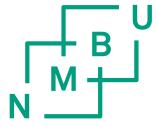


Gut microbiota in Prevention of Allergy among Children in Trondheim (PACT)

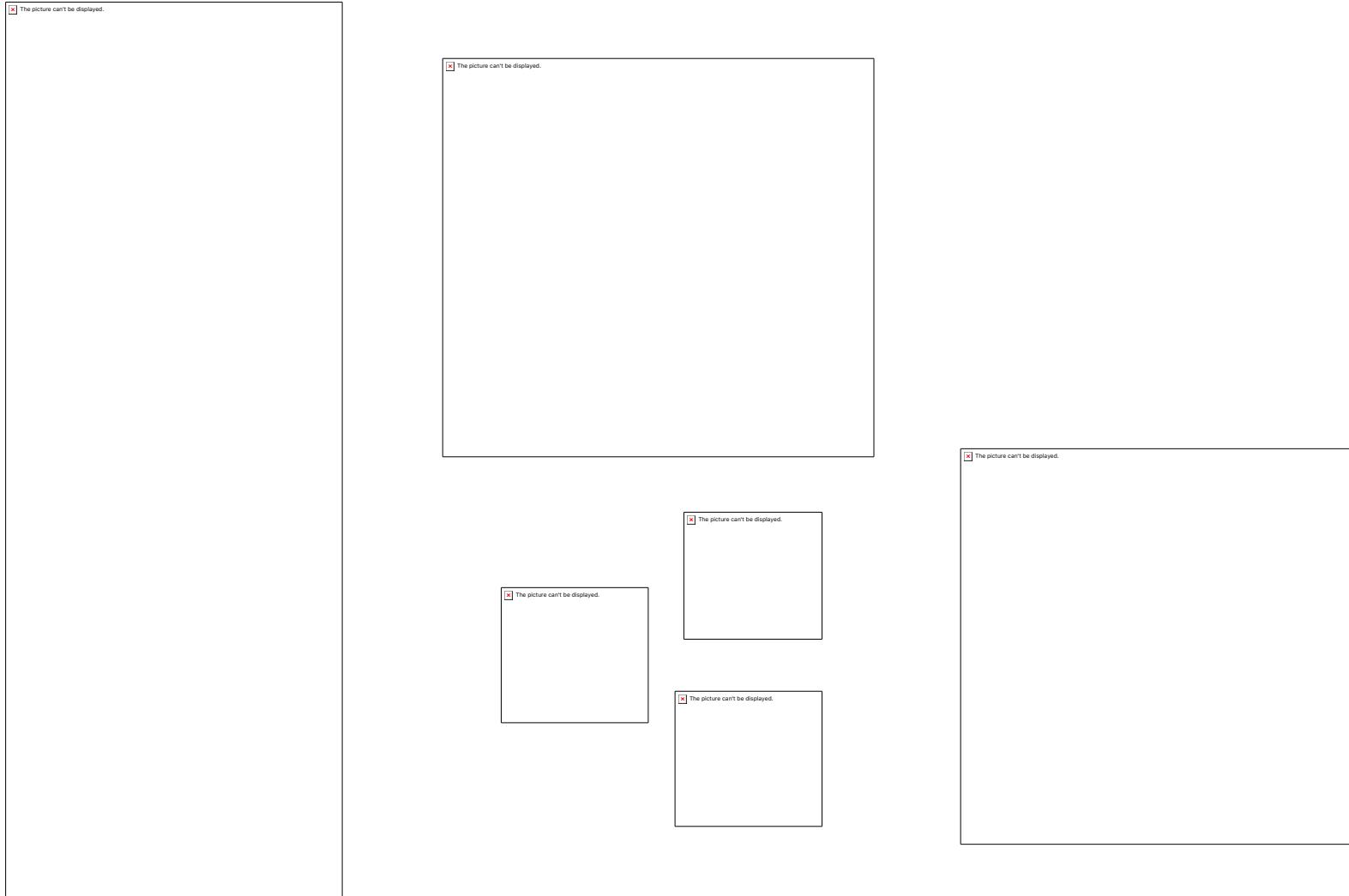
Ekaterina Avershina

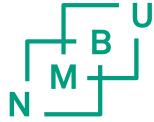
Microbial Diversity lab

29.10.2018



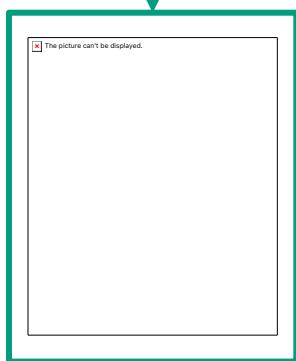
What are humans made of?





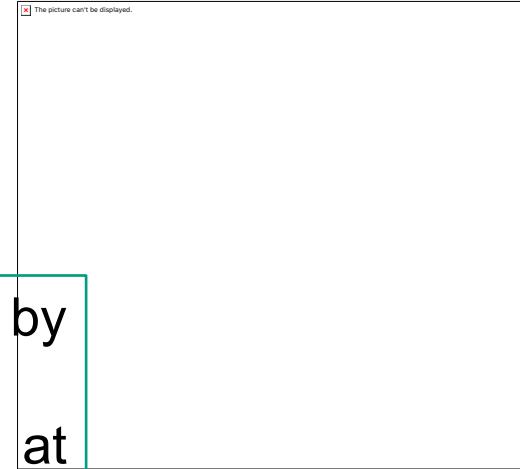
How human are humans?

Nutrients



- They *may* outnumber 'us' by at least 10 times
- All together they encode at least 100 times more genes than 'we' do
- Most of our bacteria reside in the gut

Metabolites





What do gut bacteria do for us?

Keep pathogens aside

Blood pressure

Allergy

Vitamins

Depression

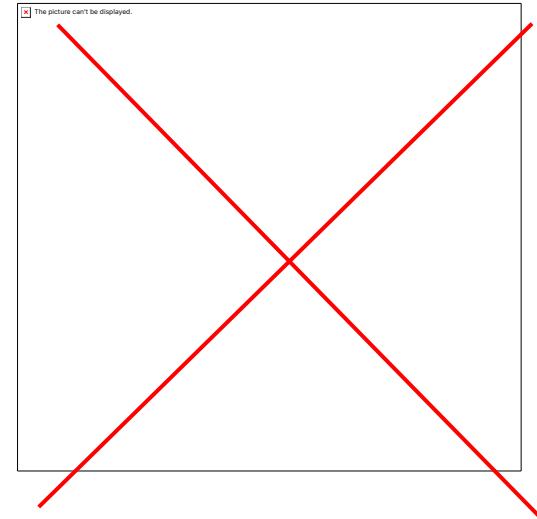
Inflammatory bowel disease

Energy for colon cells

Colorectal cancer

Autism

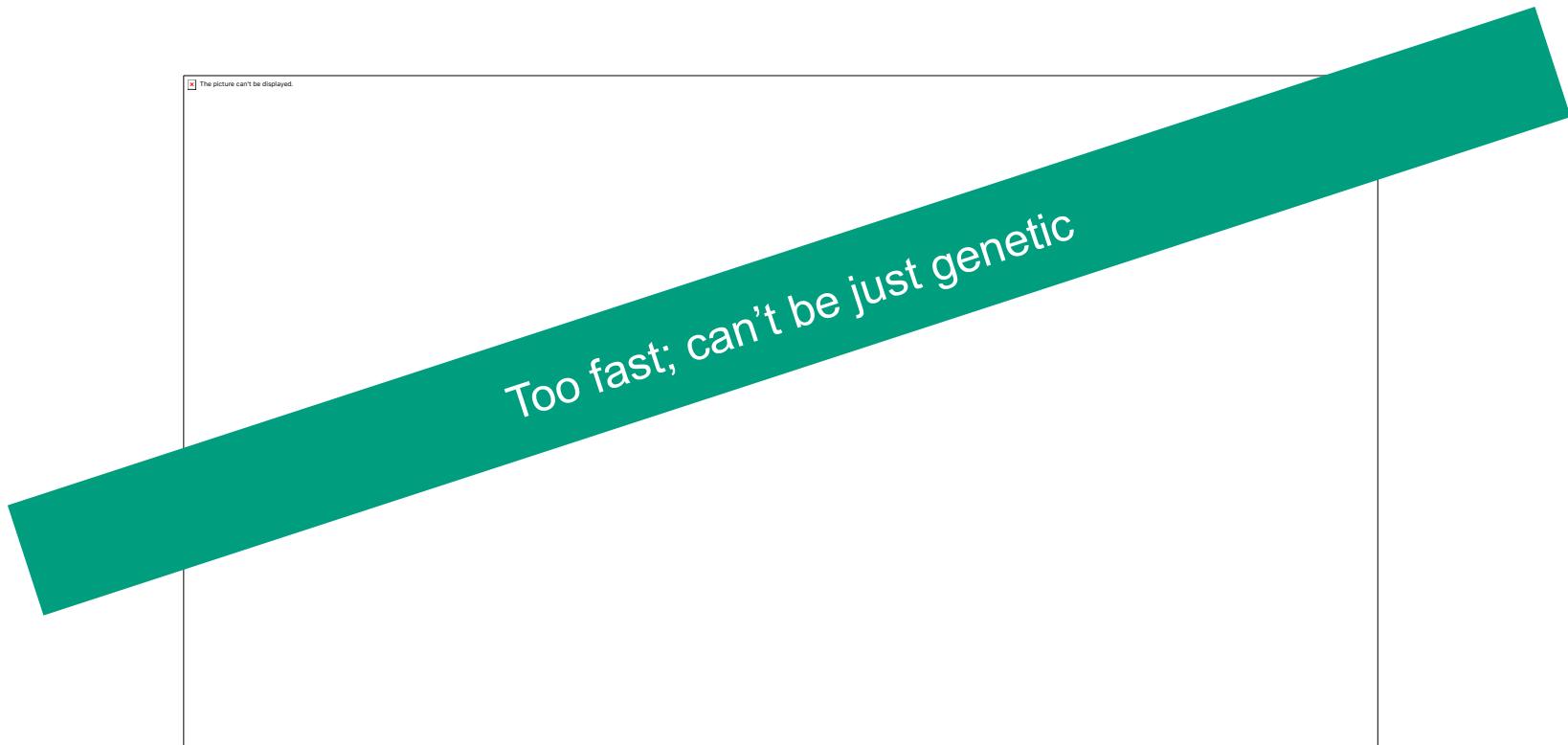
Chronic diarrhea



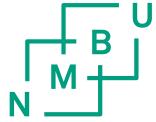
Allergy



More than 150 million Europeans (~20 %) suffer from chronic allergic diseases (European Academy of Allergy and Clinical Immunology, 2016)



Global Risk Forum 2nd One Health Summit (2013)

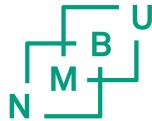


Why does it increase?

The picture can't be displayed.

Microbiota hypothesis (Wold, 1998)

Reduced exposure to different microbes in infancy impedes natural immune system development and causes predisposition to disease



Differences in GM

EC

doi: 10.1111/j.1365-2222.2008.03156.x

Clinical & Experimental Allergy, 39, 518–526

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Journal compilation © 2009 Blackwell Publishing Ltd

ORIGINAL ARTICLE Clinical Mechanisms in Allergic Disease

Altered early infant gut microbiota in children developing allergy up to 5 years of age

Y. M. Sjögren*, M. C. Jenmalm†, M.

EC

doi: 10.1111/cea.12253

Clinical & Experimental Allergy, 44, 842–850

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ORIGINAL ARTICLE Clinical Mechanisms in Allergic Disease

Low gut microbiota diversity in early infancy precedes asthma at school age

Allergy

EUROPEAN JOURNAL OF ALLERGY
AND CLINICAL IMMUNOLOGY

2017



allm^{1.6}

ORIGINAL ARTICLE

A prospective microbiome-wide association study of food sensitization and food allergy in early childhood

Jessica H. Savage, Kathleen A.
George O'Connor, Megan S.



ELSEVIER

Available online at www.sciencedirect.com

ScienceDirect

2015

Current Opinion in
Immunology

Microbiome influences on allergy in mice and humans

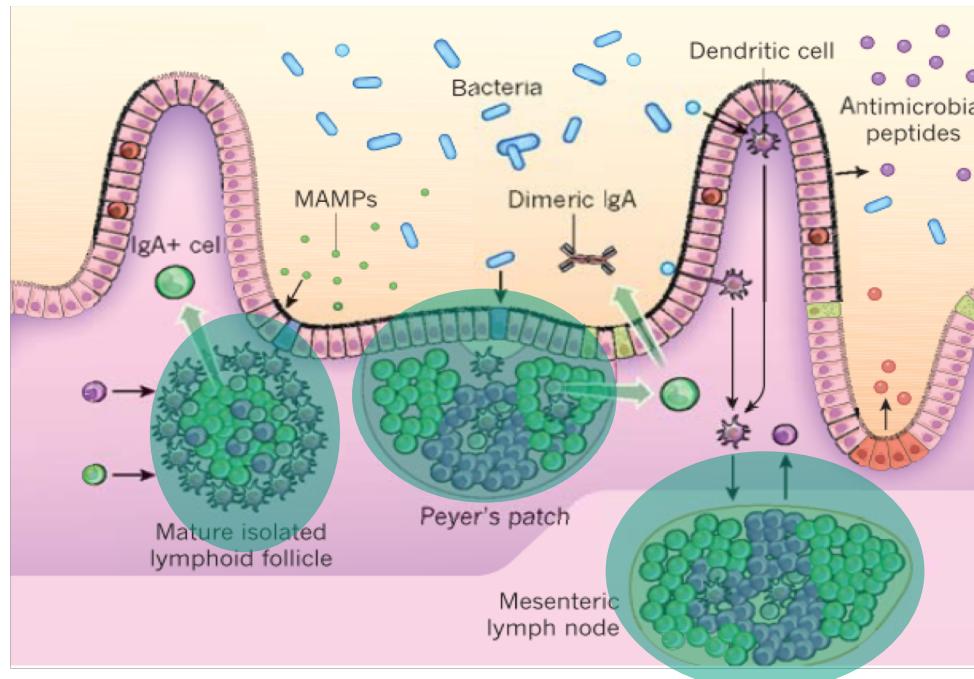
Benjamin J Marsland and Olawale Salami



GM and immune system

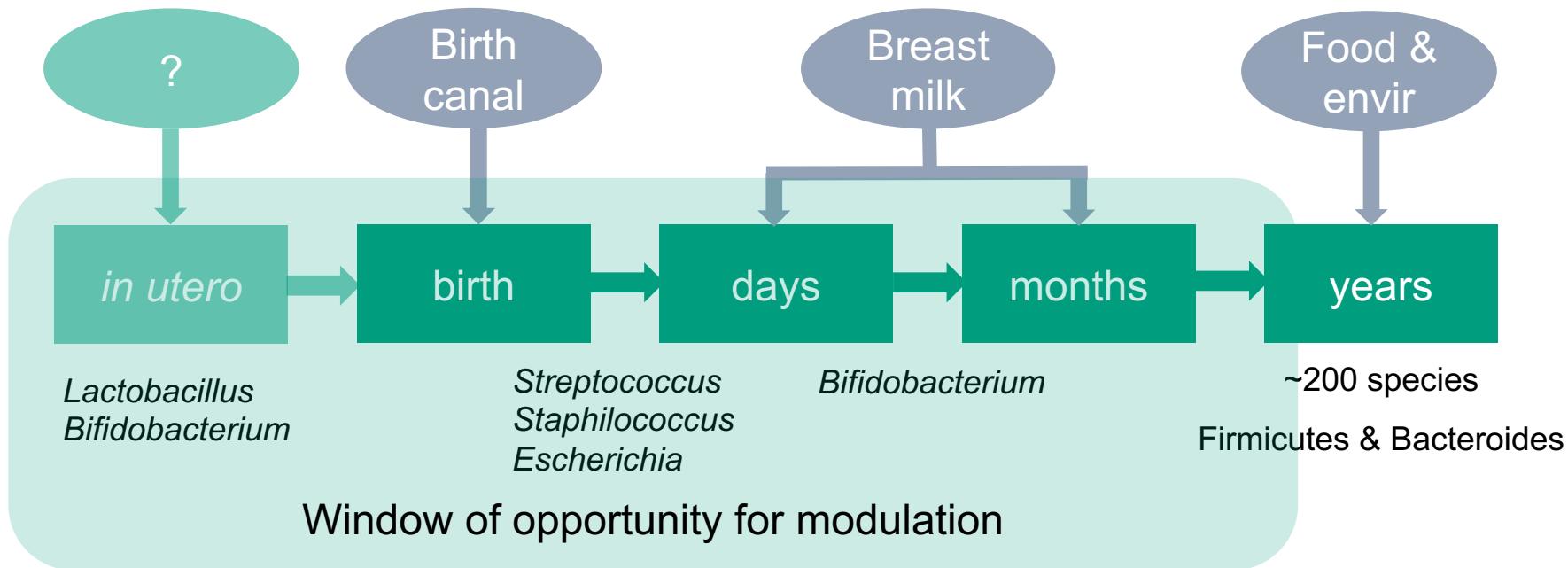
Gut-associated lymphoid tissue (GALT) – 70 % of the immune system

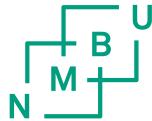
Most of human associated bacteria reside in gut



Maynard et al. (2012) Nature; 489: 231-241

Gut microbiota establishment





PACT study

THERAPEUTICS

BJD
British Journal of Dermatology

Probiotics in pregnant women to prevent allergic disease: a randomised controlled trial

Simpson et al. *BMC Dermatology* (2015) 15:13
DOI 10.1186/s12895-015-0030-1

C.K. Dotterud

Department of Pub

RESEARCH ARTICLE



Open Access

2010

Biola



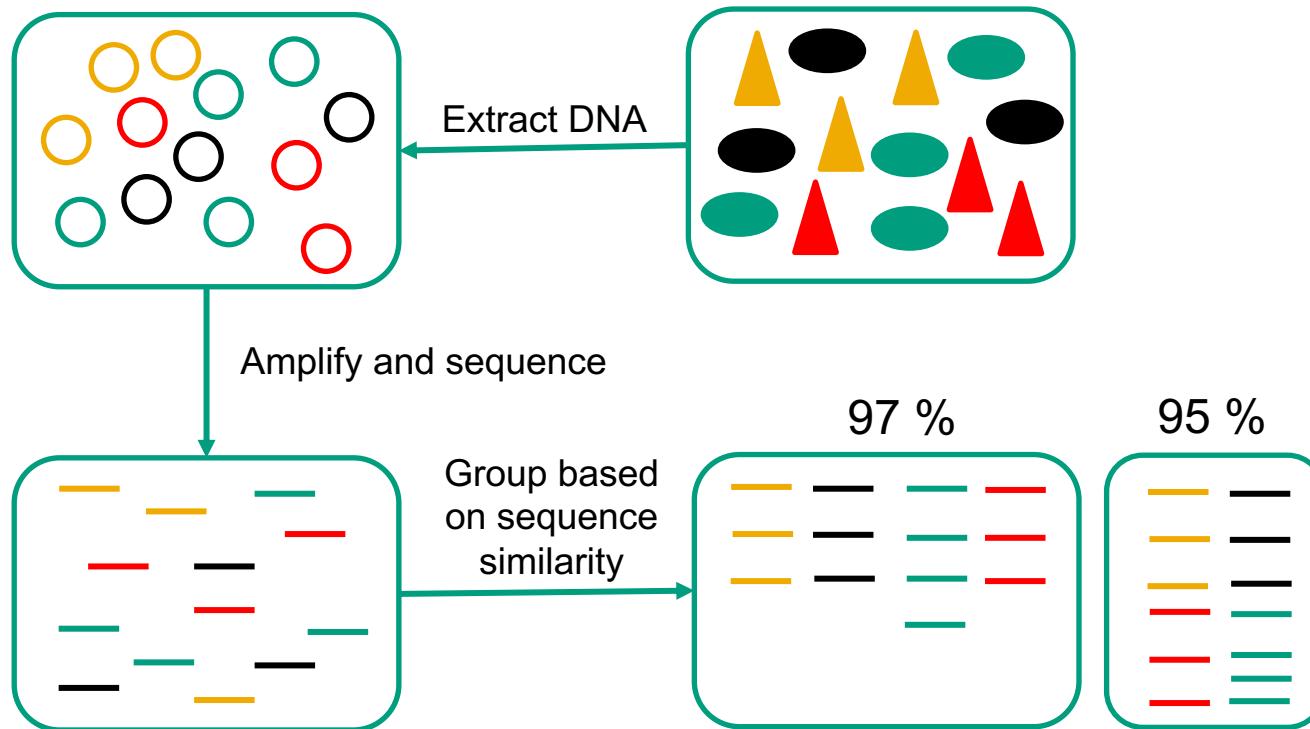
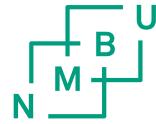
Perinatal probiotic supplementation in the prevention of allergy related disease: 6 year follow up of a randomised controlled trial

nd)

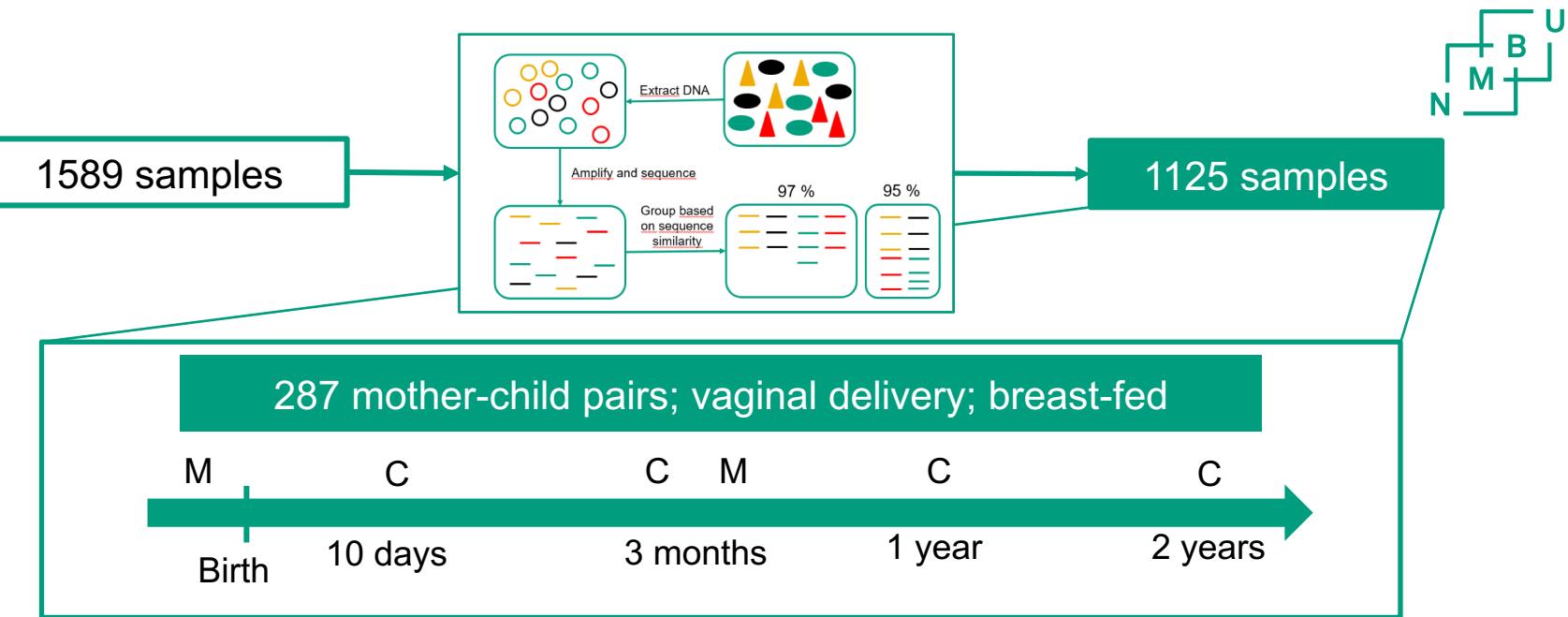
Melanie Rae Simpson^{1*}, Christian Kvikne Dotterud^{1,2}, Ola Storrø¹, Roar Johnsen¹ and Torbjørn Øien¹

At 2 years of age: significant **reduction** in incidence of **atopic dermatitis** in the Biola group; those who have – **milder symptoms** than in the placebo group

16S rRNA analysis



Groups = operational taxonomic units, **OTUs**



J Allergy Clin Immunol. 2017 Apr;139(4):1399-1402.e8. doi: 10.1016/j.jaci.2016.09.056. Epub 2016 Dec 5.

Effect of probiotics in prevention of atopic dermatitis is dependent on the intrinsic microbiota at early infancy.

Avershina E¹, Cabrera Rubio R², Lundgård K¹, Perez Martinez G², Collado MC², Storrø O³, Øien T³, Dotterud CK⁴, Johnsen R³, Rudi K⁵.

environmental
microbiology

Environmental Microbiology (2016)



doi:10.1111/1462-2920.13248

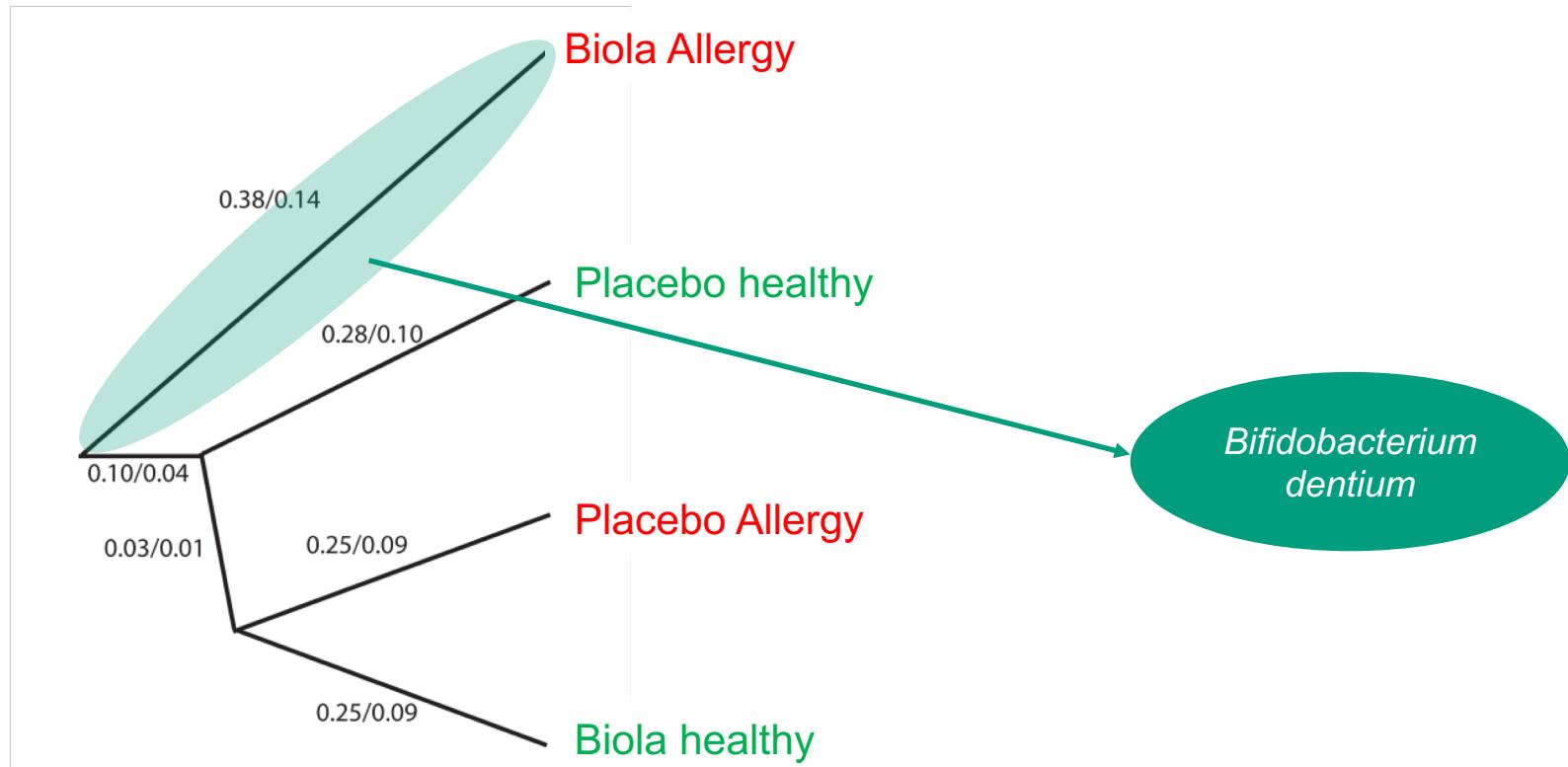
Transition from infant- to adult-like gut microbiota

E. Avershina,^{1*} K. Lundgård,¹ M. Sekelja,^{1,2} C. Dotterud,^{3,4} O. Storrø,³ T. Øien,³ R. Johnsen³ and K. Rudi¹

Effect of probiotics in prevention of atopic dermatitis is dependent on the intrinsic microbiota at early infancy.

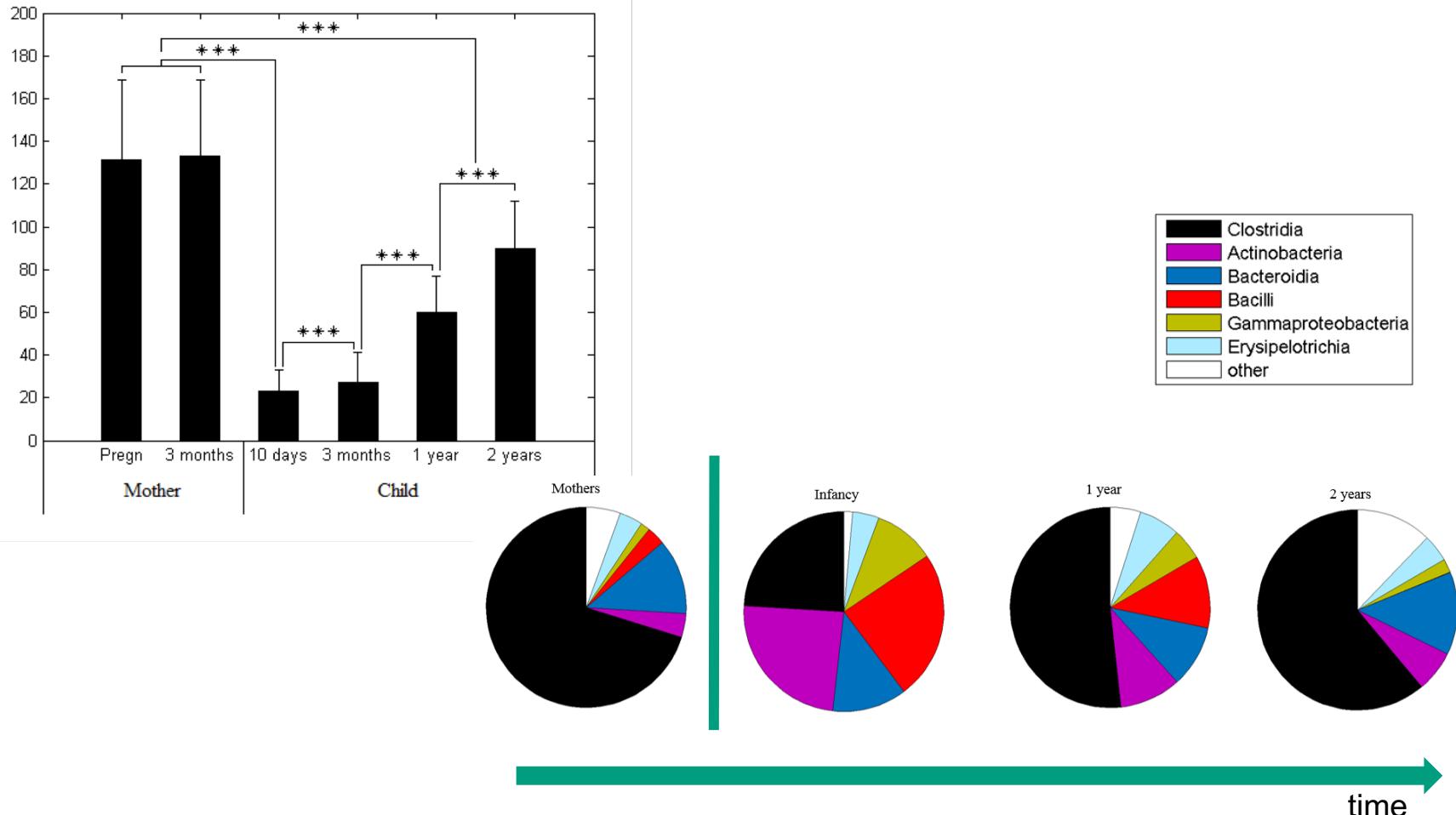
Avershina E¹, Cabrera Rubio R², Lundgård K¹, Perez Martinez G², Collado MC², Storø O³, Øien T³, Dotterud CK⁴, Johnsen R³, Rudi K⁵.

- No difference in microbiota diversity between probiotic and placebo group
- Higher detection rate of LGG in mothers and children of probiotic group

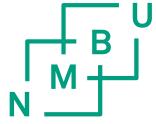


Transition from infant- to adult-like gut microbiota

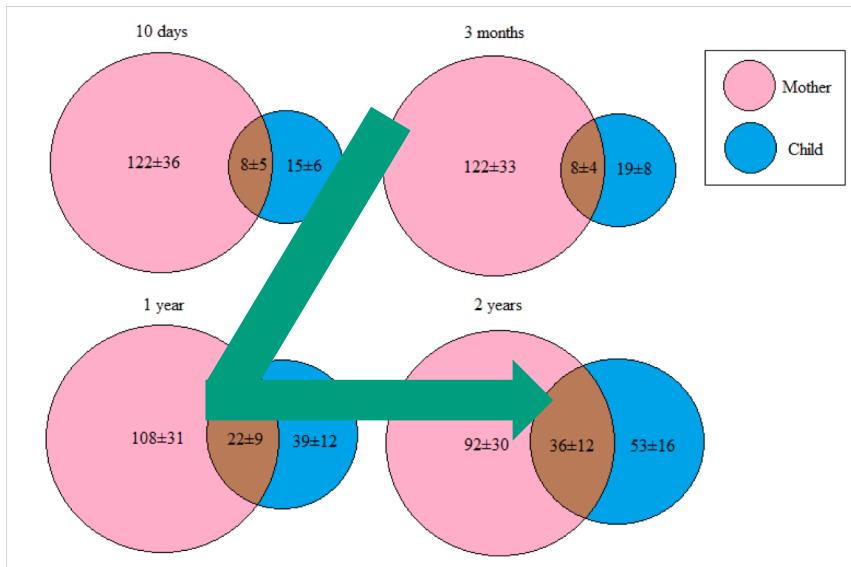
E. Avershina,^{1*} K. Lundgård,¹ M. Sekelja,^{1,2} C. Dotterud,^{3,4} O. Storrø,³ T. Øien,³ R. Johnsen³ and K. Rudi¹



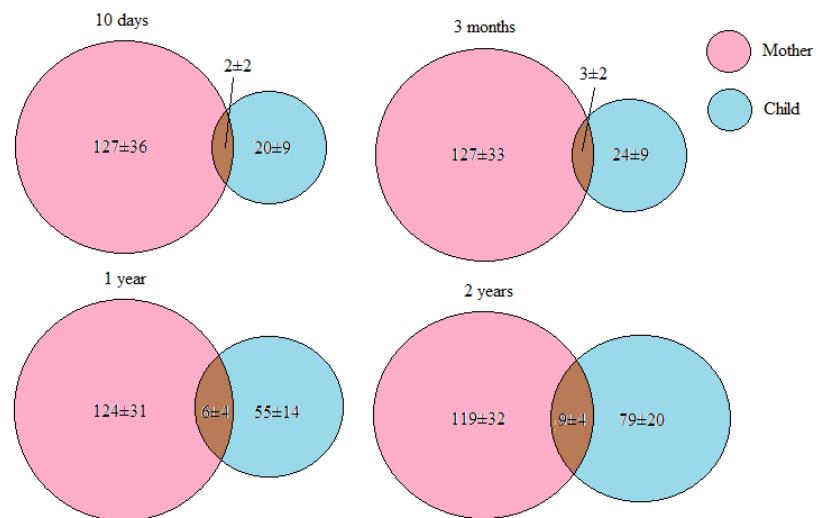
Mother-child sharing of OTUs

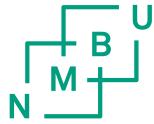


REAL

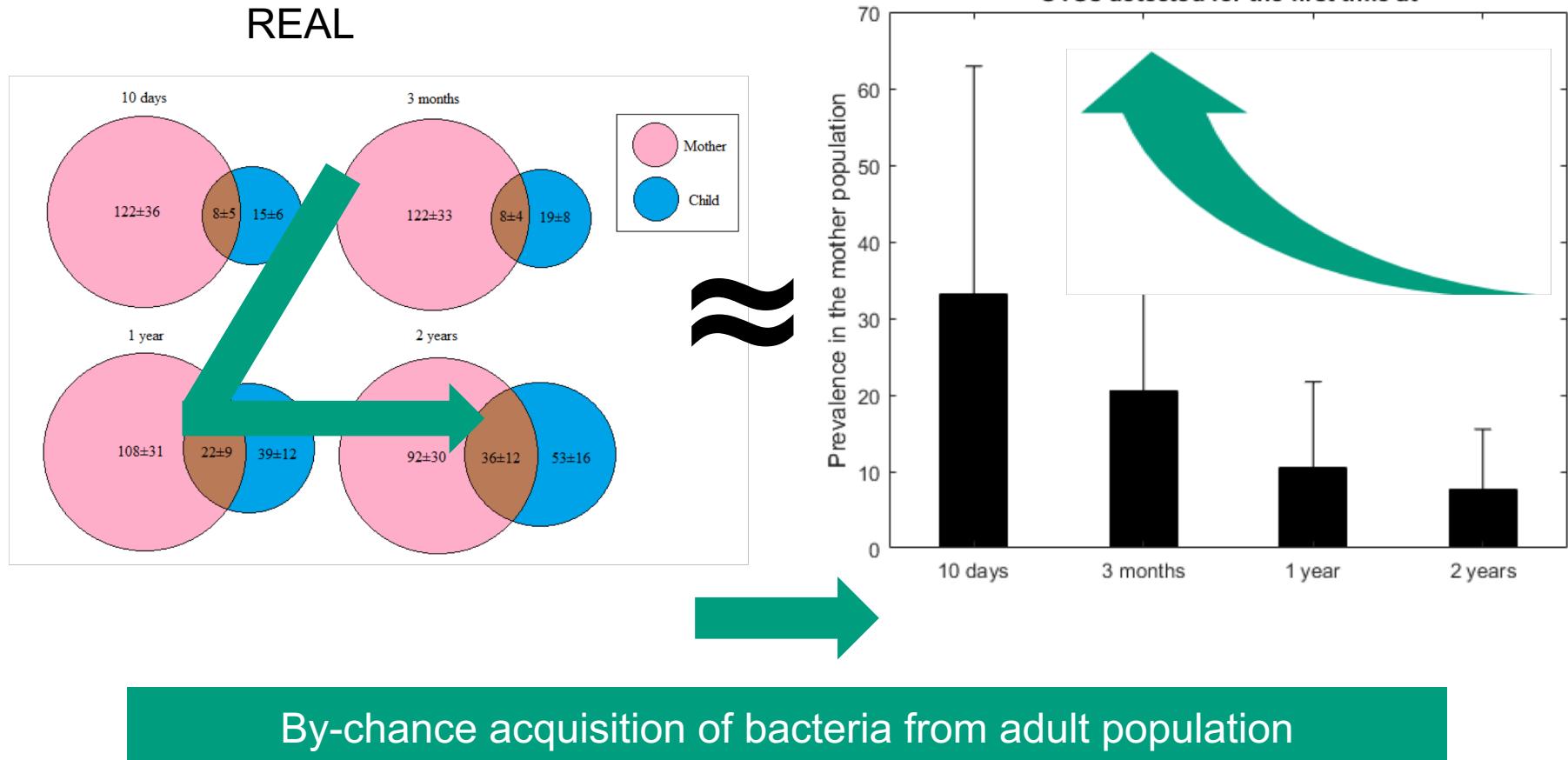


RANDOM OTUs





Mother-child sharing of OTUs

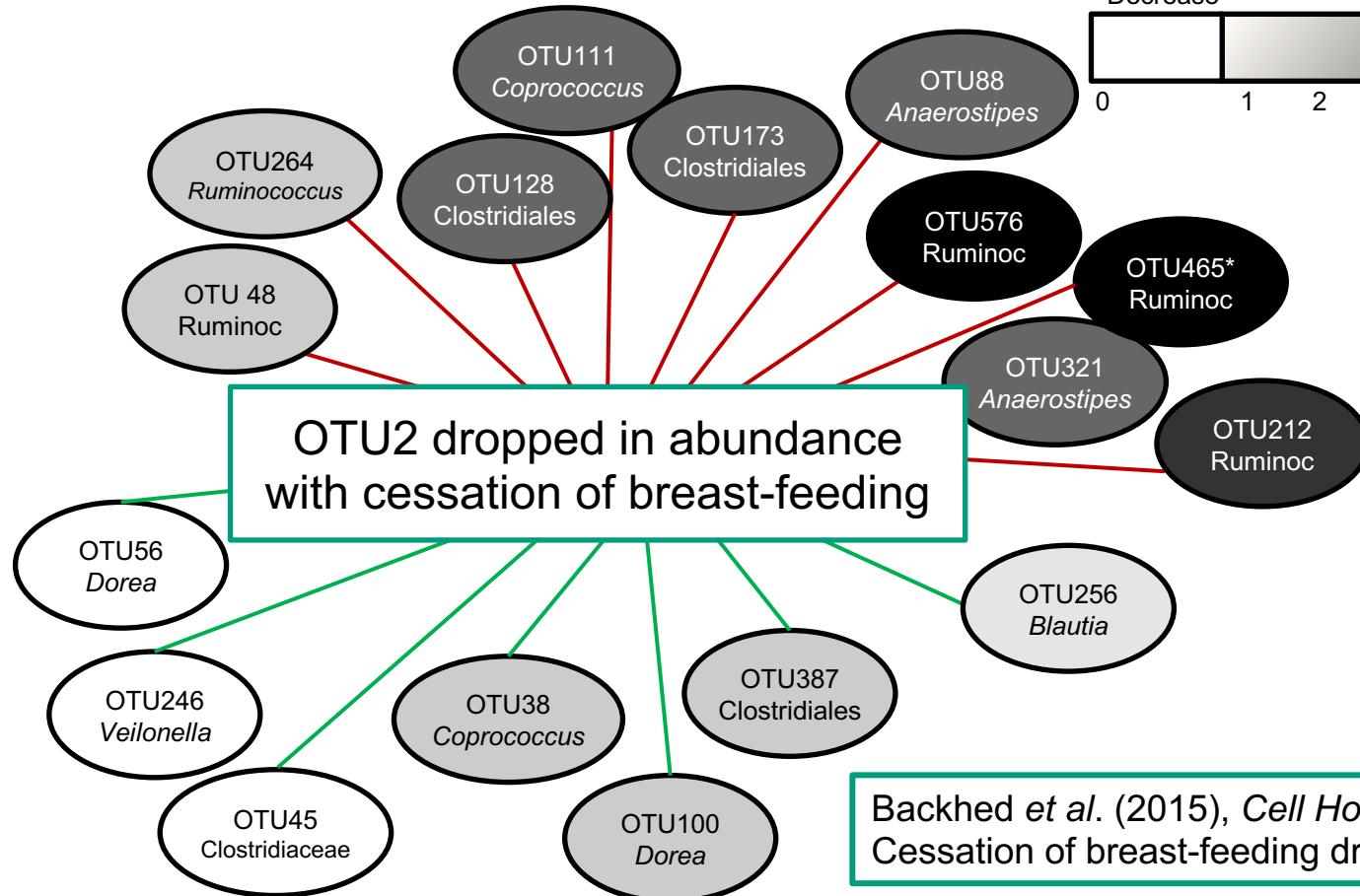
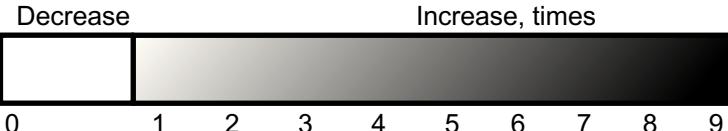


Switch in microbial population

At 2 years; if OTU2 was detected, prevalence was

higher than if OTU2 was not detected
lower

$$\frac{(\text{Prevalence at 2 years})}{(\text{Prevalence at 1 year})}$$



Non-random GM development

a

Stages of neonate colonisation from birth



b

Late term infant vaginally delivered and breastfed



Relatively early progression B->C,
Perhaps in first few days

Relatively late progression C->D
Perhaps not until cessation of breast feeding

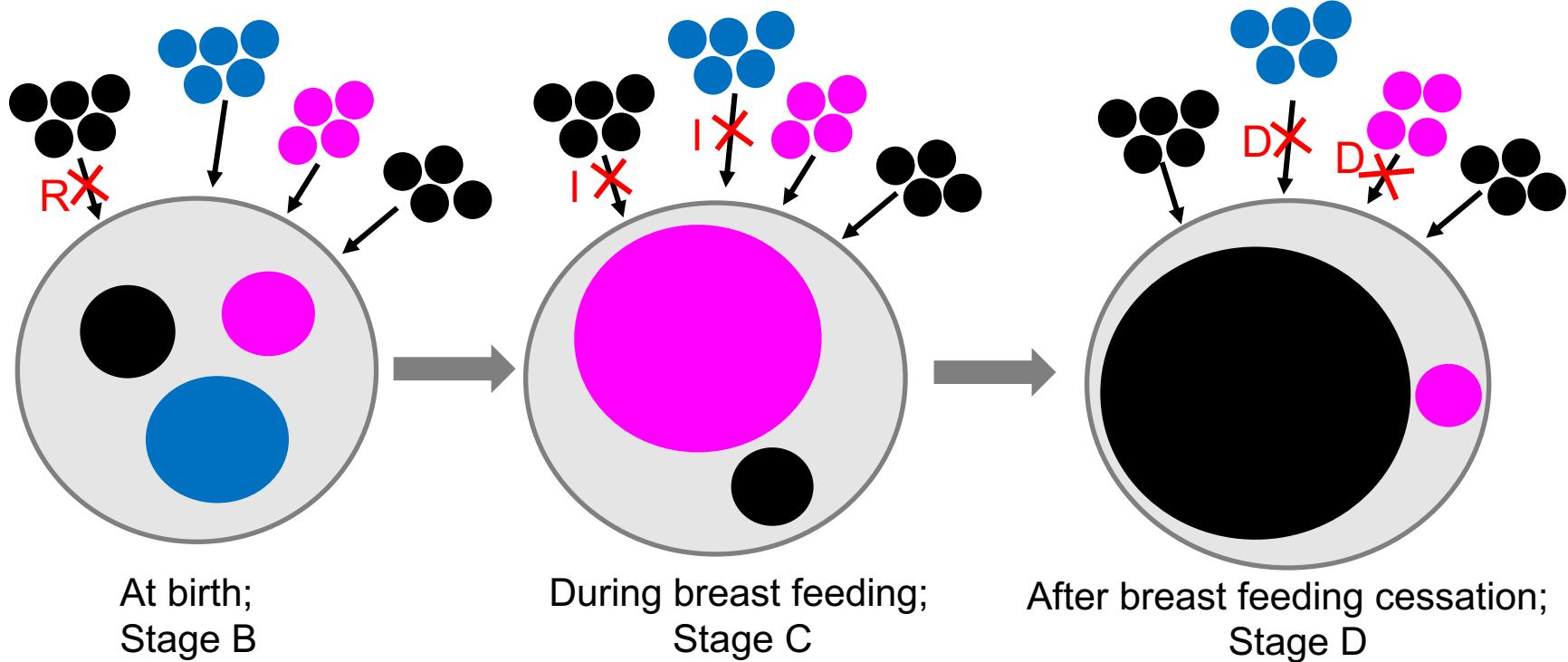
Dogra et al., (2015), *Gut microbes*

Random within non-random

- Gut
- Breast milk selected bacteria
- Gut associated bacteria from the environment
- Other bacteria from the environment

Colonization is restricted by:

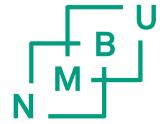
R – redox potential
 I – indirect host selection
 D – direct host selection

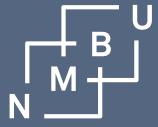




MiDiv Lab

Thank you! ☺





Good luck! 😊

