BNF webinar:
Breastfeeding: Shaping the infant gut microbiota

Wed 19th June 2019
13.00-14.00 (BST)
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We would like to thank our Sustaining Member Companies for their continued support which enables us to offer an ongoing programme of events and training. BNF is also grateful to Nestle Nutrition for providing an educational grant towards the success of this webinar. However, the programme has been directed by the Foundation alone, which is committed to producing independent, evidence-based science.

At BNF webinars, each participating speaker/organisation is responsible for the accuracy of the information provided and is requested to declare any relevant interests.

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Programme

A great start: Breastfeeding – a public health perspective
Helena Gibson-Moore, British Nutrition Foundation

Development of the infant microbiome: the role of breastfeeding
Prof Christine Edwards, University of Glasgow

Human milk oligosaccharides: Every baby needs a sugar mama
Prof Lars Bode, University of California, San Diego

Breastfeeding and the infant microbiota – an important influence on growth in the first 1000 days?
Dr Ruairi Robertson, Queen Mary University of London & University of British Columbia

Speakers

Helena Gibson-Moore
Nutrition Scientist
British Nutrition Foundation

A great start: Breastfeeding – a public health perspective

Helena joined BNF further to graduating with first class BSc (Hons) degree in Human Nutrition at Kingston University in 2008. As a nutrition scientist at the Foundation, Helena’s responsibilities include appraising and reviewing scientific information and translating it into clear evidence-based messages to a variety of audiences. She also contributes to the media service, which involves answering nutrition and health enquiries from journalists as well as giving television and radio interviews. Helena plays a key role in the organisation of the BNF conference and webinar programme. Helena is an AfN Registered Public Health Nutritionist with a particular interest in pregnancy and early years nutrition.

Take home message:

- Despite the WHO recommendation for mothers to exclusively breastfeed for the first 6 months, breastfeeding prevalence in the UK is low, with only an estimated 1% of mothers exclusively breastfeeding at 6 months. There are also significant differences in subgroups of the population, for example younger mothers (20 years old or younger) and those of white ethnicity are less likely to initiate and continue breastfeeding.
- Clear health benefits are associated with breastfeeding for both mother and baby in both developing and developed countries. For example, breastfed infants have a reduced risk of gastrointestinal and respiratory infections and women who breastfeed have a reduced risk of developing breast cancer.
- Breastfeeding is associated with a lower risk of obesity compared to formula feeding, which may, in part, be attributed to the baby being more responsive to its appetite cues and/or the influence of bioactive compounds in breastmilk on the gut microbiome.

Declaration of interest: Employed by BNF. Details regarding BNF funding can be found at www.nutrition.org.uk
Prof Christine Edwards
Professor of Nutritional Physiology
University of Glasgow

Development of the infant microbiome: the role of Breastfeeding

Christine Edwards is a registered Nutritionist and Professor of Nutritional Physiology at the University of Glasgow. She studied Biochemistry and Physiology at the University of Sheffield and her PhD developed models to research gut bacteria and the impact of diet on their metabolism. Prof Edwards has been studying the role of gut bacteria in health for over 30 years, including a focus on early colonisation and the role of environment and early diet, as well the role of gut bacteria in gut health, obesity and human metabolism. She is chair of the ILSI Europe working group on Early Bacterial Colonization and Potential Implications Later in Life which aims to provide insight into the role of microbiota during the early stages of life in programming health and disease.

Take home message:

- The diversity and composition of the human gut microbiome has been associated with many disorders including inflammatory bowel disease, allergy, obesity, CVD and even brain function.
- Early colonisation after birth is a key stage in the development of the microbiome. Several factors can influence the infant gut microbiome including birth mode, and perinatal antibiotics but breast feeding is a major determinant.
- Breast milk contains many factors which promote healthy gut colonisation including immunoglobulins, lactoferrin and oligosaccharides.
- It has now been established that breast milk also has its own diverse microbiome which may also be important in the colonisation process but more research is needed.

Declaration of interest: None declared
Prof Lars Bode
Professor of Pediatrics and Endowed Chair of Collaborative Human Milk Research &
Director, Larsson-Rosenquist Foundation Mother-Milk-Infant Center of Research Excellence
(LRF MOMI CORE)
University of California, San Diego

Human milk oligosaccharides: Every baby needs a sugar mama

Lars Bode is Professor of Pediatrics and Endowed Chair of Collaborative Human Milk Research at the University of California, San Diego. He is also the Director of the Larsson-Rosenquist Foundation Mother-Milk-Infant Center of Research Excellence and Past President of the International Society for Research in Human Milk and Lactation. Prof Bode’s current research is focussed on investigating human milk oligosaccharide (HMO) biosynthesis and functions with potential benefits for infant health and development. Prof Bode was the recipient of the 2013 Norman Kretchmer Memorial Award in Nutrition and Development from the American Society for Nutrition, awarded for a substantial body of independent research in nutrition and development with potential relevance to improving children’s health.

Concluding remarks:

- Human milk oligosaccharides are the third most abundant component of human milk.
- Maternal (genetic and environmental) factors driving variation in complex HMO composition not fully understood.
- Combined approach of preclinical, cohort and clinical studies to fully assess effects, functions and potential claims.
- Sometimes individual HMOs are effective, and the effects are highly structure-specific.
- Sometimes complex mixtures of HMOs in specific relative abundancies (HMO profiles) are required (personalized?).

Declaration of interest: None declared
Breastfeeding and the infant microbiota – an important influence on growth in the first 1000 days?

Dr Ruairi Robertson obtained a BSc in Human Nutrition from University College Dublin. He subsequently undertook a PhD in microbiology from University College Cork during which time he conducted research on the interaction between maternal and early-life dietary lipids, the developing microbiome and metabolic health outcomes within the APC Microbiome Institute and as a Fulbright Scholar in Harvard University Medical School. Dr Robertson was awarded a 4-year Sir Henry Wellcome Postdoctoral Fellowship from the Wellcome Trust in 2017 to conduct research within the Blizard Institute in Queen Mary University of London on the influence of the intestinal microbiome in early child growth, particularly in the context of malnutrition. His research capitalises upon large cohort studies in Zimbabwe and Zambia to examine the environmental factors that influence early gut microbiota development and the subsequent influence on chronic and acute undernutrition.

Take home message:
Healthy infant growth is dependent upon the combined interaction between breastmilk and the gut microbiota.

Declaration of interest: Dr Robertson was invited to speak at the Nestlé Nutrition Institute Workshop “Global Landscape of Nutrition Challenges in Children” in March 2019.
BNF would like to welcome all our registrants in the UK and Europe, and further afield including our delegates from the US and Canada, Africa, Asia, the Middle East, South America and Australasia.

We have had over 600 registrations for this event.

Delegate profile
Abstracts of interest


Breastmilk contains a complex community of bacteria that may help seed the infant gut microbiota. The composition and determinants of milk microbiota are poorly understood. Among 393 mother-infant dyads from the CHILD cohort, we found that milk microbiota at 3-4 months postpartum was dominated by inversely correlated Proteobacteria and Firmicutes, and exhibited discrete compositional patterns. Milk microbiota composition and diversity were associated with maternal factors (BMI, parity, and mode of delivery), breastfeeding practices, and other milk components in a sex-specific manner. Causal modeling identified mode of breastfeeding as a key determinant of milk microbiota composition. Specifically, providing pumped breastmilk was consistently associated with multiple microbiota parameters including enrichment of potential pathogens and depletion of bifidobacteria. Further, these data support the retrograde inoculation hypothesis, whereby the infant oral cavity impacts the milk microbiota. Collectively, these results identify features and determinants of human milk microbiota composition, with potential implications for infant health and development.


Human milk oligosaccharides (HMOs) comprise a group of structurally complex, unconjugated glycans that are highly abundant in human milk. HMOs are minimally digested in the gastrointestinal tract and reach the colon intact, where they shape the microbiota. A small fraction of HMOs is absorbed, reaches the systemic circulation, and is excreted in urine. HMOs can bind to cell surface receptors expressed on epithelial cells and cells of the immune system and thus modulate neonatal immunity in the infant gut, and possibly also sites throughout the body. In addition, they have been shown to act as soluble decoy receptors to block the attachment of various microbial pathogens to cells. This review summarizes the current knowledge of the effects HMOs can have on infections, allergies, auto-immune diseases and inflammation, and will focus on the role of HMOs in altering immune responses through binding to immune-related receptors.


An increasing number of studies show low diversity of the gut microbiome in those with chronic diseases such as obesity, inflammatory bowel disease, and allergy. Manipulation of the microbiota may promote health. However, the adult microbiota is stable and may be difficult to change. Understanding the fixed and modifiable factors, which determine colonization in early life, may provide strategies for acquisition of a health-promoting microbiome. Not enough is known about the long-term effects of established determinants of gut colonization, including delivery mode, perinatal antibiotics, and infant diet. It has been suggested that weaning onto solid diet containing non-digestible carbohydrates and cessation of breastfeeding are key stages in the colonization process. In addition, the microbiome of the placenta, amniotic fluid, and breast milk, alongside vaginal and fecal bacteria, may aid the transfer of maternal bacteria to the infant. However, methodological issues such as contamination during collection and/or analysis should be considered. The factors determining early colonization are becoming more evident. However, longitudinal studies of microbiome maturation into late childhood and adulthood are required. The nutrition and health status of the mother before, during, and after birth may be major factors in the early colonization of the infant.
The assembly of microbial communities within the gastrointestinal tract during early life plays a critical role in immune, endocrine, metabolic, and other host developmental pathways. Environmental insults during this period, such as food insecurity and infections, can disrupt this optimal microbial succession, which may contribute to lifelong and intergenerational deficits in growth and development. Here, we review the human microbiome in the first 1000 days - referring to the period from conception to 2 years of age - and using a developmental model, we examine the role of early microbial succession in growth and development. We propose that an 'undernourished' microbiome is intergenerational, thereby perpetuating growth impairments into successive generations. We also identify and discuss the intertwining host-microbe-environment interactions occurring prenatally and during early infancy, which may impair the trajectories of healthy growth and development, and explore their potential as novel microbial targets for intervention.

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