medications, especially antibiotics
- Exposure to environmental toxins
- Chronic stress

Research suggests that a more diverse microbiota may be more resilient to these stressors. Disruptions are often temporary, and the microbiota usually returns to its baseline state. However, a less resilient microbiota may result in a long-term imbalance known as dysbiosis.

In the case of the early microbiota, studies suggest that an imbalance in the infant microbiota in the first stages of life may impact immune, digestive, and metabolic functions. Several studies have shown an association between disruptions in the early microbiota and a higher risk of these health conditions later: [2,3,4]

- Asthma
- Eczema
- Food allergies
- Inflammatory bowel disease
- Irritable bowel syndrome

- Type 1 diabetes
- Metabolic disorders like obesity and type 2 diabetes

Researchers are also examining how the early microbiota might affect brain development, behavior, and the risk for various neuropsychiatric disorders. As an example, several studies have shown that compared to typically developing children, those diagnosed with autism spectrum disorder have alterations in their gut microbiota with less diversity.[8,9]

How to Support Infant Gut Health

Current research cannot show a cause-and-effect link between the early microbiota and later disease risk. But there seems to be a connection. Parents and caregivers should do all they can to support and nourish the infant's microbiota, especially during those first three formative years.

After birth, breastmilk offers the best opportunity to pass on beneficial microbes and prebiotic compounds personalized to the infant. Parents should be encouraged to breastfeed exclusively for the first six months, if possible, with careful attention to the mother's diet and stress. Once children begin eating solids, a high-quality diet is essential. Avoid heavily processed foods or added sugars, and focus on ample fruits, vegetables, whole grains, and legumes.

Attention to the home environment is also crucial. Avoid toxins like harsh cleaning chemicals, cigarette smoke, and air pollution, which may disrupt the microbiota.

Depending on diet and other risk factors, healthcare professionals can recommend probiotics designed for infants and young children and food or supplemental sources of prebiotics. These can add and nourish beneficial bacteria species, helping balance the microbiota as it matures.

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