



# H3ABioNet

Pan African Bioinformatics Network for H3Africa

## 16SrRNA Intermediate Bioinformatics Online Course: Int\_BT

### Module 2: Introduction to the microbiome – why 16S?



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16SrRNA Intermediate Bioinformatics Online  
Course: Int\_BT  
Shantelle Claassen-Weitz

# Learning Outcomes

Describe the importance of the microbiome and why it should be studied – why 16S

- Defining the term “microbiome” (and other related terminology)
- Current hypothesis around the ways we may be acquiring our microbes; how it may change due to lifetime exposures (for example, the GIT microbiome has been described as an extremely plastic entity); and how these microbial profiles may be similar or vary between individuals
- Know that different body sites have unique microbiomes
- Appreciate the importance of studying the microbiome (what are the clinical impacts).



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### Module 2:

### Introduction to the microbiome – why 16S?

#### Part 2.1

#### The human microbiome: meeting our microbes



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# The human microbiome: meeting our microbes



<https://www.bbc.com/news/health-43674270>

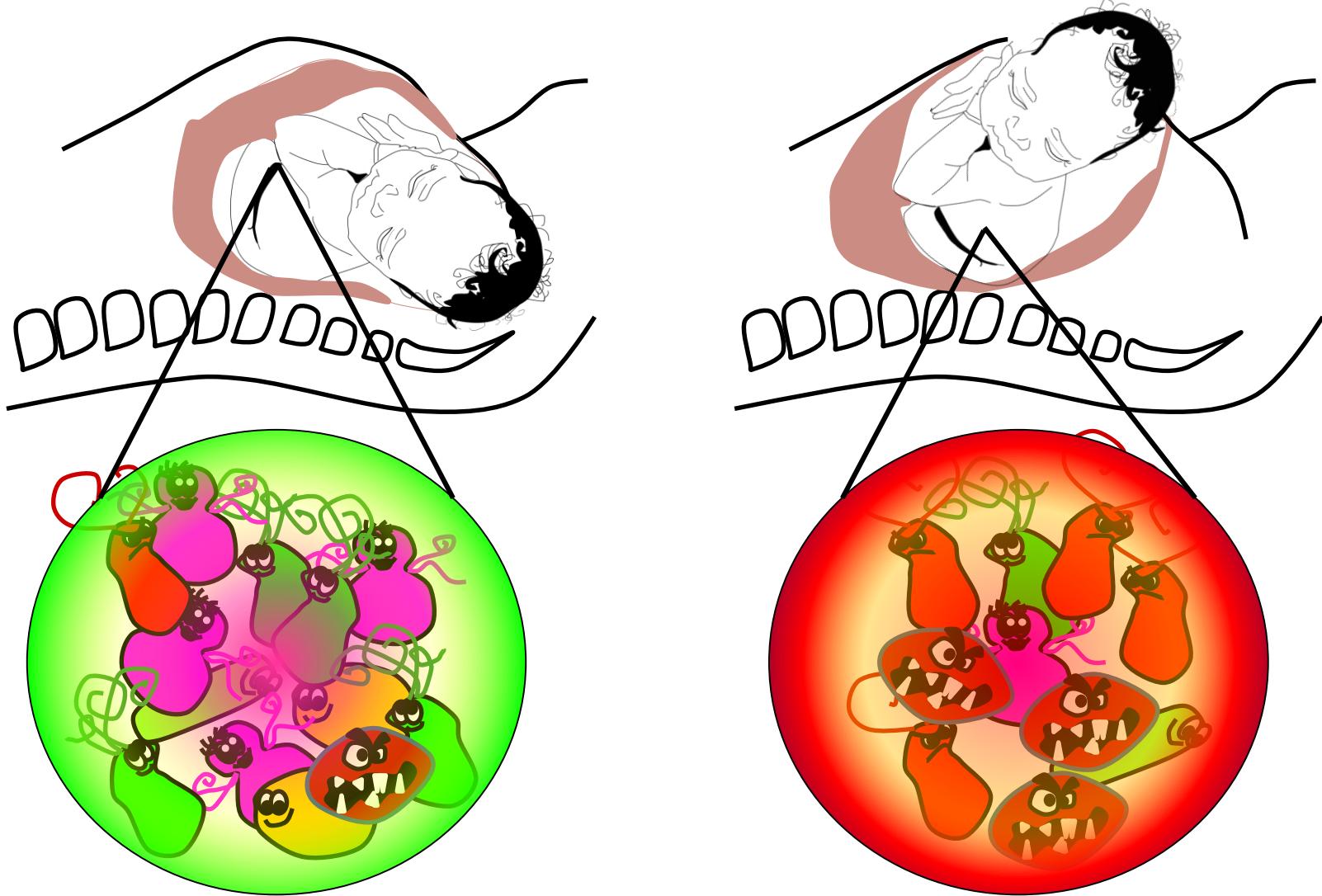


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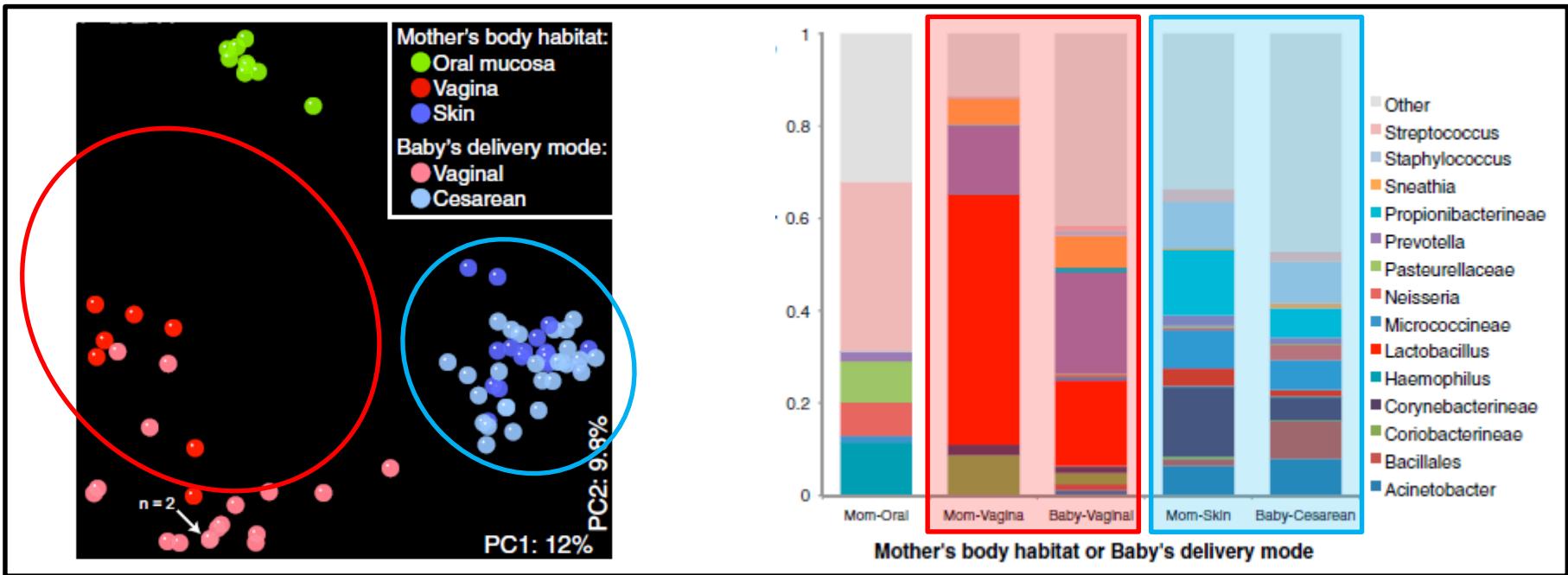
# The human microbiome: meeting our microbes



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Dominguez-Bello et al. (2010). *PNAS*.107(26):11971–75, Nagpal et al. (2016). *Front Microbiol*. <https://doi.org/10.3389/fmicb.2016.01997>

# The human microbiome: meeting our microbes



## This baby had visitors already!!!

Satokari et al. (2009) *Lett Appl Microbiol.* 48(1):8-12;

Jiménez et al. (2008) *Res Microbiol.* 159(3):187-93;

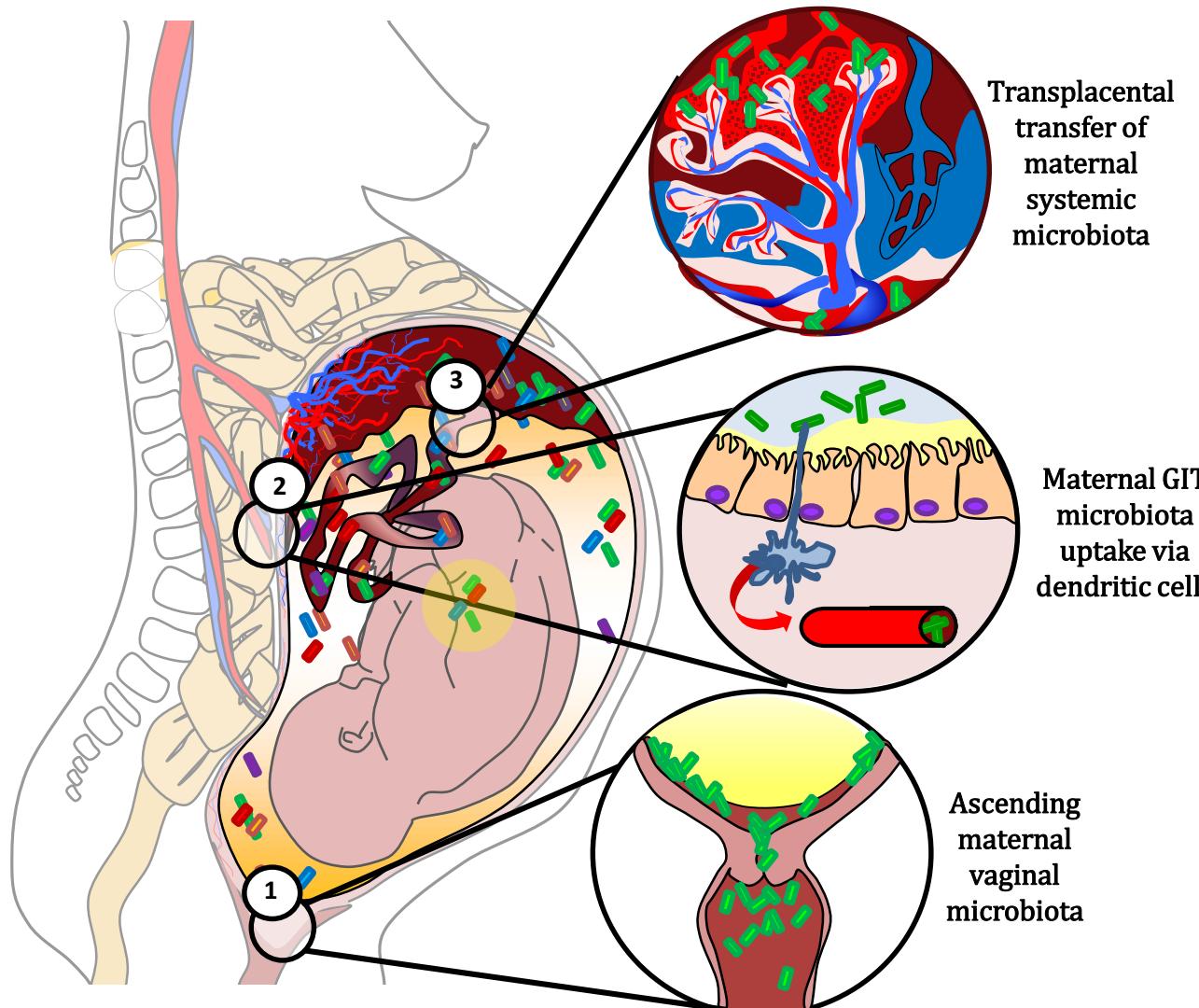
Gosalbes et al. (2012) *Clin Exp Allergy.* 43(2):198-211;

Jiménez E et al. (2005). *Curr Microbiol.* 51(4):270-4;

DiGiulio DB. (2012) *Semin Fetal Neonatal Med.* 17(1):2-11.

Source: Hamzelou, J. (2012) *New Scientist*, 14 April 2012, 6-7

# The human microbiome: meeting our microbes



Source: Claassen et al.

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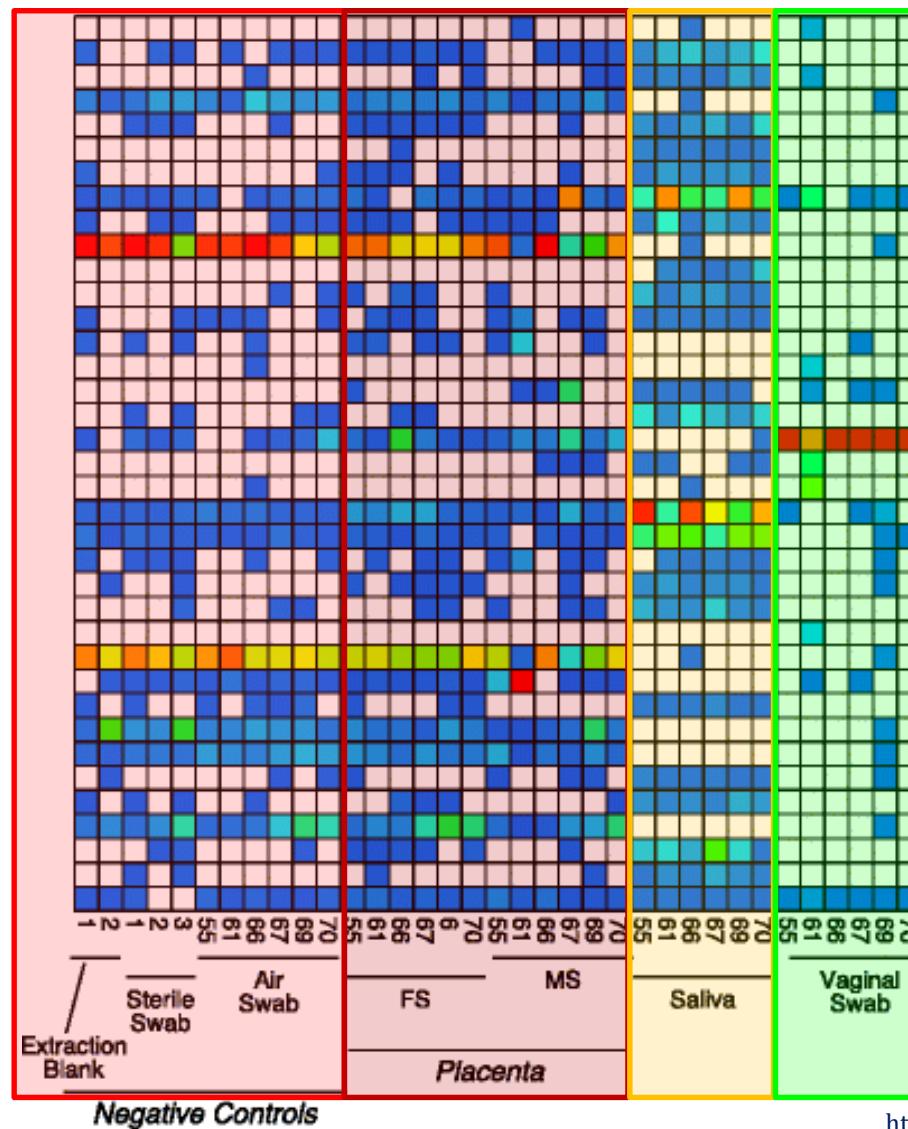
## A critical assessment of the “sterile womb” and “in utero colonization” hypotheses: implications for research on the pioneer infant microbiome



Maria Elisa Perez-Muñoz<sup>1</sup>, Marie-Claire Arrieta<sup>2,3</sup>, Amanda E. Ramer-Tait<sup>4</sup> and Jens Walter<sup>1,5\*</sup> 

Perez-Munoz et al. (2017) Microbiome. 5(48) <https://doi.org/10.1186/s40168-017-0268-4>

# The human microbiome: meeting our microbes

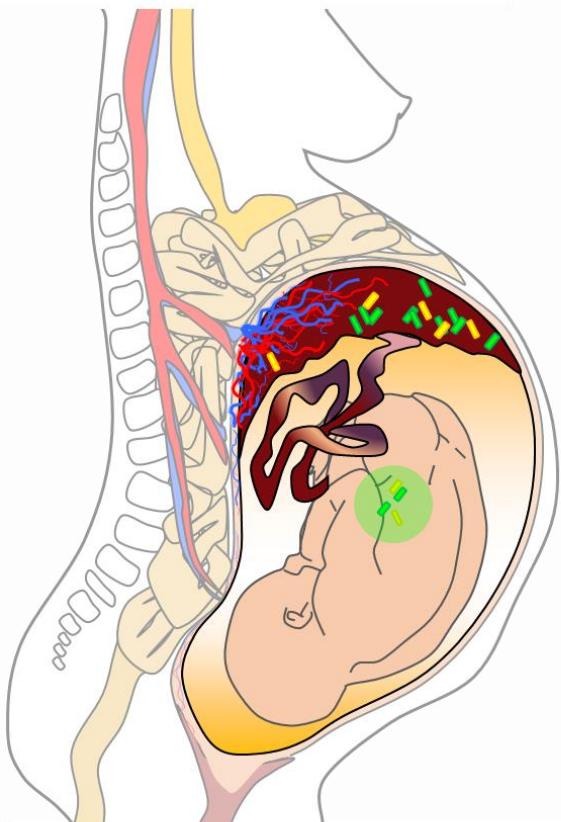


Lauder et al. (2016) Microbiome. 4(29)  
<https://doi.org/10.1186/s40168-016-0172-3>

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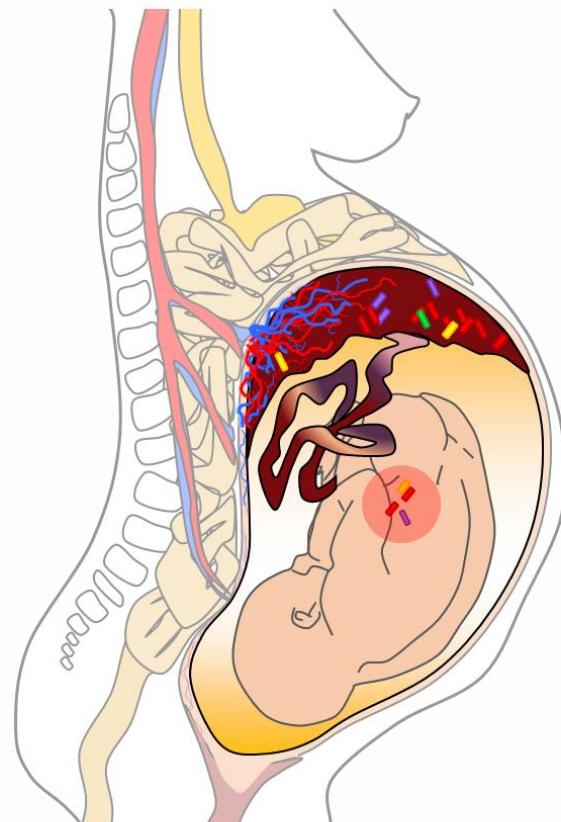
# The human microbiome: meeting our microbes

Probiotics during pregnancy



Source: Claassen et al.

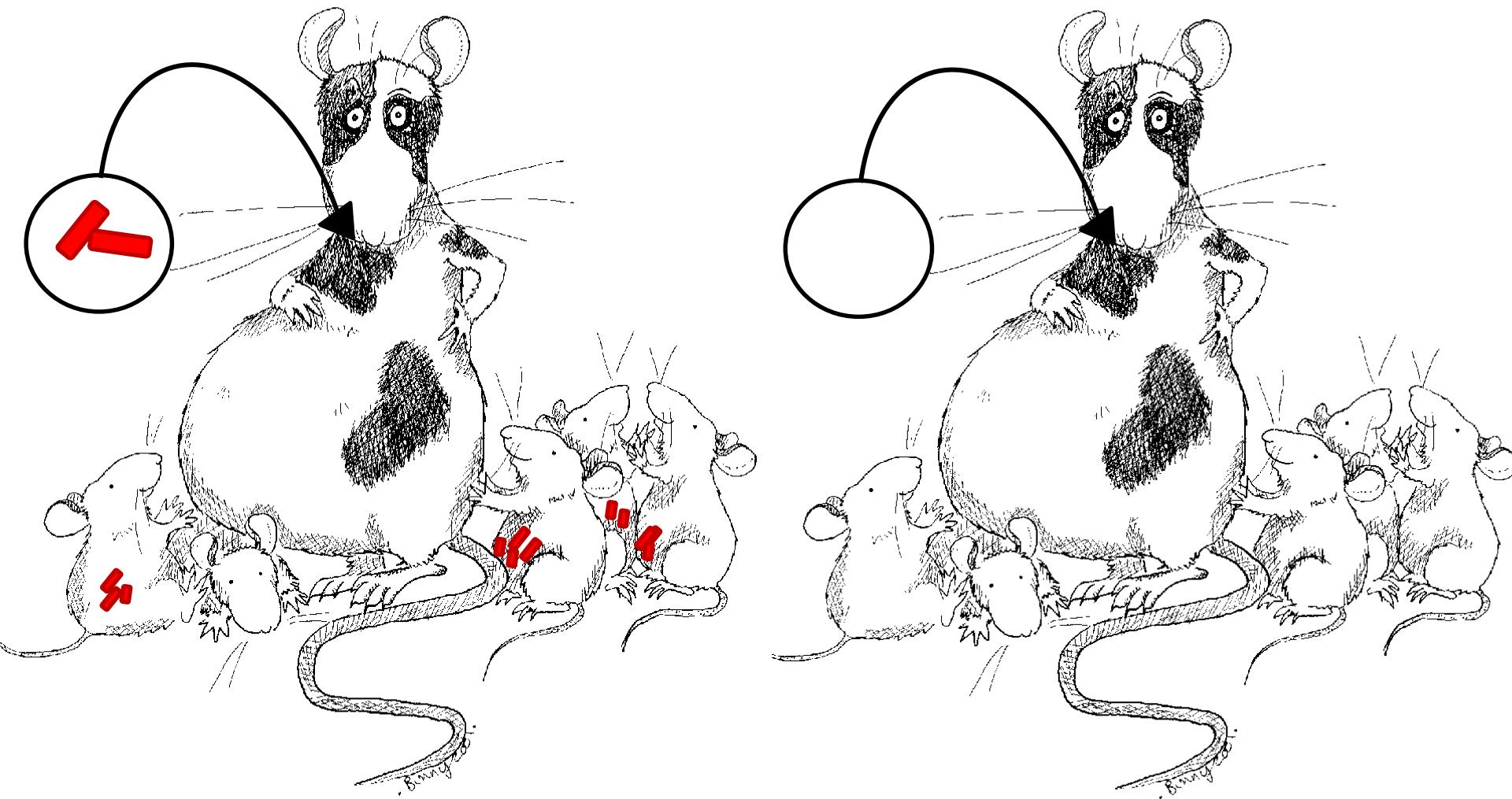
Placebo during pregnancy



Source: Claassen et al.

Satokari et al. (2009) *Lett Appl Microbiol.* 48(1):8-12; Jiménez et al. (2008) *Res Microbiol.* 159(3):187-93;  
Gosalbes et al. (2012) *Clin Exp Allergy.* 43(2):198-211; Jiménez E et al. (2005). *Curr Microbiol.* 51(4):270-4;  
DiGiulio DB. (2012) *Semin Fetal Neonatal Med.* 17(1):2-11

# The human microbiome: meeting our microbes



Jiménez et al. (2008) *Res Microbiol.* 159(3):187-93; Jiménez E et al. (2005). *Curr Microbiol.* 51(4):270-4;

# The human microbiome: meeting our microbes

## In summary:

- We are more microbes than human.
- Studies, using 16S sequencing technology, have shown that we may acquire our microbes during the process of delivery and that profiles may be dependent on delivery mode.
- In addition, studies (which include studies using 16S technology) have recently reported that in-utero colonization may occur prior to colonization during the process of delivery.
- Studies investigating samples sites such as placental samples, cord blood and amniotic fluid, which are all regarded as “**low-biomass” specimens**, need to have optimal study designs and sequencing controls in place.



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### Part 2.2

#### The human microbiome: friend or foe?



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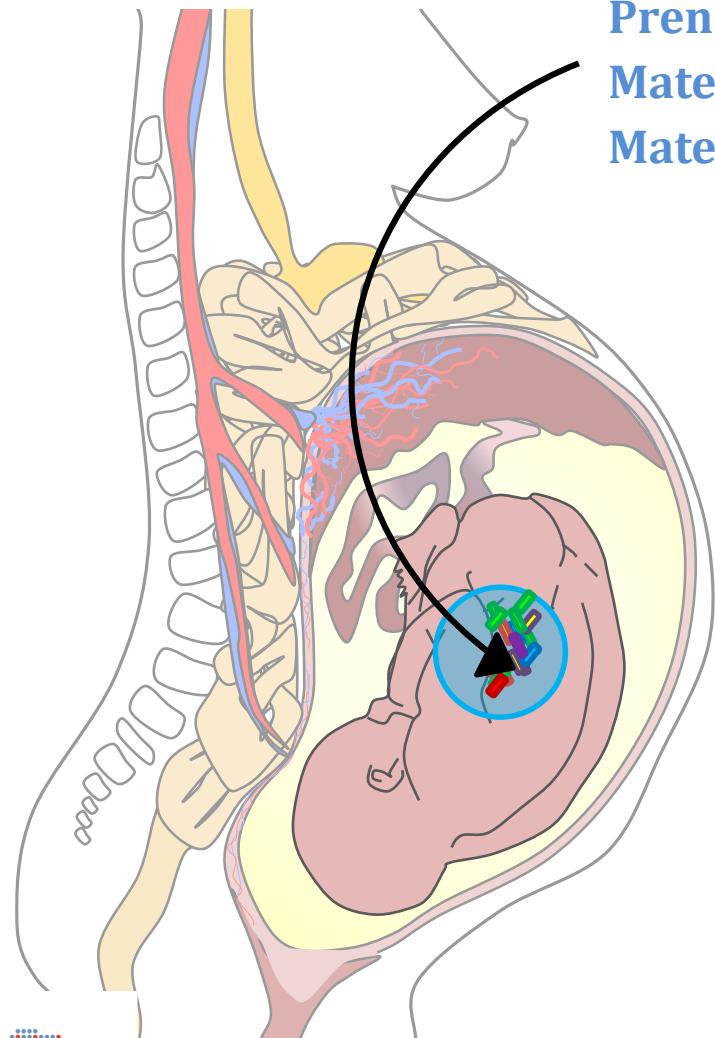
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# The human microbiome: friend or foe?

Gestational duration  
Prenatal antibiotic treatment  
Maternal prenatal stress  
Maternal diabetes status



Mode of delivery  
Milk feeding  
Antibiotics?  
Solid foods  
Antibiotics?  
Antibiotics?



# The human microbiome: friend or foe?



Decker et al. (2011). *Gut Microbes*. 2:91-98, Marcabal et al. (2010). *J Agric Food Chem*. 58:5334-40; Renz-Polster et al. (2005) *Clin Exp Allergy*. 35: 1466-72

# The human microbiome: friend or foe?



*Mum's Guide to*

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## INFANT MICROBIOME SEEDING

Wearing gloves, fold a piece of gauze into a fan shape.

Dampen the gauze with saline solution.

Still wearing gloves, insert the damp gauze into the mothers' birth canal

Leave for 30 minutes.

Remove carefully and store in a sterile jar until needed.

When the baby is born, use gloved hands to wipe the seeded gauze all over the baby's head and body moistening the gauze with further saline solution if necessary.

[www.brianagunn.com](http://www.brianagunn.com)

# The human microbiome: friend or foe?



Published in final edited form as:

*Nat Med.* 2016 March ; 22(3): 250–253. doi:10.1038/nm.4039.

## Partial restoration of the microbiota of cesarean-born infants via vaginal microbial transfer

Maria G. Dominguez-Bello<sup>1,2,\*</sup>, Kassandra M. De Jesus-Laboy<sup>2</sup>, Nan Shen<sup>8</sup>, Laura M. Cox<sup>1</sup>, Amnon Amir<sup>3,7</sup>, Antonio Gonzalez<sup>3,7</sup>, Nicholas A. Bokulich<sup>1</sup>, Se Jin Song<sup>3,4</sup>, Marina Hoashi<sup>5</sup>, Juana I. Rivera-Vina<sup>6</sup>, Keimari Mendez<sup>6</sup>, Rob Knight<sup>3,7</sup>, and Jose C. Clemente<sup>8,9,\*</sup>