

THE MICROBIOME & THE PRETERM INFANT: GUT IMMATURITY & DYSBIOSIS

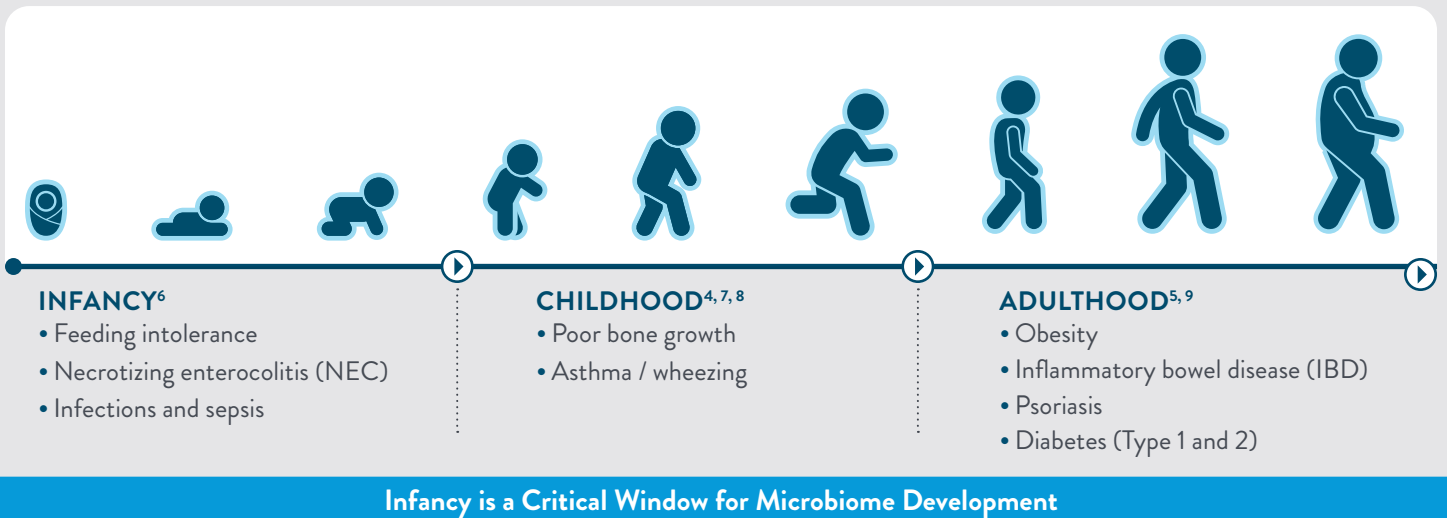
GUT IMMATURITY

The preterm infant's gut motility, digestion, absorption, immune defenses, barrier function, and circulatory regulation are underdeveloped.^{1,2}

DYSBIOSIS

The abnormal colonization or the imbalance of microbes.³

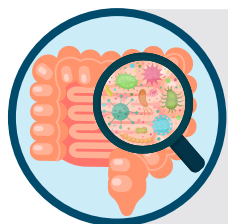
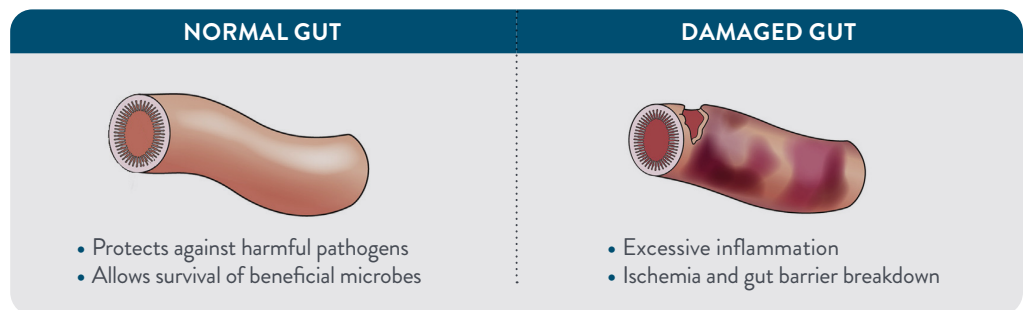
THE CHALLENGE: The combination of gut immaturity and dysbiosis places preterm infants at risk for impaired nutrient absorption, damaged barrier function, and compromised gut-based immunity, in turn predisposing them to health threats across the lifespan^{2,4,5}



THE SCIENCE: Gut pathophysiology in a preterm infant

For **full term infants**, the gut's immune system and microbiome mature in parallel during the first year of life, leading to better tolerance of foods and beneficial microbes.

In **preterm infants**, gut immaturity and dysbiosis can lead to abnormal immune responses and permeability to pathogens, which can lead to serious, life-threatening consequences such as NEC and sepsis.¹⁰⁻¹³



An immature infant gut has fewer and less diverse microbiota.^{3,14}

Supporting the gut microbiome in preterm infants promotes better health while lowering the risk for adverse health consequences.

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NEC is a devastating disease that can affect the intestine of preterm infants. Multiple environmental factors such as: microbial dysbiosis, dysregulated inflammation, and gut immaturity contribute to increased risk.⁶

1 in 14

premature infants with very low birth weight is likely to develop NEC^{1,10}

Premature infants who develop the life-threatening condition of NEC have a mortality risk of

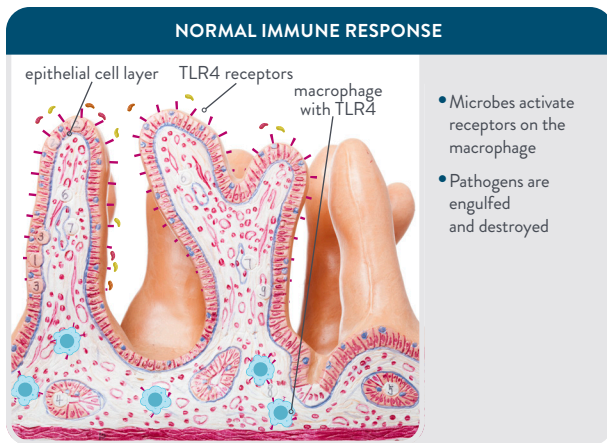
20-30%^{1,10}

NEC survival rates have remained low and unchanged for 3 decades, despite other advances in care for preterm infants¹³

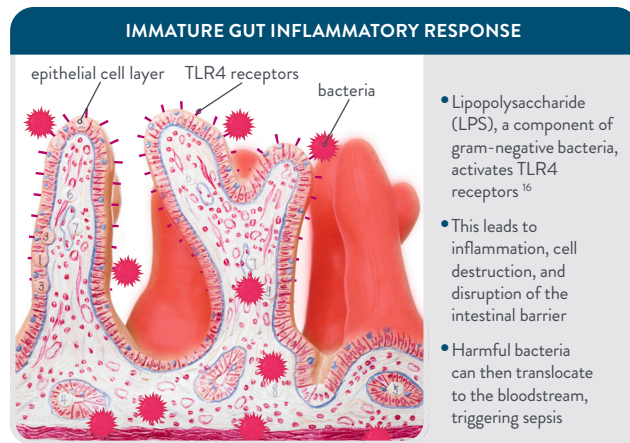


Why is NEC more likely to affect preterm infants than full-term infants?

Emerging research shows that a link between prematurity, NEC, and microbes is a membrane protein called toll-like receptor 4 (TLR4)¹⁵



- Microbes activate receptors on the macrophage
- Pathogens are engulfed and destroyed



- Lipopolysaccharide (LPS), a component of gram-negative bacteria, activates TLR4 receptors¹⁶
- This leads to inflammation, cell destruction, and disruption of the intestinal barrier
- Harmful bacteria can then translocate to the bloodstream, triggering sepsis

All part of the rapid-onset, serious condition of NEC

THE SOLUTION: Strategically build a microbiota with gut-friendly bacteria in early life



Use human milk for optimal intake of human milk oligosaccharides (HMOs), which serve as prebiotics to support healthy microbial growth.¹⁷



Use antibiotics judiciously to minimize overgrowth of harmful pathogens in the gut.³



Consider probiotics to help build a balanced population of gut microbes. Evidence suggests that such interventions can reduce intestinal inflammation and lower risk for adverse health outcomes.^{18,19} Importantly, giving probiotics to preterm infants can reduce the incidence of NEC.¹⁸

TAKE-HOME MESSAGES

PRETERM INFANTS CAN HAVE IMPAIRED MATURATION OF GUT MICROBIOTA AND DYSBIOSIS.²

1. If sustained, dysbiosis with inflammation may predispose the child to develop serious health consequences.^{2,4,5}
2. Dysbiosis and its adverse consequences in preterm infants can now be reduced by using a combination of strategies—human milk feeding, judicious use of antibiotics, and use of probiotics.^{3,17-20}

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