

Microbiota In Health And Disease: From Pregnancy to Childhood

1. **Synopsis of the content**
2. **Optional chapters (words/pages)**
3. **List of optional co-editor(s)**
4. **Audience**
5. **Overview current knowledge on 'infant microbiota'; what does this book add to current existing knowledge?**

1. Synopsis of the content

This publication provides an overview of the scientific knowledge on infant and child microbiota based on the current state of the art in research. It will focus on microbiota with respect to related infant and childhood diseases and will provide an overview of optional practical interventions for health care professionals to improve the microbiota of their patients. The points of discussion are subsequently as follows: 1) Can we define a 'healthy' infant intestinal microbiota in view of microbial composition and genetic diversity?; 2) What environmental inputs positively affect or deregulate the infant and child microbiota?; 3) What are the immediate and long-term consequences of microbial dysbiosis on infant and child mental and physical health?; 4) How can health care professionals (youth-care physicians, paediatricians, gynaecologists, paediatric-fellows, dieticians) accurately act to prevent these consequences by focusing on infant and child microbiota?; 5) Can we accurately assess these interventions in medical research?; 6) Conclusion: future perspectives on infant and child microbiota in clinical practice and research.

2. Chapters

Preface. The 'healthy' infant and child gut microbiota

Chapter 1. The 'healthy' intestinal infant and child microbiota – does it exist?

(Infant and child microbiota: current status and future directions)

- With special emphasis on microbial composition, genetic diversity and microbiome dynamics.

I. Development, acquisition and disease states related to dysbiosis

Chapter 2. The development of the infant gut microbiota and its relevance to infant health

- This chapter describes the development of a healthy neonatal microbiota, and possible causes of bacterial symbiosis and dysbiosis.

- The pathology of associated in infant intestinal disorders (e.g. NEC, infectious diarrhoea, antibiotic-associated diarrhoea) will also be discussed.
- Per disorder aetiology/pathophysiology, diagnostics, optional therapeutic strategies in daily clinical practice (i.e. practical advice regarding diet and pre- probiotics to improve microbiota).
- Recommendations for future clinical research.

II. The role of enteric microbiota in functional systems of the body

Chapter 3. Gut microbiota and the gastro-intestinal system in children

Running header: Microbiota and the gastro-intestinal system in children

- This chapter describes the relation between the intestinal microbiota and gastro-intestinal maturation and metabolism in children. For example, it discusses maturation of digestive and absorptive functions of nutrients in the gut, gut bacteria influencing intestinal epithelial cell processes and motility, metabolic effects of enteric microbiota on mucosal barrier function, the effect of gut microbiota on host metabolism etc.

- The chapter portrays the anatomical and physiological mechanisms.

Chapter 4. Gut microbiota and the child's immune system.

Running header: Gut microbiota and childhood immunity

- Exploring the interaction of the intestinal microbiota and the host immune system in children.
- In depth investigation how different colonization strategies of enteric microbiota during early childhood can influence the mucosal immune system, by what means intestinal microbiota elicits humoral and cellular immune mechanisms, the role of epithelial cells/epithelial barrier as component of the immune system, maternal microbial transmission influencing immune development during pregnancy etc.
- This chapter focuses on immunological and physiological mechanisms; related diseases will be extensively discussed in later chapters.

Chapter 5. The interplay between microbiota and the central nervous system during neurodevelopment

Running header: Microbiota and the central nervous system

- This chapter discusses the concomitant development of the gut microbiota and neurological systems in infancy.
- It provides an in depth overview of functions of the enteric nervous system, microbiome-gut-brain-axis, gut-brain-axis, HPA-axis etc. in infants and children.
- The chapter describes the anatomical and physiological mechanisms; related diseases will be discussed in later chapters.

III. Shaping the gut: environmental factors affecting infant microbial development

Chapter 6. Perinatal factors and the infant microbiota

- This chapter describes maternal microbial transfer to the fetus, the effect of maternal factors (i.e. maternal stress during pregnancy, maternal diet, maternal metabolic and immunological disorders) on microbial development, the role of gestational age on infant microbial development, natural mode of delivery (vaginal delivery) etc.
- Practical recommendations in relation to clinical treatment and research.

Chapter 7. The impact of pre and postnatal medical interventions on infant gut microbiota

Running header: Pre- and postnatal medical interventions and the infant gut microbiota

- Describing the influence of infant and maternal medical treatments during the perinatal period on infant gut microbiota composition. For example, the effect of infant postnatal ingestion of antibiotics or antimycotic agents on infant microbial development, the relation between maternal infection and antibiotic prophylaxis during pregnancy (e.g. Group B Streptococcus prophylaxis) and infant microbiota, the influence of the mode of delivery (caesarean section).
- In short, the potential child health consequences of maternal and infant antibiotic use.
- Practical recommendations for the use of medical treatments for mothers and infants during the perinatal period.

Chapter 8. Early diet and the infant gut microbiome. How breastfeeding and solid foods shape the microbiome.

Running header: The impact of infant feeding and weaning on the gut microbiome

- This chapter describes the effect of breast-feeding, formula feeding and weaning on infant microbial development.
- Practical recommendations in relation to clinical treatment and research.

- To note: a broad overview of the influence and role of pre- and probiotics and synbiotics will be provided in later chapters.

IV. The role of microbial measurements in clinical practice and research

Chapter 9. Methodologies for microbiota assessment in infancy and childhood.

- Overview of modern (molecular) techniques to sample, classify and identify bacteria in clinical daily clinical practice and clinical research.

V. Pre- probiotics and synbiotics

Chapter 10. Probiotic interventions to optimize the infant and child microbiota.

Running header: Probiotics and microbiota

- Definition/nomenclature, possible mechanism of action (infant probiotic intake and maternal probiotic intake during pregnancy), safety profiles (infant probiotic intake, probiotic intake during pregnancy), probiotic applications (e.g. microbial sprays, oral intake etc). To note, optional probiotic efficacy per disease will extensively be discussed under section VI.

Chapter 11. Safety of probiotics

- This chapter provides most up to date information on the safety of probiotic ingestion by infants and children.

VI. Dysbiosis of the gut and infant diseases (0-2 years).

Chapter 12. The role of intestinal microbiota in infant allergic diseases.

- This chapter discusses the role of intestinal microbiota in auto-immune diseases in infants (e.g. atopic dermatitis/eczema, (food) allergies).
- Per disorder aetiology/pathophysiology, diagnostics, optional therapeutic strategies in daily clinical practice (i.e. practical advice regarding diet and pre- probiotics to improve microbiota).
- Recommendations for future clinical research.

Chapter 13. The association between intestinal microbiota and infant crying and behaviour.

- This chapter provides insight into the relation between intestinal microbiota and infant mental health (e.g. colic, crying, behaviour).
- Per condition aetiology/pathophysiology, diagnostics, optional therapeutic strategies in daily clinical practice (i.e. practical advice regarding diet and pre- probiotics to improve microbiota).
- Recommendations for future clinical research.

VII. Dysbiosis of the gut and childhood diseases (2-12 years).

Chapter 14. Intestinal microbiota and the development of gastrointestinal disorders in children.

- This chapter addresses the role of gut microbiota in the development of gastrointestinal disorders in children (e.g. functional gastro-intestinal disorders, constipation, obesity, gastrointestinal infections (H. Pylori, C. difficile, Shigella, E. Coli)).
- Per disorder aetiology/pathophysiology, diagnostics, optional therapeutic strategies in daily clinical practice (i.e. practical advice regarding diet and pre- probiotics)
- Recommendations for future clinical research.

Chapter 15. Intestinal microbiota and allergic and auto-immune disorders in children.

- This chapter discusses the role of gut microbiota in the development of allergic and auto-immune disorders in children (e.g. IBD, celiac disease, type 1 diabetes, atopic disorders (wheezing/asthma, allergic rhinitis)).
- Per disorder aetiology/pathophysiology, diagnostics, optional therapeutic strategies in daily clinical practice (i.e. practical advice regarding diet and pre- probiotics), recommendations for future clinical research.
- Recommendations for future clinical research.

Chapter 16. Microbiota and mental health disorders in childhood

- This chapter discusses the role of gut microbiota in the development of mental health or mood disorders in children (e.g. anxiety, depression, psychiatric disorders - ADHD and autism).
- Per disorder aetiology/pathophysiology, diagnostics, optional therapeutic strategies in daily clinical practice (i.e. practical advice regarding diet and pre- probiotics).
- Recommendations for future clinical research.

VIII Dysbiosis outside of the gut and childhood diseases (2-12 years).

Consequences of dysbiosis outside of the gut

Chapter 17. Microbiota and the respiratory tract

- The child's microbiota in relation to infectious diseases outside of the gut (e.g. oral infections, ear-nose-throat infections, pneumonia, UTIs).
- Per disorder aetiology/pathophysiology, diagnostics, optional therapeutic strategies in daily clinical practice (i.e. practical advice regarding diet and pre- probiotics).
- Recommendations for future clinical research.

Chapter 18. Microbiota and urinary genitonal tract

- The child's microbiota in relation to infectious diseases outside of the gut (e.g. oral infections, ear-nose-throat infections, pneumonia, UTIs).
- Per disorder aetiology/pathophysiology, diagnostics, optional therapeutic strategies in daily clinical practice (i.e. practical advice regarding diet and pre- probiotics).
- Recommendations for future clinical research.

Conclusion.

Personalized treatment: future directions to improve infant and child microbiota.

Chapter 19. Future perspectives in child health: from a microbial perspective

- Future perspectives on how to improve child microbiota and to prevent or treat infant and childhood diseases.
- Management of child microbiota, the future role for microbial altering applications (i.e faecal transplantations) and diagnostic tools (i.e. e-nose) in daily clinical practice.
- Prioritization in clinical research.

3. List of co-editors

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4. Audience

The audience will comprise of paediatricians, gynaecologists, youth health care physicians, fellows/residents/medical students, microbiologists, microbial and medical scientists and dieticians.

5. Overview current knowledge on 'infant microbiota'; what does this book add to current existing knowledge?

There is growing evidence on the relationship between child microbiota, health and disease. This project provides a novel approach by discussing all these relationships in one book. To our knowledge, this edition will be the first complete scientific overview for health care professionals and scientists, and the first to provide practical guidance for daily medical care and research. This book employs a holistic view on infant and child microbiota and health, ultimately, to improve infant and child health worldwide.