Maturing the immune system

probiotics for disease prevention

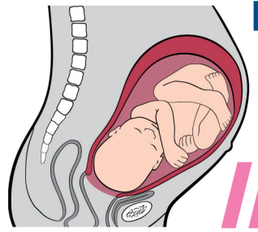
Medicine

90% of the cells in the **HUMAN BODY** are **BACTERIAL**[1]

The **MICROBIOME** has a **PROFOUND INFLUENCE** on **HOST HEALTH** and the development of the **IMMUNE RESPONSE**[1]

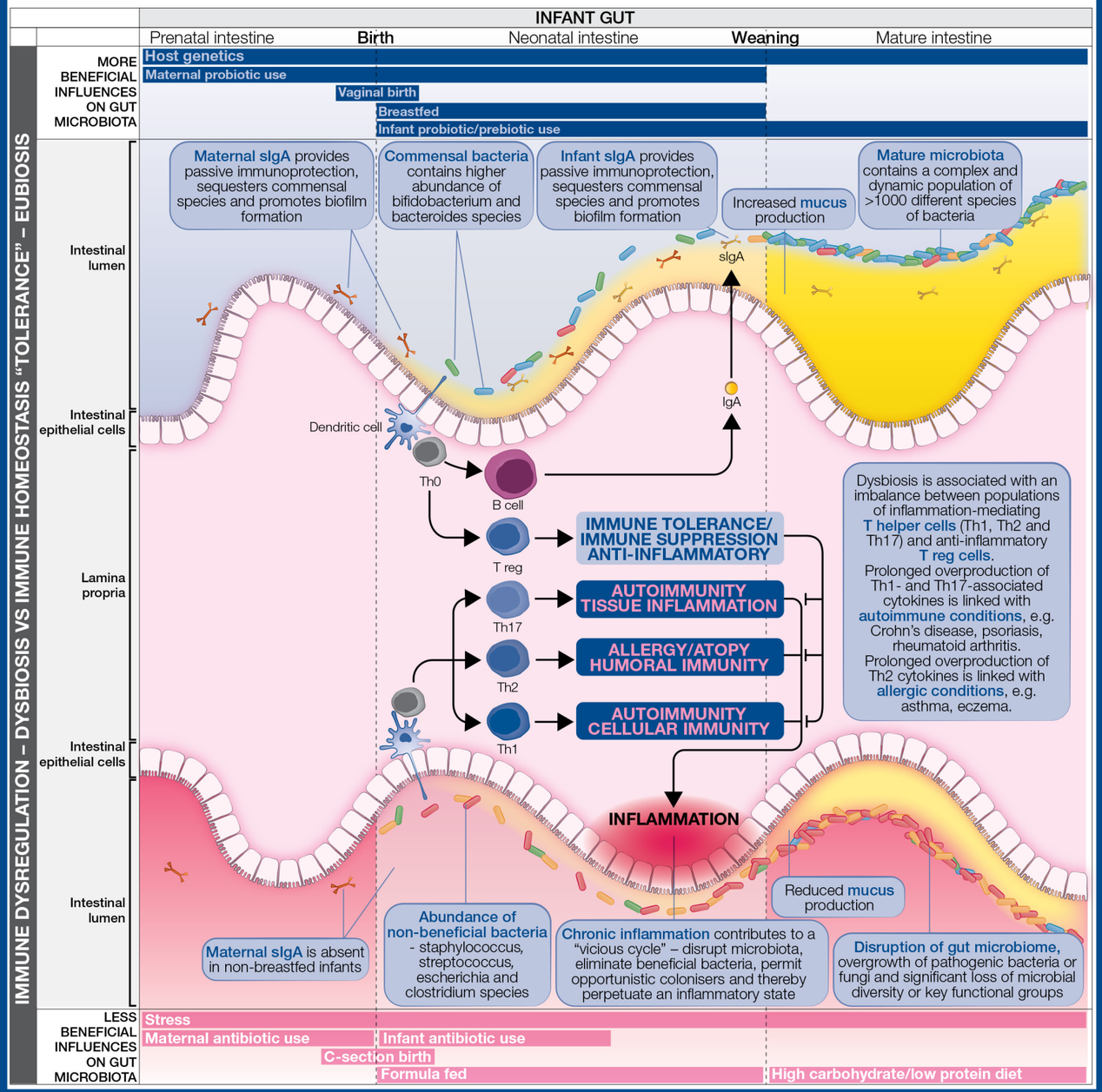
IMMUNE DISORDERS: **FAILURE** in the development of a **BALANCED IMMUNE RESPONSE**[1]

Over the last 50 years there has been a **STEEP INCREASE** in the incidence of **ATOPIC AND AUTOIMMUNE DISEASE**[2]

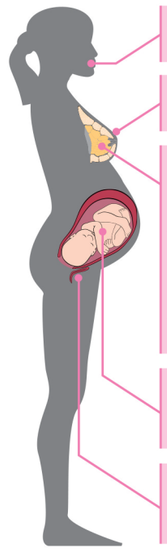


PREDISPOSITION TO DISEASE may, in part, be determined ***IN UTERO***[1]

MATURATION OF THE INFANT GUT[1-8]



MATERNAL SOURCES OF BACTERIA[7]



Mouth
Bacteria of oral origin found in amniotic fluid.

External breast
Skin of the breast is an external source of bacteria for breast milk.

Internal breast
Hundreds of microbes identified in breast milk. Abundant genera include: staphylococcus, streptococcus, serratia, pseudomonas, corynebacterium, ralstonia, propionibacterium, sphingomonas, bradyrhizobiaceae.

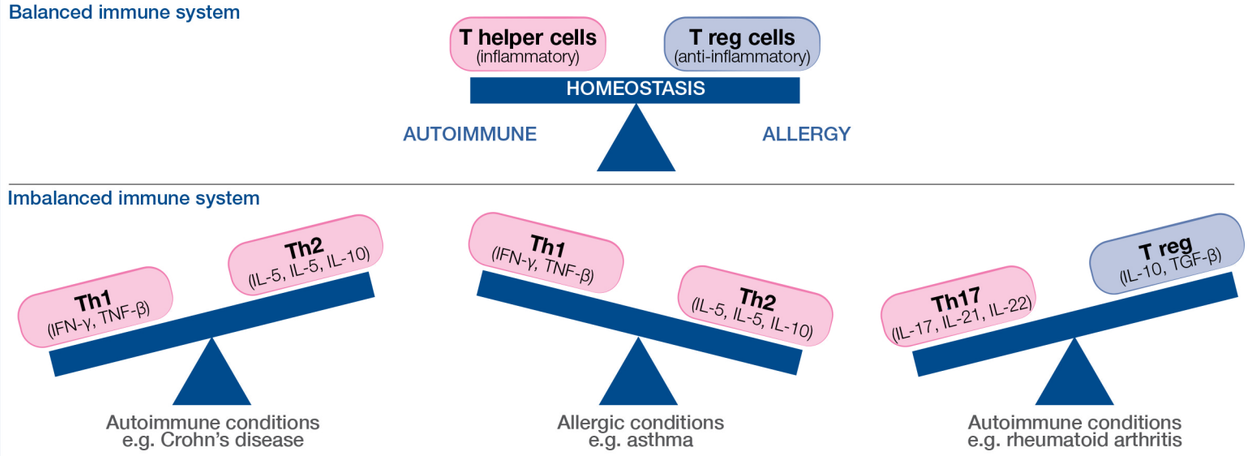
The bacterial composition of breast milk changes over time – milk produced immediately after labour contains more lactic acid bacteria (staphylococcus, streptococcus and lactococcus). Milk after 6 months of lactation shows an increase in bacteria typically found in the oral cavity (veillonella, leptotrichia and prevotella, typically found in the oral cavity).

An entero-mammary pathway exists that transports bacteria from the maternal gut to the mammary gland via dendritic cells, lymph and blood circulation.

Uterus
Bacteria found in umbilical cord blood, the placenta, amniotic fluid, foetal membranes and meconium of healthy infants. Meconium harbours microbes commonly found in gastrointestinal tract: enterococcus and escherichia.

Vagina
Delivery mode (vaginal delivery versus C-section) has been shown to influence postnatal gut microbiome. Microbiota of vaginally born infants resembles that of their mother's vagina, while that of C-section infants is representative of skin microbes.

CONSEQUENCES OF IMMUNE IMBALANCES[1-8]



IgA: immunoglobulin A; sIgA: secretory immunoglobulin A; Th0: naive T cell; T reg: regulatory T cell; Th1: T-helper 1; Th2: T helper 2; Th17: T helper 17; IFN-γ: interferon-gamma; TNF-β: tumour necrosis factor-beta; IL-4: interleukin 4, IL-5: interleukin 5; IL-10: interleukin 10; IL-17: interleukin 17; IL-21: interleukin 21, IL-22: interleukin 22; TGF-β: transforming growth factor-beta