



# H3ABioNet

Pan African Bioinformatics Network for H3Africa

## 16SrRNA Intermediate Bioinformatics Online Course: Int\_BT\_2019

### Module 2:

## Introduction to the microbiome – why 16S?

### Part 2.2

### The human microbiome: friend or foe?



**H3ABioNet**

Pan African Bioinformatics Network for H3Africa



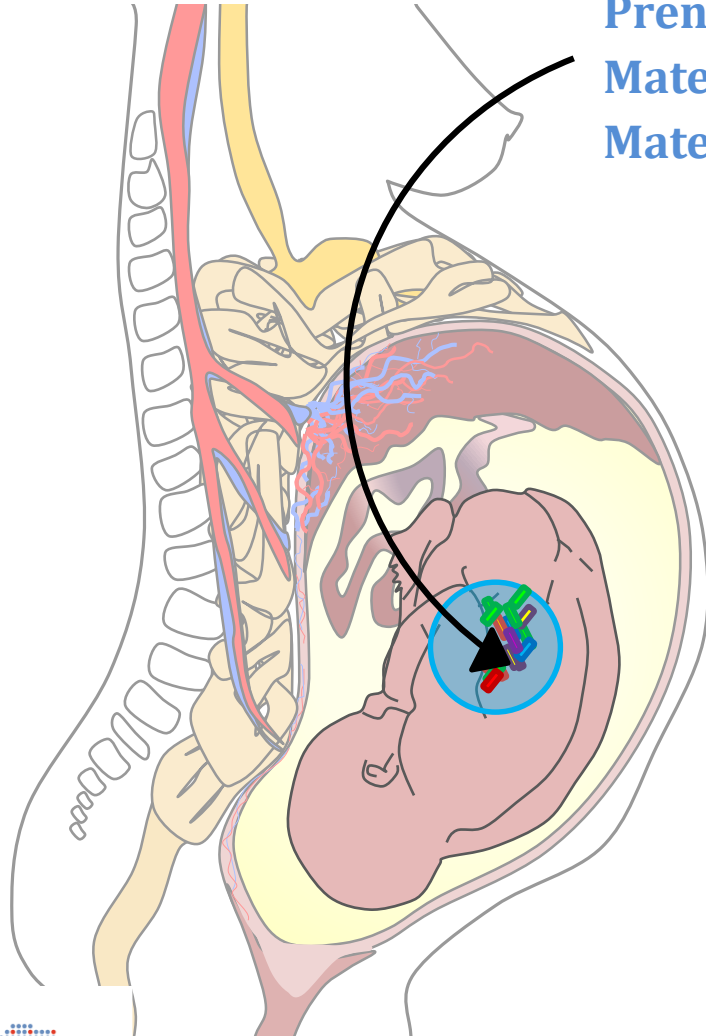
16SrRNA Intermediate Bioinformatics Online Course:

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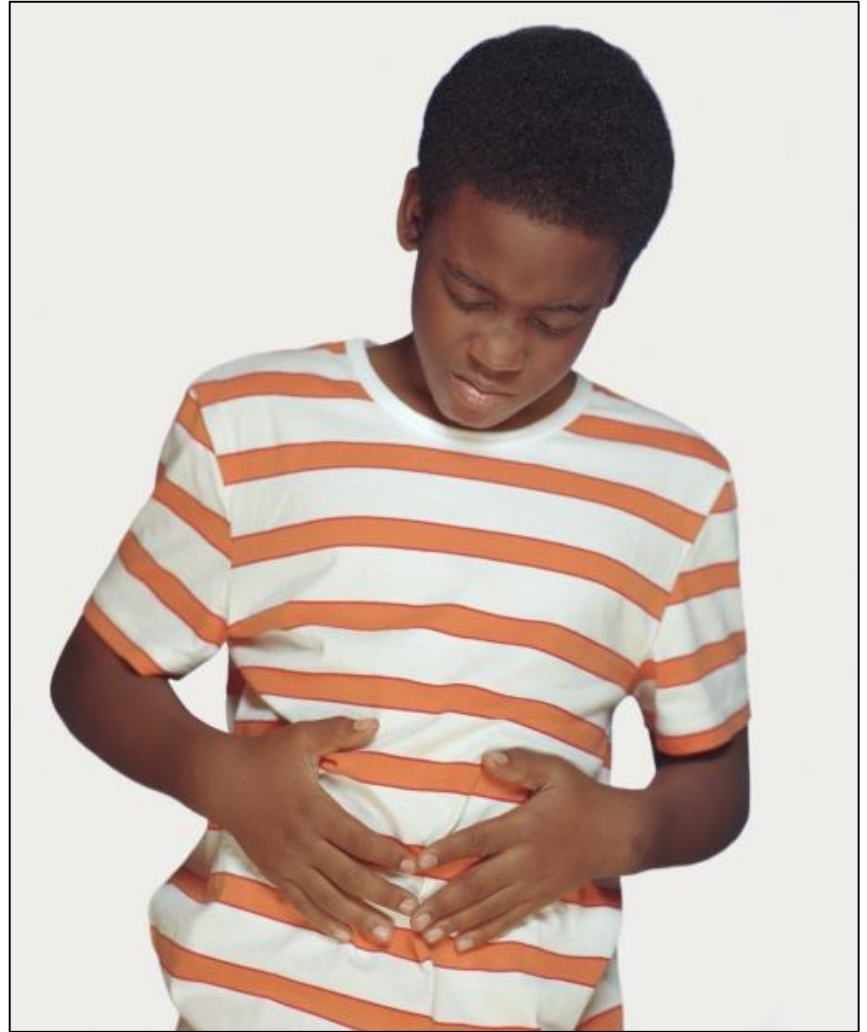
Shantelle Claassen-Weitz

# The human microbiome: friend or foe?

Gestational duration  
Prenatal antibiotic treatment  
Maternal prenatal stress  
Maternal diabetes status



# The human microbiome: friend or foe?



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



*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)



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>



#BehindTheHeadlines

## ***“Vaginal seeding’ of babies born by C-section could pose infection risk,”***

*The Guardian reports.*

Despite the lack of studies proving cause and effect, many women in Australia and the UK are reportedly requesting the procedure after reading about it in the news.



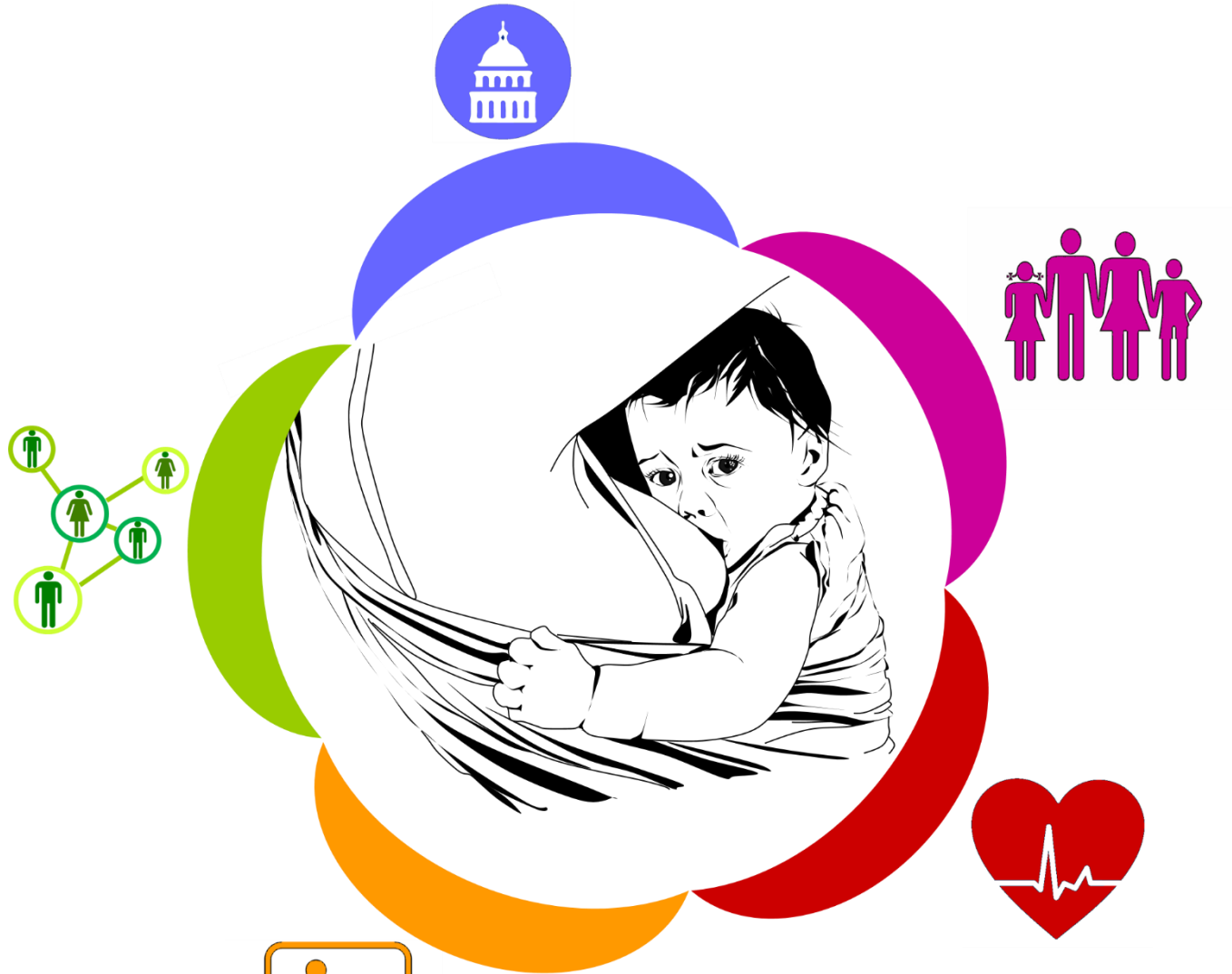
Behind The Headlines gives you the facts without the fiction

**NHS**  
choices  
[www.nhs.uk](http://www.nhs.uk)

# The human microbiome: friend or foe?



# The human microbiome: friend or foe?



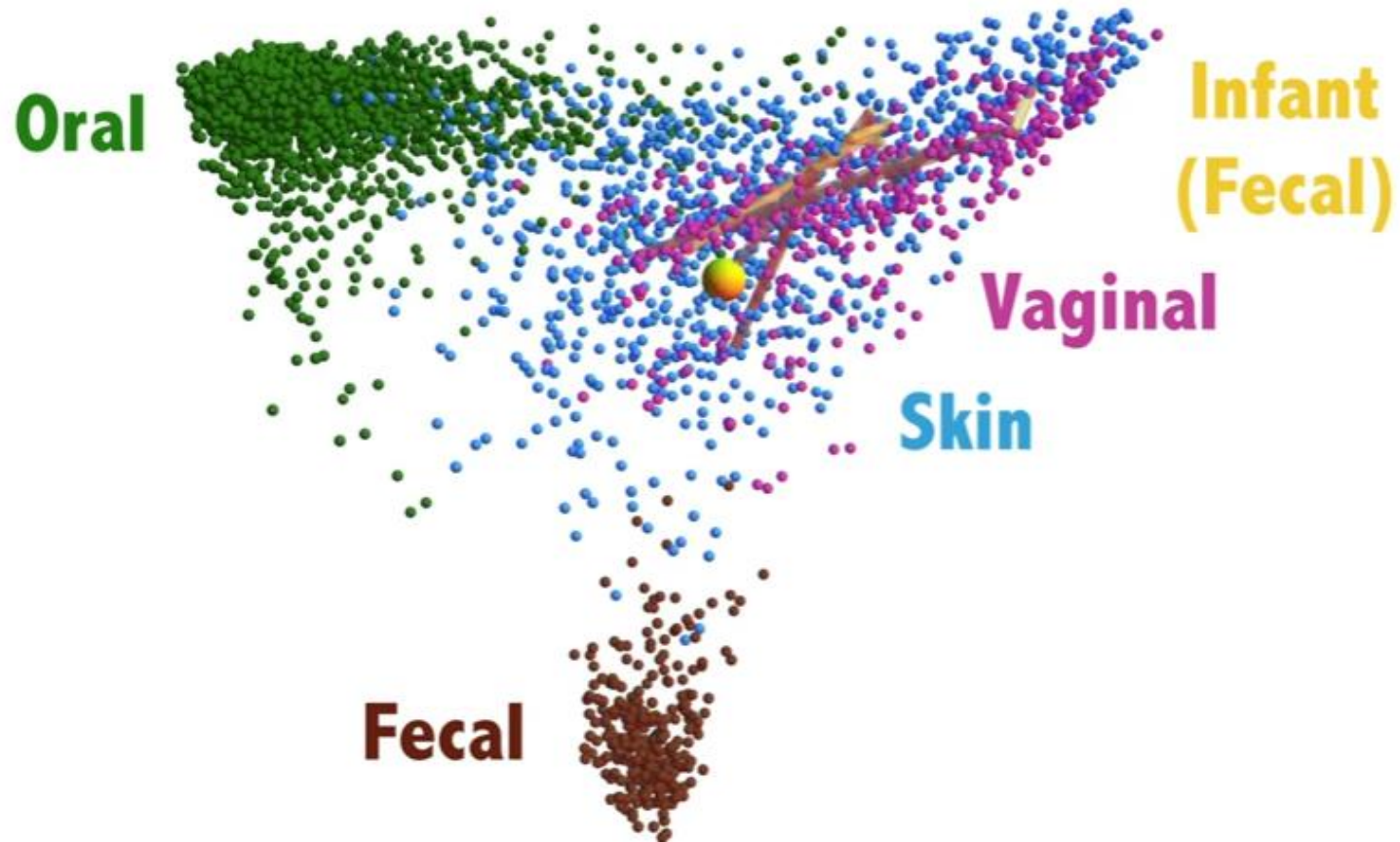


## Randomized controlled trial on the impact of early-life intervention with bifidobacteria on the healthy infant fecal microbiota and metabolome

*Monika Bazanella,<sup>1</sup> Tanja V Maier,<sup>4</sup> Thomas Clavel,<sup>2</sup> Ilias Lagkouravdos,<sup>2</sup> Marianna Lucio,<sup>4</sup> Maria X Maldonado-Gómez,<sup>5</sup> Chloe Autran,<sup>7</sup> Jens Walter,<sup>6</sup> Lars Bode,<sup>7</sup> Philippe Schmitt-Kopplin,<sup>3,4</sup> and Dirk Haller<sup>1,2</sup>*

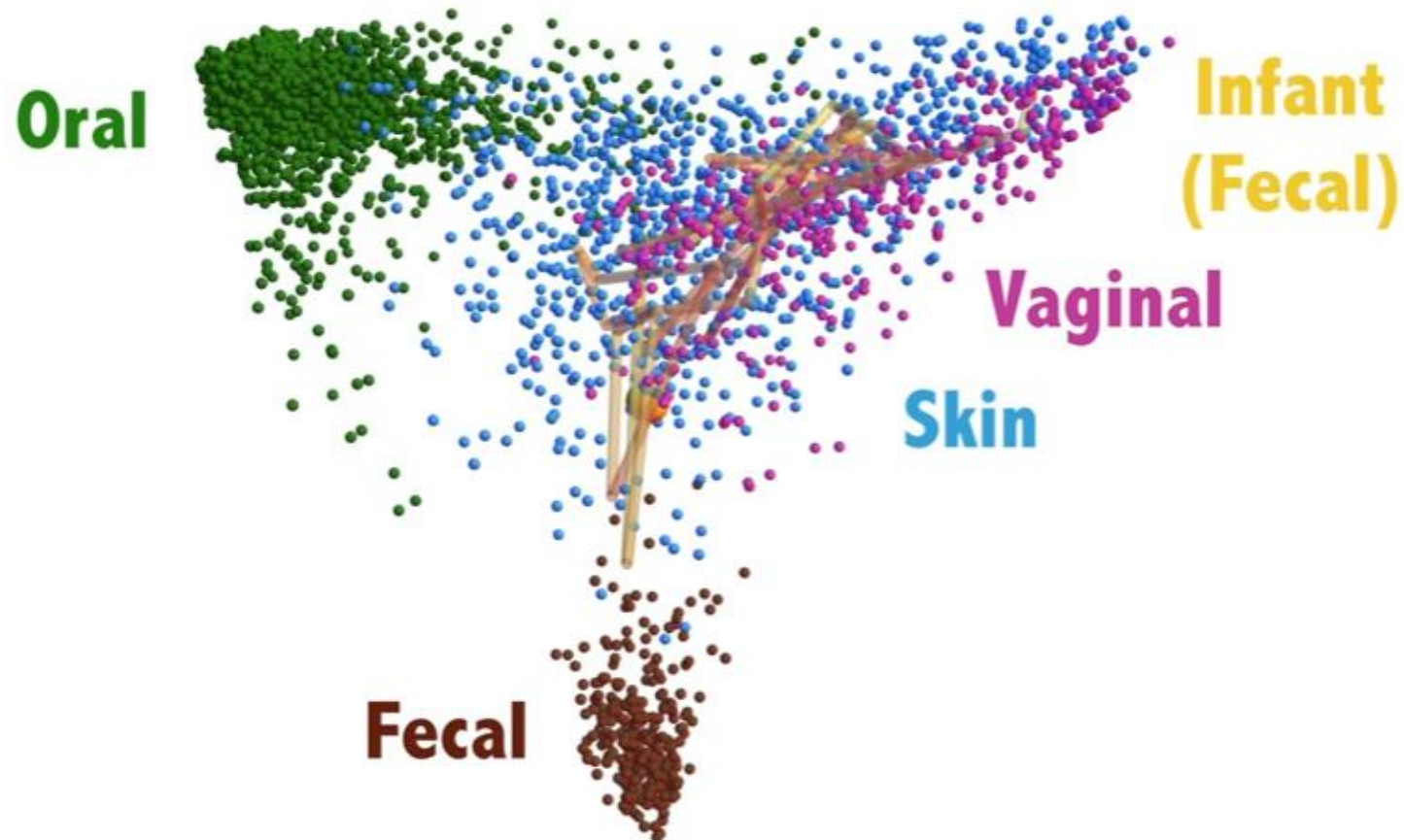
<sup>1</sup>Chair of Nutrition and Immunology, <sup>2</sup>ZIEL – Institute for Food & Health, and <sup>3</sup>Chair of Analytical Food Chemistry, Technical University of Munich, Freising, Germany; <sup>4</sup>Research Unit Analytical Biogeochemistry, Helmholtz Center Munich, Oberschleißheim, Germany; <sup>5</sup>Department of Food Science and Technology, University of Nebraska, Lincoln, NE; <sup>6</sup>Chair for Nutrition, Microbes and Gastrointestinal Health, University of Alberta, Edmonton, Alberta, Canada; and <sup>7</sup>Divisions of Neonatology and Gastroenterology, Hepatology, and Nutrition, Department of Pediatrics, and Larsson-Rosenquist Foundation Mother-Milk-Infant Center of Research Excellence (MoMICoRE), University of California, San Diego, La Jolla, CA

# The human microbiome: friend or foe?



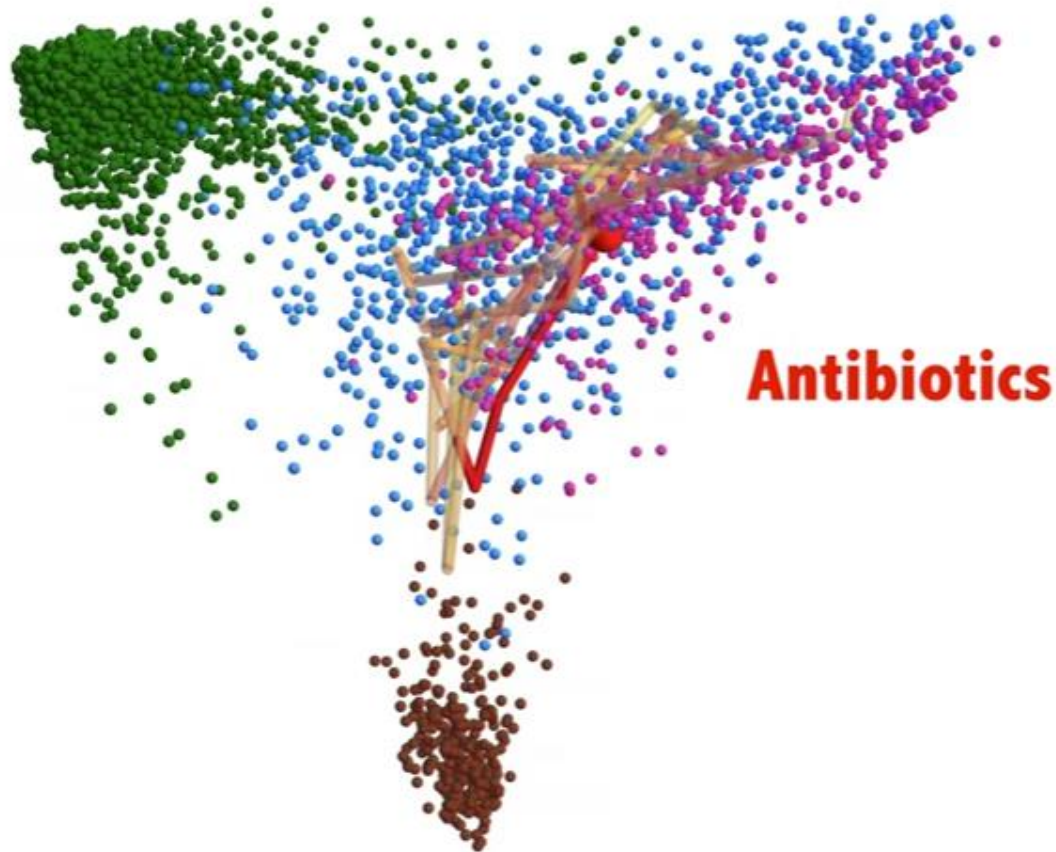
[https://www.ted.com/talks/rob\\_knight\\_how\\_our\\_microbes\\_make\\_us\\_who\\_we\\_are?language=en#t-617423](https://www.ted.com/talks/rob_knight_how_our_microbes_make_us_who_we_are?language=en#t-617423)

# The human microbiome: friend or foe?



[https://www.ted.com/talks/rob\\_knight\\_how\\_our\\_microbes\\_make\\_us\\_who\\_we\\_are?language=en#t-617423](https://www.ted.com/talks/rob_knight_how_our_microbes_make_us_who_we_are?language=en#t-617423)

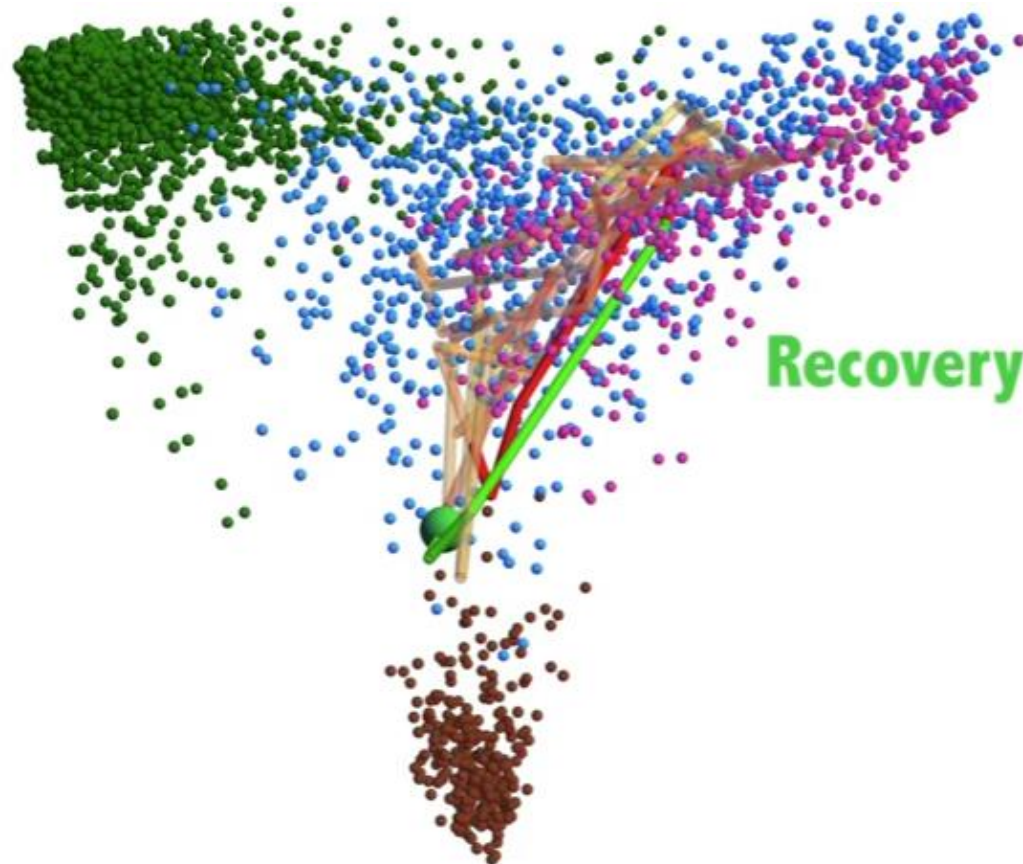
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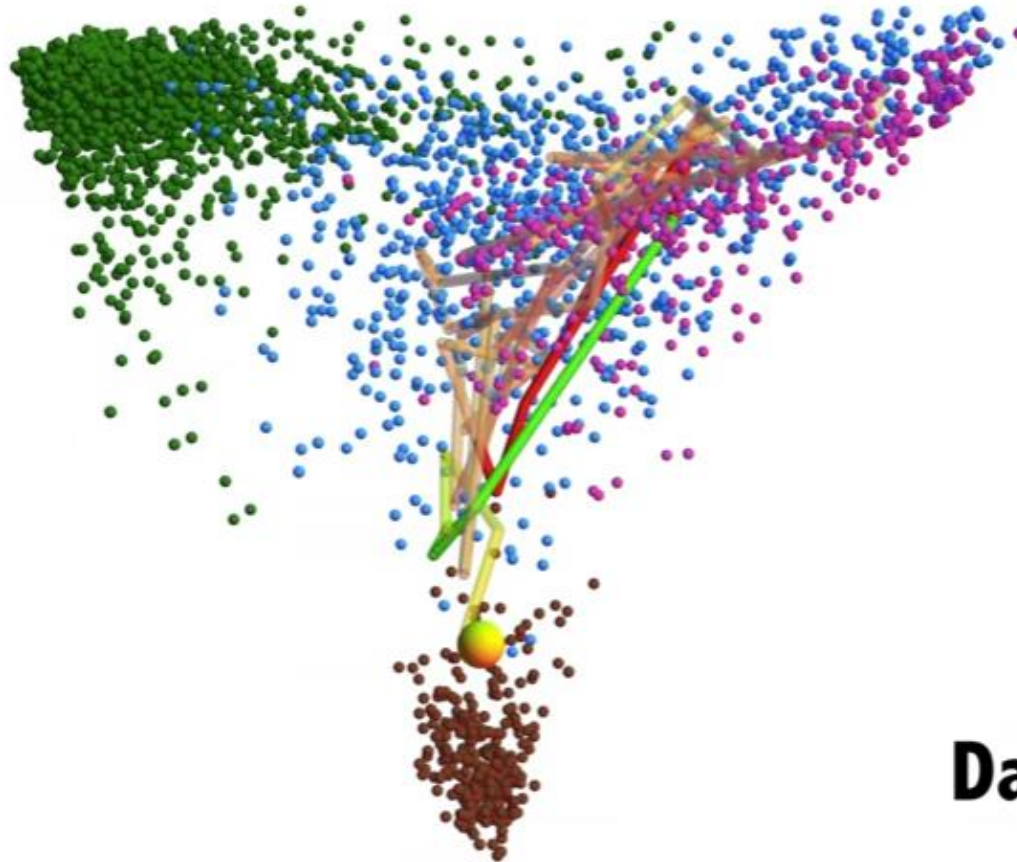


# The human microbiome: friend or foe?



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# The human microbiome: friend or foe?



**Day 838**

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RESEARCH ARTICLE  
Host-Microbe Biology



## Antibiotic-Induced Alterations of the Gut Microbiota Alter Secondary Bile Acid Production and Allow for *Clostridium difficile* Spore Germination and Outgrowth in the Large Intestine

Casey M. Theriot,<sup>a,b</sup> Alison A. Bowman,<sup>b</sup> Vincent B. Young<sup>b,c</sup>



## Fecal microbiota transplantation: in perspective

**Shaan Gupta, Emma Allen-Vercoe and Elaine O. Petrof**

*Ther Adv Gastroenterol*

2016, Vol. 9[2] 229–239

DOI: 10.1177/  
1756283X15607414

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journalsPermissions.nav](http://www.sagepub.co.uk/journalsPermissions.nav)

**Abstract:** There has been increasing interest in understanding the role of the human gut microbiome to elucidate the therapeutic potential of its manipulation. Fecal microbiota transplantation (FMT) is the administration of a solution of fecal matter from a donor into the intestinal tract of a recipient in order to directly change the recipient's gut microbial composition and confer a health benefit. FMT has been used to successfully treat recurrent *Clostridium difficile* infection. There are preliminary indications to suggest that it may also carry therapeutic potential for other conditions such as inflammatory bowel disease, obesity, metabolic syndrome, and functional gastrointestinal disorders.



## Creating crapsules: is faeces in a pill the cure for our ills?



<https://www.smh.com.au/lifestyle/health-and-wellness/creating-crapsules-is-faeces-in-a-pill-the-cure-for-our-ills-20180319-p4z53z.html>

# The human microbiome: friend or foe



Minute  
Earth

Created by:  
**Henry Reich**

Production Team:  
**Alex Reich**  
**Emily Eiert**  
**Ever Salazar**  
**Henry Reich**  
**Peter Reich**

Music by:  
**Nathaniel Schroeder**  
[soundcloud.com/drschroeder](https://soundcloud.com/drschroeder)

References, detailed credits  
and more in the description



# The human microbiome: friend or foe

Neptune Studios  
presents

# The human microbiome: friend or foe?

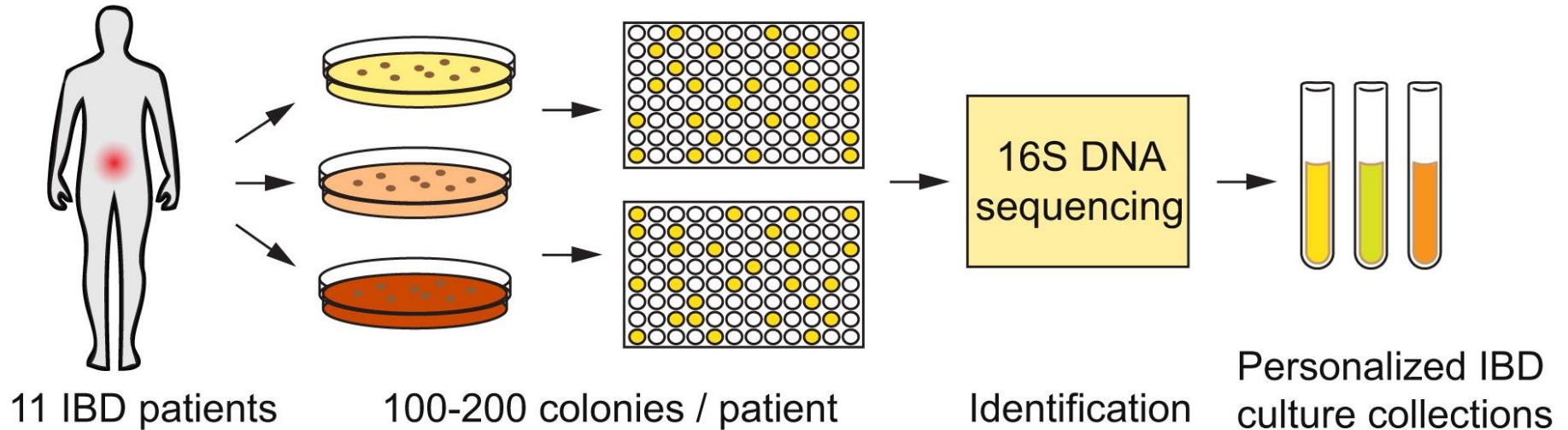
**Table 1.** Role of Pathogenic Gut Microbiota in Gastrointestinal Diseases

Risk factor	Microbial change	Possible mechanisms	Ref.
<b>IBD</b>			
Genetics (Nlrp6 deficient)	<i>Prevotellaceae</i> ↑, TM7 ↑	IL-18↓, CCL5↑, and innate and adaptive immune cell recruitment	14, 15, 16
Genetics (IL-10, IL-2 deficient)	<i>Escherichia coli</i> or <i>Enterococcus faecalis</i> (monocolonization)	IL-12, IFN-γ ↑	23
Genetics (HLA-B27)	<i>Bacteroides fragilis</i> (monocolonization)	Unknown	24
Diet (high fat derived from milk)	Firmicutes ↓, <i>Bifidobacterium</i> ↓, <i>Lactobacillus</i> ↓	Immune system (Th1) disruption	26, 27
Diet (high protein)	<i>Desulfovibrio</i> spp. ↑, <i>Desulfuromonas</i> spp. ↑	Genotoxic ↑, DNA damage ↑, inflammation ↑	28, 29
Diet (high fat, high beef)	<i>Erysipelotrichaceae</i> ↑, <i>Bacteroides fragilis</i> ↑	Unknown	30, 31
Smoking	<i>Anaerostipes</i> ↓	Butyrate ↓	35
Antibiotics (ciprofloxacin, metronidazole)	<i>Dorea</i> ↓, <i>Butyrivibrio</i> ↓, <i>Coriobacteriaceae</i> ↓	Organic acid ↓ (e.g., formic acid, butyrate)	40, 41
Antibiotics	<i>Clostridium scindens</i> ↓, <i>Clostridium difficile</i> ↑	DCA ↓	47
Unknown	<i>Faecalibacterium prausnitzii</i> ↓	Anti-inflammatory effect ↓	50, 51
Unknown	<i>pks+</i> <i>Escherichia coli</i> ↑	Colibactin ↑, DNA damage ↑	64

Nagao-Kitamoto et al. (2016) *Intest Res.* 14: 127–138



## Irritable bowel disease: confirmed using mouse models



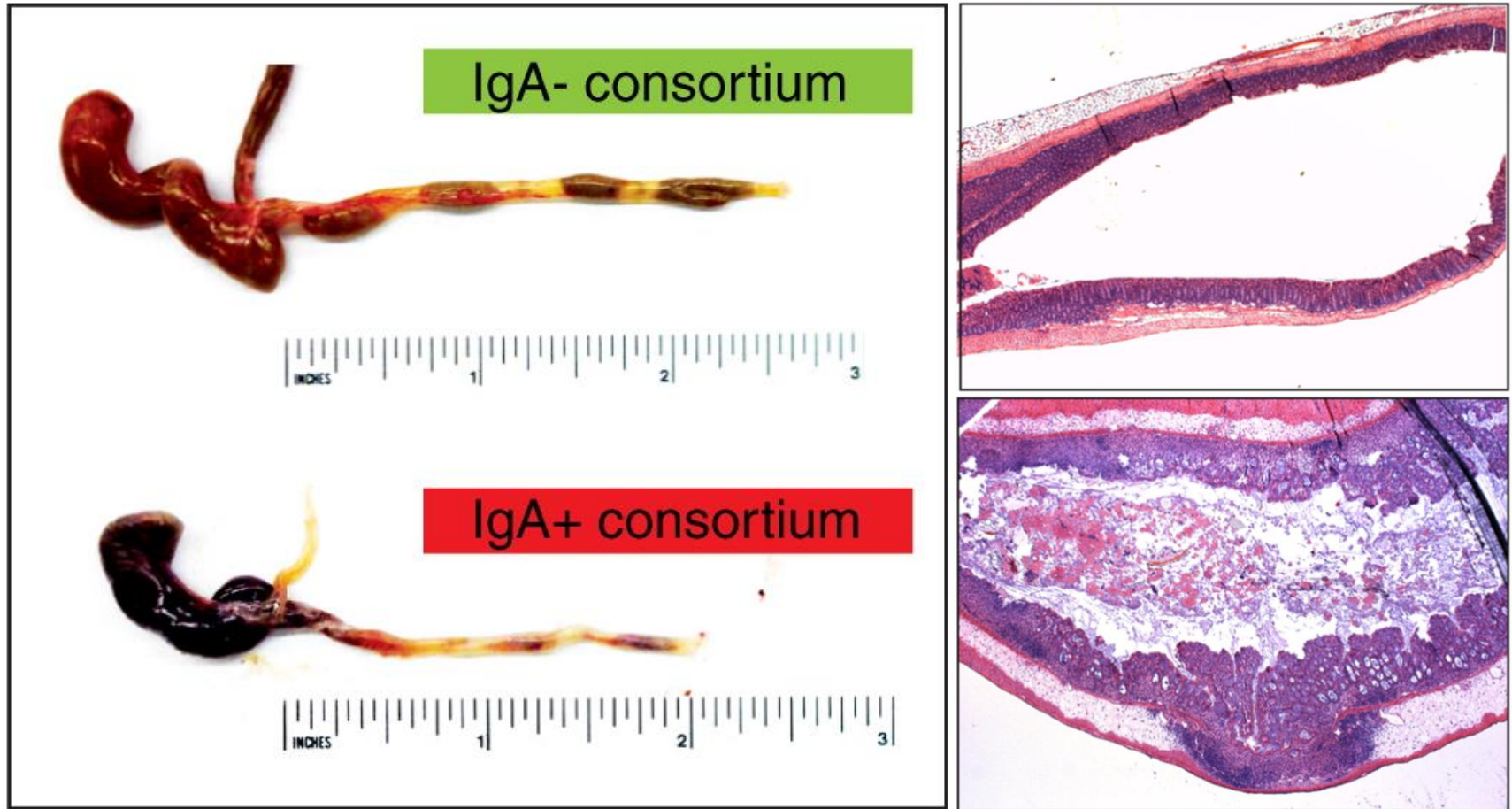
Selected individual bacterial isolates comprising of IgA+ and IgA– bacteria and colonized germ free mice.

*High IgA coating are thought to mark colitogenic bacteria in inflammatory bowel disease*

Palm et al. (2014) *Cell* 158: 1000-1010

# The human microbiome: friend or foe?

Irritable bowel disease: confirmed using mouse models



Palm et al. (2014) *Cell* 158: 1000-1010

# The human microbiome: friend or foe

## In summary:

- Our GIT microbiome is a “plastic entity” which is modulated by a number of exposures throughout our lives.
- A large number of 16S studies have contributed to our current knowledge of the GIT microbiome – which has led to a number of potential interventions for disease states.
- To date, the majority of 16S studies have focussed on the GIT microbiome.
- This research, however, is still very new and more well designed studies are needed to better understand not only “what’s there”, but also “what they’re doing”.