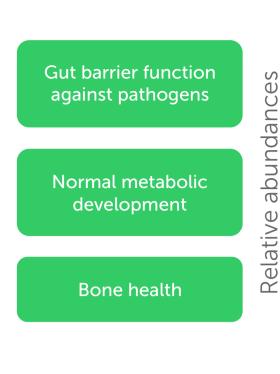


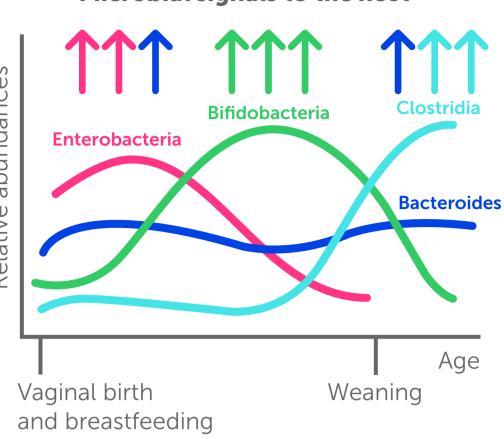
C-Section Birth and the Infant Gut Microbiota: Nutritional Strategies

Healthy gut microbiota development after birth why it is so important?

A healthy gut microbiota development after birth contributes to healthy growth, immediate and long-term health¹⁻⁵

Microbial signals to the host



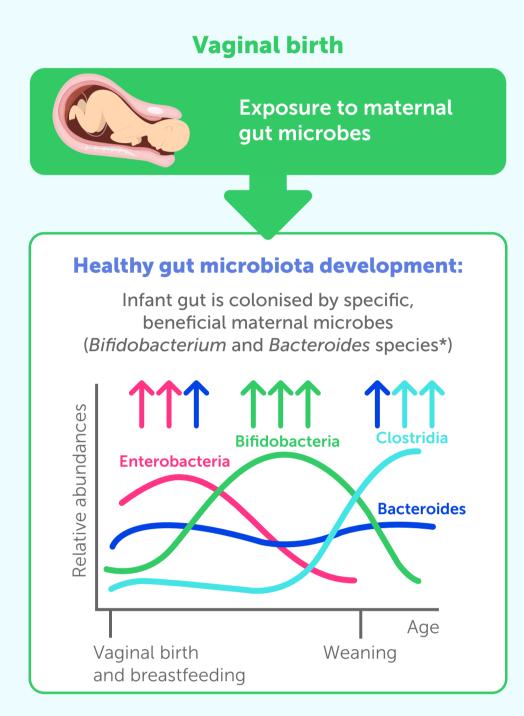


Proper development of a baby's immature immune system

Normal functioning of the gut-brain-axis on a baby's developing brain

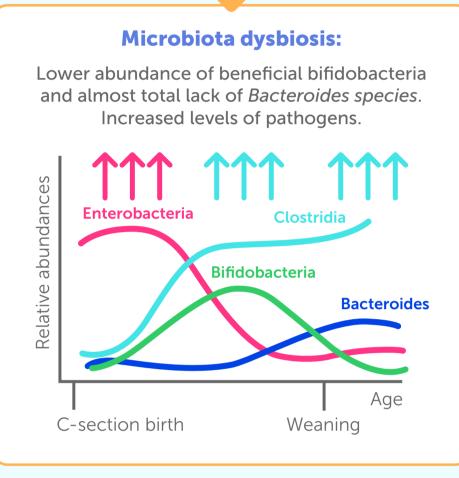
What is the impact of C-section birth on an infant's gut development and health?

C-section birth is a major disruptor of early gut microbiota development¹



Exposure to microbes from the skin and the hospital environment Microbiota dysbiosis: Lower abundance of beneficial bifidobacteria and almost total lack of *Bacteroides species*.

C-section birth

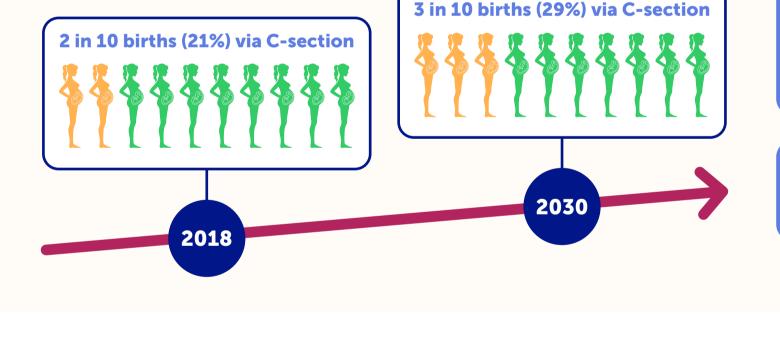


*Several species of Bifidobacterium and Bacteroides can metabolise human milk oligosaccharides (HMOs), which very likely explains their success in colonising the infant gut¹

Microbial dysbiosis in early life is associated with gastrointestinal infections and carries long-term health risks, including increased risk of chronic immune diseases, overweight, and may impact neurodevelopment¹⁻⁴

What do we know about C-section rates?

The global C-section rate is higher than recommended and continues to rise⁶



When medically necessary, a C-section is an effective means of saving maternal and infant lives⁷

maximum C-section rate of 10% to 15%⁷

WHO recommends a

microbiota after C-section in early life? HMOs, certain prebiotics and probiotics help shift gut microbiota in babies

Can nutritional interventions balance a disruptive gut

Prebiotics HMOs

born by C-section closer to that of vaginally born and breastfed infants⁸⁻¹⁰

Definition

A group of diverse and complex oligosaccharides in breast milk,

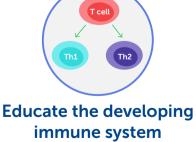
supporting gut microbiota and immune health in four major ways^{11,12}



Prevent pathogen

adhesion in the gut





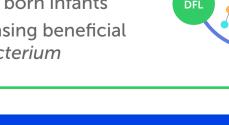
Pathogen Glycan on cell surface



A clinical study shows: Feeding a blend of 5 HMOs (2'FL, DFL, LNT, 3'SL, 6'SL) can8:

C-section born infants closer to breastfed and vaginally born infants by increasing beneficial Bifidobacterium

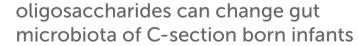
shift the gut microbiota of



Definition

A substrate selectively utilised by host microorganisms, conferring

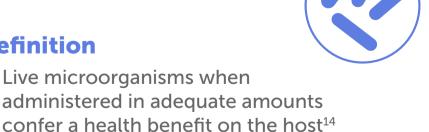




Feeding bovine milk-derived

towards the composition observed in vaginally born and breastfed infants9 **Probiotics**

Definition



Live microorganisms when administered in adequate amounts

- Efficacy of a probiotic is strain specific¹⁴
- Several clinical studies show:

Bifidobacterium lactis helps support a

healthy gut microbiota and immune system

- in formula-fed infants born by C-section¹⁵⁻¹⁷ ✓ Lactobacillus reuteri helps shift overall gut
 - microbiota profile and taxa abundance in C-section born infants towards that of vaginally born infants^{18,19}

C-section birth is a major disruptor of an infant's early gut microbiota development, which can have a negative impact on their health status. Early nutritional interventions with HMOs, certain

probiotics and prebiotics can help correct microbial dysbiosis and shift gut microbiota closer to that of vaginally born and breastfed infants.

C-section, caesarean section; DFL, difucosyllactose; FL, fucosyllactose; HMO, human milk oligosaccharide; LNT, lacto-N-tetraose; SL, sialyllactose.

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