The effect of age on the intestinal mucus thickness, microbiota composition and immunity in relation to sex in mice

A mucus layer covers and protects the intestinal epithelial cells from direct contact with microbes. This mucus layer not only prevents inflammation but also plays an essential role in microbiota colonization, indicating the complex interplay between mucus composition-microbiota and intestinal health. However, it is unknown whether the mucus layer is influenced by age or sex and whether this contributes to reported differences in intestinal diseases in males and females or with ageing. Therefore, in this study we investigated the effect of age on mucus thickness, intestinal microbiota composition and immune composition in relation to sex. The ageing induced shrinkage of the colonic mucus layer was associated with bacterial penetration and direct contact of bacteria with the epithelium in both sexes. Additionally, several genes involved in the biosynthesis of mucus were downregulated in old mice, especially in males, and this was accompanied by a decrease in abundances of various Lactobacillus species and unclassified Clostridiales type IV and XIV and increase in abundance of the potential pathobiont Bacteroides vulgatus. The changes in mucus and microbiota in old mice were associated with enhanced activation of the immune system as illustrated by a higher percentage of effector T cells in old mice. Our data contribute to a better understanding of the interplay between mucus-microbiota-and immune responses and ultimately may lead to more tailored design of strategies to modulate mucus production in targeted groups.
Correlation of the allergenicity and tolerogenicity of two cow’s milk protein products with intestinal uptake

General information
State: Published
Organisations: National Food Institute, Research Group for Gut Microbiology and Immunology, Technical University of Denmark, Utrecht University, Arla Foods
Authors: Graversen, K. (Intern), Hornslet, S. E. (Ekstern), Smit, J. J. (Ekstern), Heydenreich Jensen, L. (Intern), Christoffersen, H. F. (Ekstern), Jacobsen, L. N. (Ekstern), Bøgh, K. L. (Intern)
Pages: 320-320
Publication date: 2017
Conference: European Academy of Allergy and Clinical Immunology Congress 2017, Helsinki, Finland, 17/06/2017 - 17/06/2017
Main Research Area: Technical/natural sciences

Publication information
Journal: Allergy
Volume: 72
Issue number: S103
Article number: 0455
ISSN (Print): 0105-4538
Correlation of the allergenicity and tolerogenicity of two cow's milk protein products with their intestinal uptake – a study in Brown Norway (BN) rats
General information
State: Published
Organisations: National Food Institute, Research Group for Gut Microbiology and Immunology, Technical University of Denmark, Utrecht University, Arla Foods Ingredients Group P/S
Authors: Graversen, K. (Intern), Asukowit, C. (Ekstern), Reholt, J. (Ekstern), Homslet, S. E. (Ekstern), Jensen, L. H. (Intern), Smit, J. (Ekstern), Christoffersen, H. F. (Ekstern), Jacobsen, L. N. (Ekstern), Bøgh, K. L. (Intern)
Number of pages: 1
Pages: 35-35
Publication date: 2017

Host publication information
Title of host publication: Proceedings of the 3rd International ImpARAS Conference
Place of publication: Helsingør, Denmark
Article number: 016
Main Research Area: Technical/natural sciences
Conference: 3rd International ImpARAS Conference, Helsingør, Denmark, 10/10/2017 - 10/10/2017
Electronic versions:
Proceeding book
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2017

Correlation of the allergenicity and tolerogenicity of two cow’s milk protein products with their intestinal uptake – a study in Brown Norway rats

General information
State: Published
Organisations: National Food Institute, Research Group for Gut Microbiology and Immunology, Technical University of Denmark, Arla Foods Ingredients Group P/S, Utrecht University
Authors: Graversen, K. (Intern), Asukowit, C. (Ekstern), Reholt, J. (Ekstern), Homslet, S. E. (Ekstern), Smit, J. (Ekstern), Christoffersen, H. F. (Ekstern), Jacobsen, L. N. (Ekstern), Bøgh, K. L. (Intern)
Number of pages: 1
Publication date: 2017
Main Research Area: Technical/natural sciences
Electronic versions:
ImpARAS_2017_Abstract_Katrine_Graversen.pdf
Source: PublicationPreSubmission
Source-ID: 138327626
Publication: Research - peer-review › Conference abstract for conference – Annual report year: 2017

The effect of Akkermansia muciniphila on house dust mite induced allergic airway inflammation

General information
State: Published
Organisations: National Food Institute, Research Group for Gut Microbiology and Immunology, University of Zurich
Authors: Graversen, K. (Intern), Barcik, W. (Ekstern), Fersti, R. (Ekstern), Frei, R. (Ekstern), O'Mahony, L. (Ekstern), O’Mahony, L. (Ekstern), Bøgh, K. L. (Intern),
Number of pages: 1
Pages: 56-56
Publication date: 2017

Host publication information
Title of host publication: Proceedings of the 3rd International ImpARAS Conference
Place of publication: Helsingør, Denmark
Article number: F03
Main Research Area: Technical/natural sciences
Conference: 3rd International ImpARAS Conference, Helsingør, Denmark, 10/10/2017 - 10/10/2017
Electronic versions:
Proceeding book
Publication: Research - peer-review › Conference abstract in proceedings – Annual report year: 2017

Establishing methods to evaluate intestinal uptake of food proteins
**Projects:**

**Microbiota and cow's milk tolerance**

Cow's milk allergy is a health problem of growing concern for which reason efficient strategies for the prevention is urgently needed. In recent years it has been demonstrated that the gut microbiota composition influences the development of allergy. However, our knowledge about how the microbiota composition influences the sensitising or tolerance inducing capacities of the food is only scarcely described. The objectives of this project are: (1) to increase our knowledge about the interplay between food proteins and the gut microbiota, and how this interplay impact on induction of cow’s milk allergy versus tolerance, and (2) in a broader perspective to gain knowledge about mechanisms influenced by microbiota, which drives the immune system towards allergy or tolerance.

Intact whey, which is one fraction of cow’s milk often used for infant formula, and enzymatic hydrolysed products hereof, used for hypoallergic infant formulas, will used as model protein ingredients. The interplay between whey-based ingredients and the gut microbiota will be investigated in in vitro fermentation studies based on faecal samples from food allergic and healthy infants, as well as in animal studies in which the gut microbiota is manipulated by antibiotics treatment. Microbial composition will be analysed by 16S rRNA gene sequencing in combination with quantitative real-time PCR. The allergy or tolerance inducing capacity of the different whey-based ingredients and the influence of the gut microbiota composition will be analysed by evaluating different serological and cell based end-points. Appropriate functional in vitro, in vivo and ex vivo assays will be applied to investigate the mechanism by which the gut microbiota and metabolites hereof impact on directing the immune system towards allergy or tolerance.

**National Food Institute**

Research Group for Gut Microbiology and Immunology

Arla Foods Ingredients Group P/S

Period: 01/01/2016 → 31/12/2018

Number of participants: 4

Milk allergy, tolerance, infant formulas, gut microbiota

Number of related Ph.D. students: 1

Project participant:

Graversen, Katrine (Intern)

Licht, Tine Rask (Intern)

Bahl, Martin Iain (Intern)

Project Manager, academic:

Bøgh, Katrine Lindholm (Intern)

Project
Microbiota and cow’s milk tolerance

National Food Institute
Period: 15/12/2015 → 14/12/2018
Number of participants: 4
Phd Student:
Graversen, Katrine (Intern)
Supervisor:
Bahl, Martin Iain (Intern)
Licht, Tine Rask (Intern)
Main Supervisor:
Bøgh, Katrine Lindholm (Intern)

Financing sources
Source: Internal funding (public)
Name of research programme: Samfinansieret - Andet
Project: PhD