



H3ABioNet

Pan African Bioinformatics Network for H3Africa

16SrRNA Intermediate Bioinformatics Online Course: Int_BT

Module 2:

Introduction to the microbiome – why 16S?

Part 2.2

The human microbiome: friend or foe?



H3ABioNet

Pan African Bioinformatics Network for H3Africa



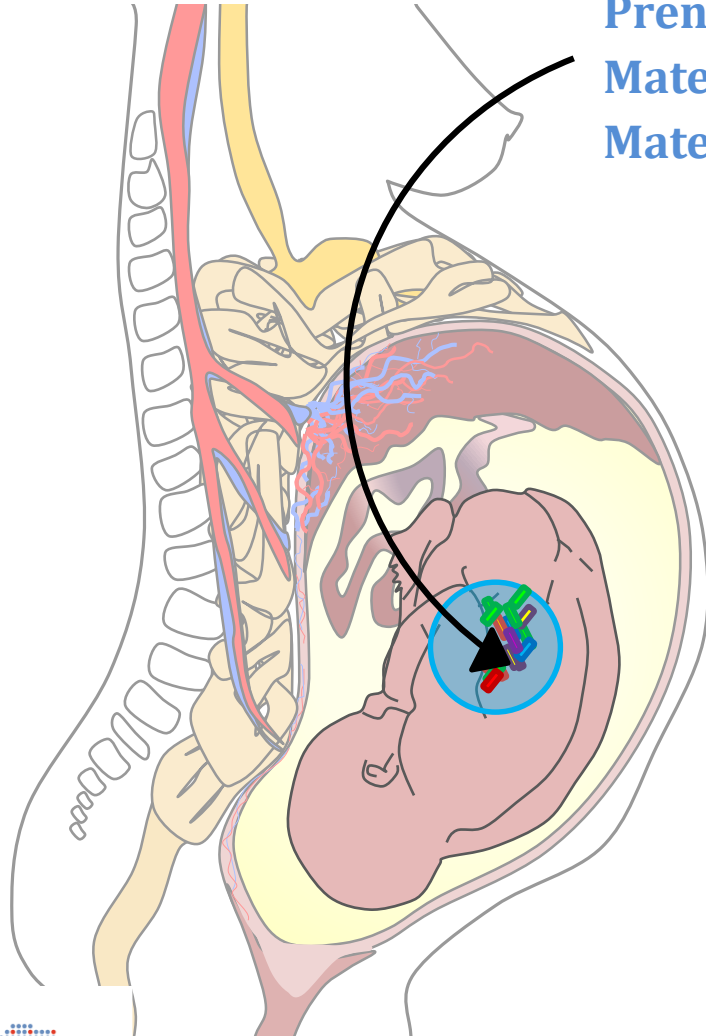
16SrRNA Intermediate Bioinformatics Online Course:

Int_BT_2019

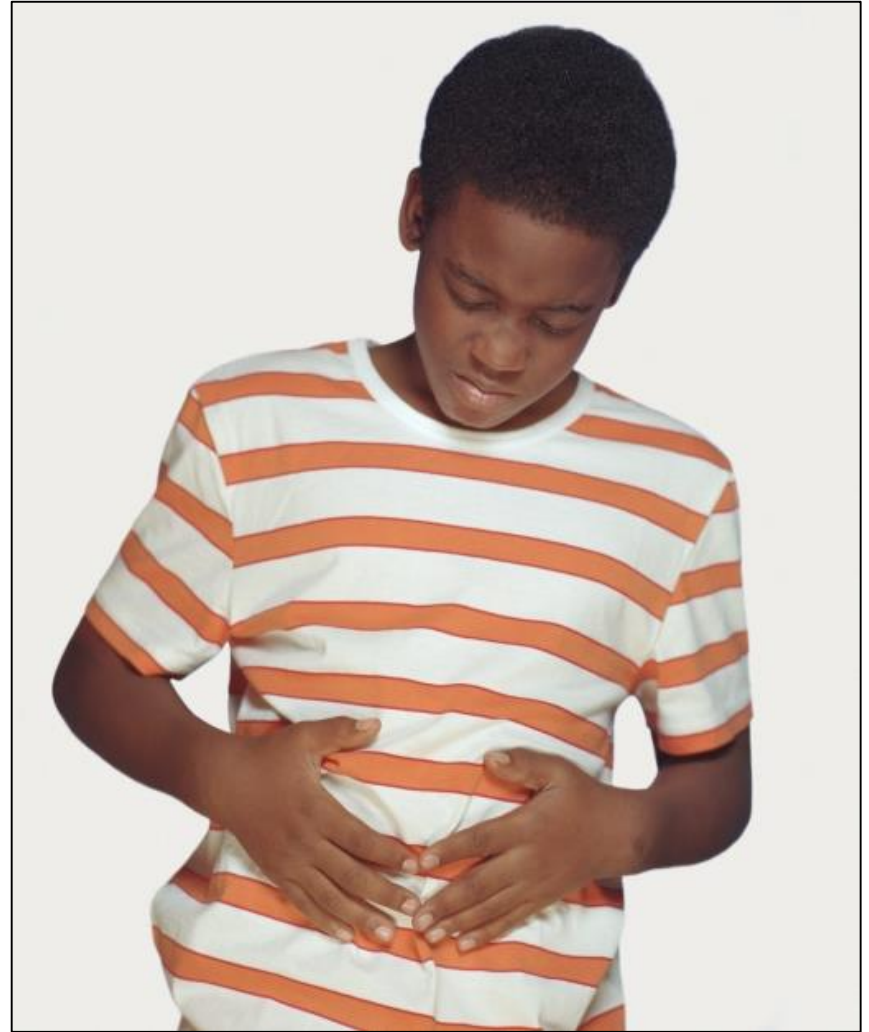
Shantelle Claassen-Weitz

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

The human microbiome: friend or foe?



Mum's Guide to

**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



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^{1,2,*}, Kassandra M. De Jesus-Laboy², Nan Shen⁸, Laura M. Cox¹, Amnon Amir^{3,7}, Antonio Gonzalez^{3,7}, Nicholas A. Bokulich¹, Se Jin Song^{3,4}, Marina Hoashi⁵, Juana I. Rivera-Vina⁶, Keimari Mendez⁶, Rob Knight^{3,7}, and Jose C. Clemente^{8,9,*}

#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.



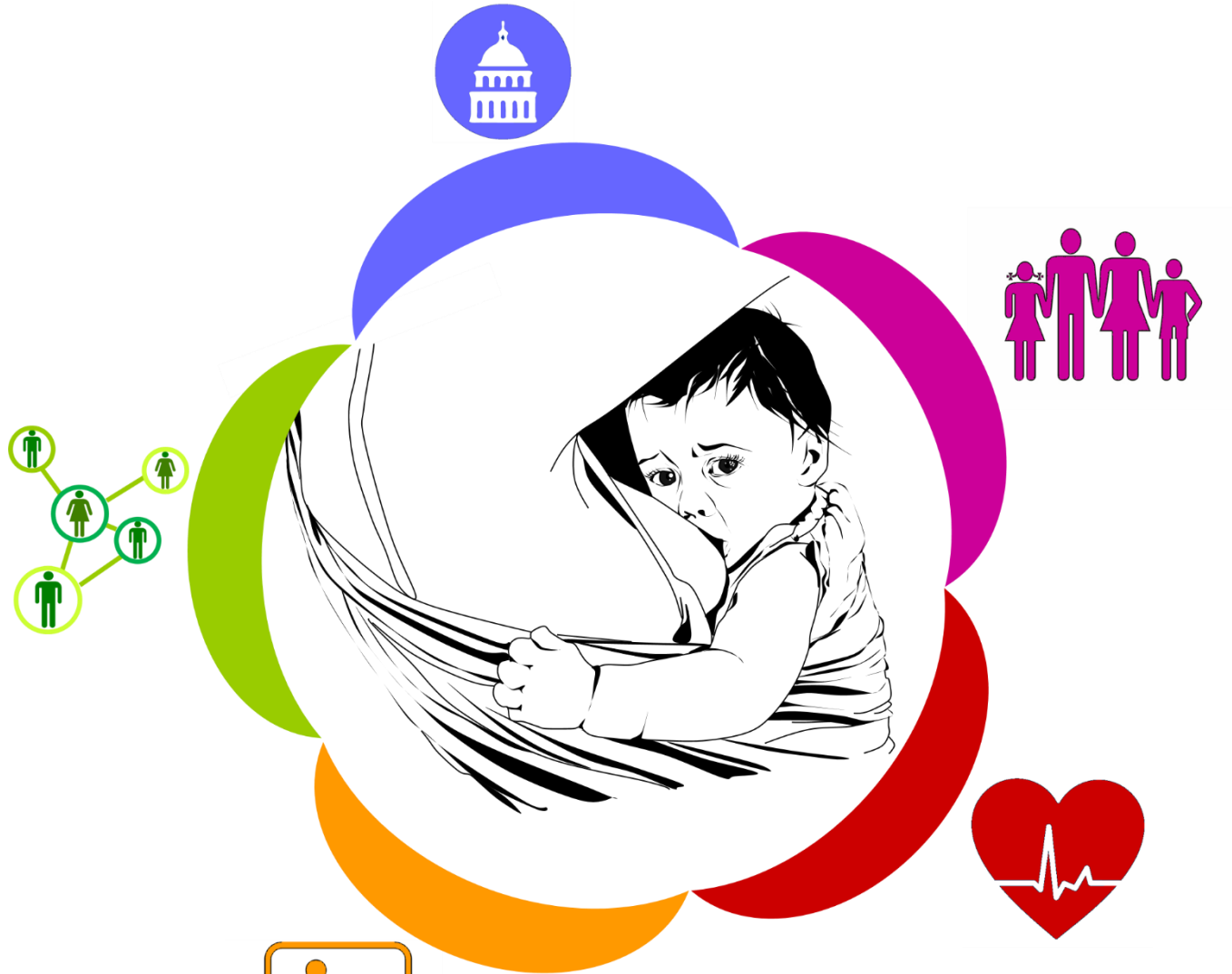
Behind The Headlines gives you the facts without the fiction

NHS
choices
www.nhs.uk

The human microbiome: friend or foe?



The human microbiome: friend or foe?

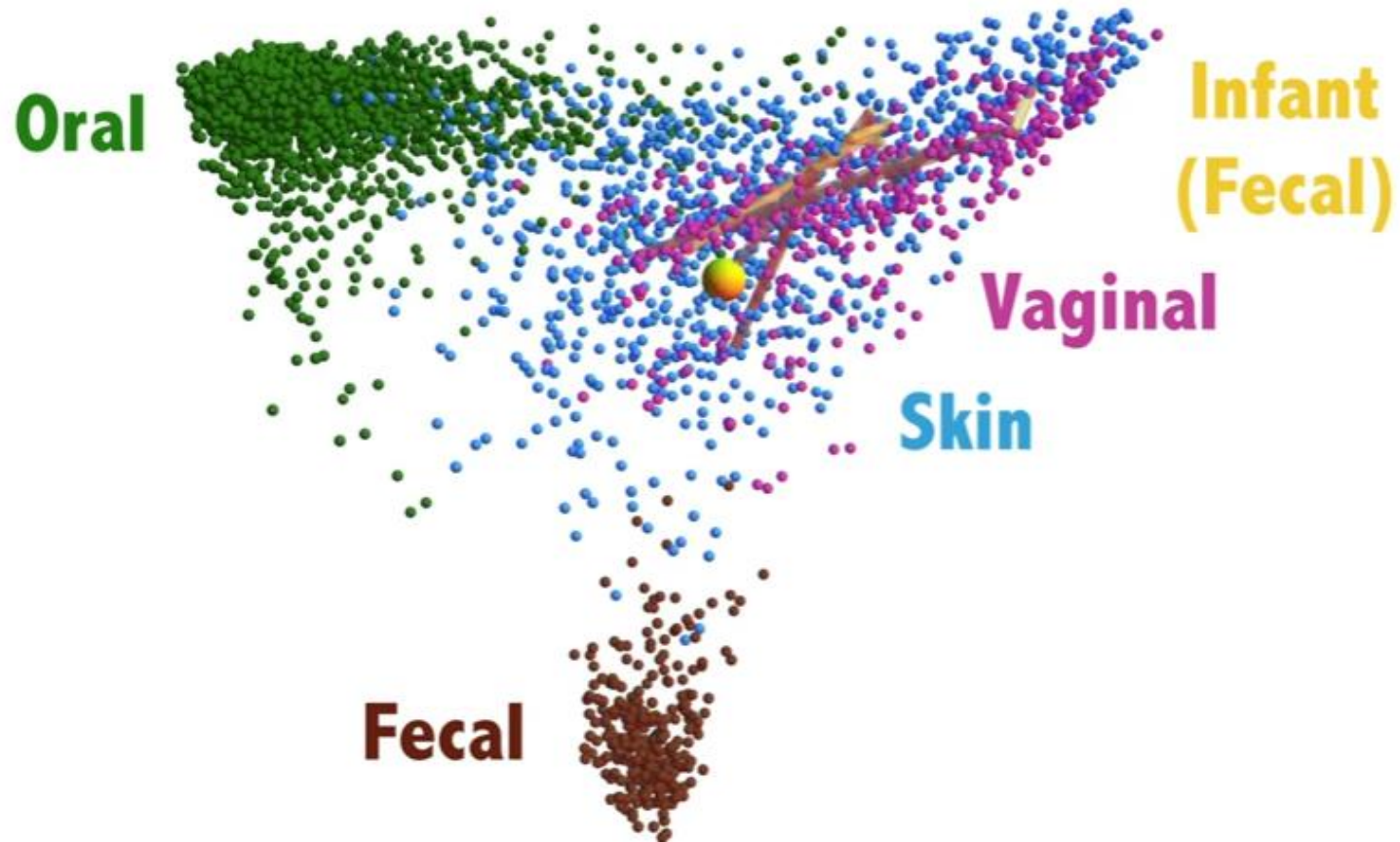


Randomized controlled trial on the impact of early-life intervention with bifidobacteria on the healthy infant fecal microbiota and metabolome

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

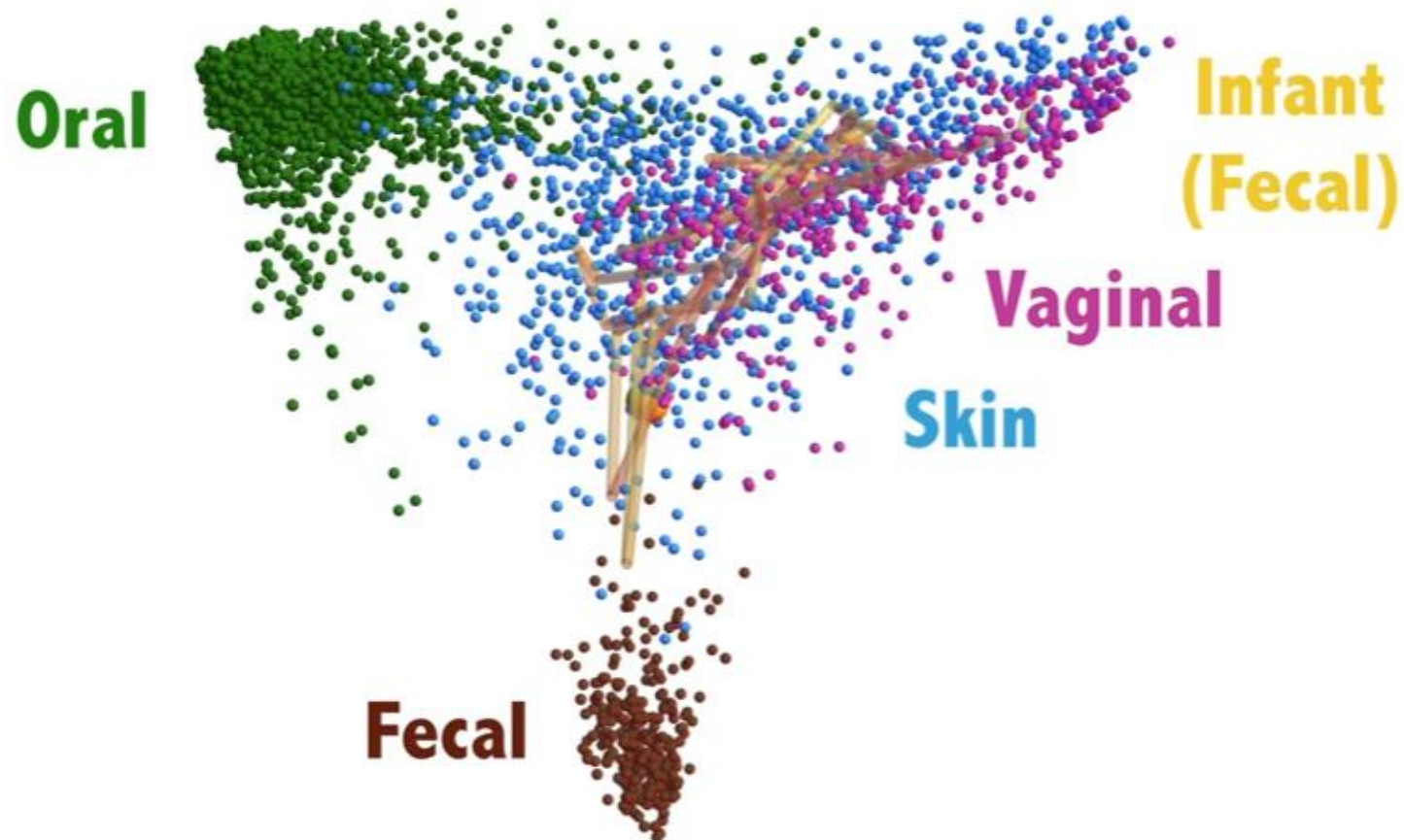
¹Chair of Nutrition and Immunology, ²ZIEL – Institute for Food & Health, and ³Chair of Analytical Food Chemistry, Technical University of Munich, Freising, Germany; ⁴Research Unit Analytical Biogeochemistry, Helmholtz Center Munich, Oberschleißheim, Germany; ⁵Department of Food Science and Technology, University of Nebraska, Lincoln, NE; ⁶Chair for Nutrition, Microbes and Gastrointestinal Health, University of Alberta, Edmonton, Alberta, Canada; and ⁷Divisions 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?



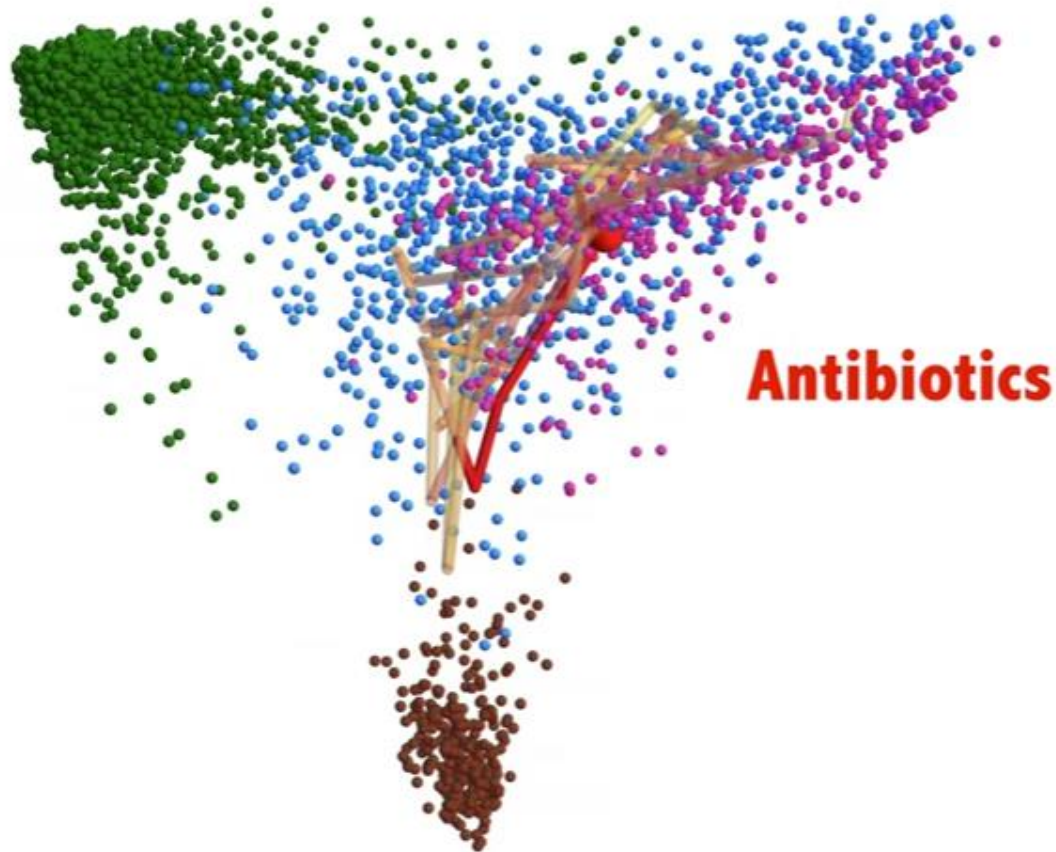
https://www.ted.com/talks/rob_knight_how_our_microbes_make_us_who_we_are?language=en#t-617423

The human microbiome: friend or foe?



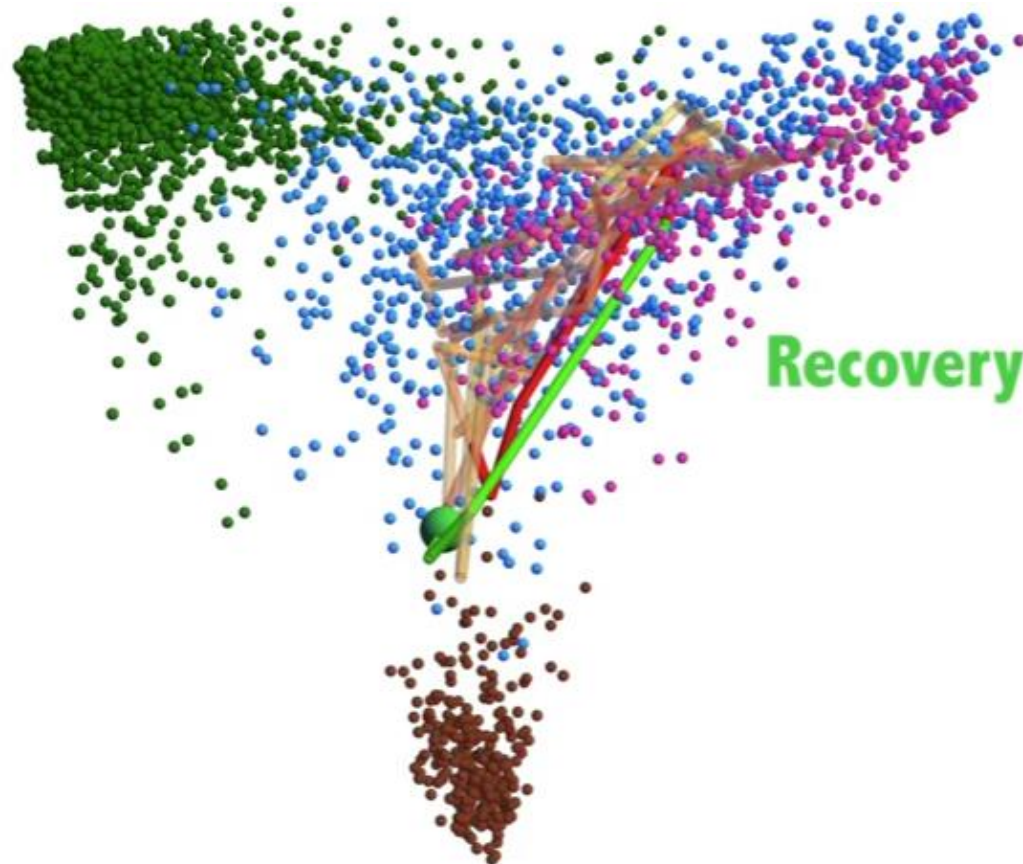
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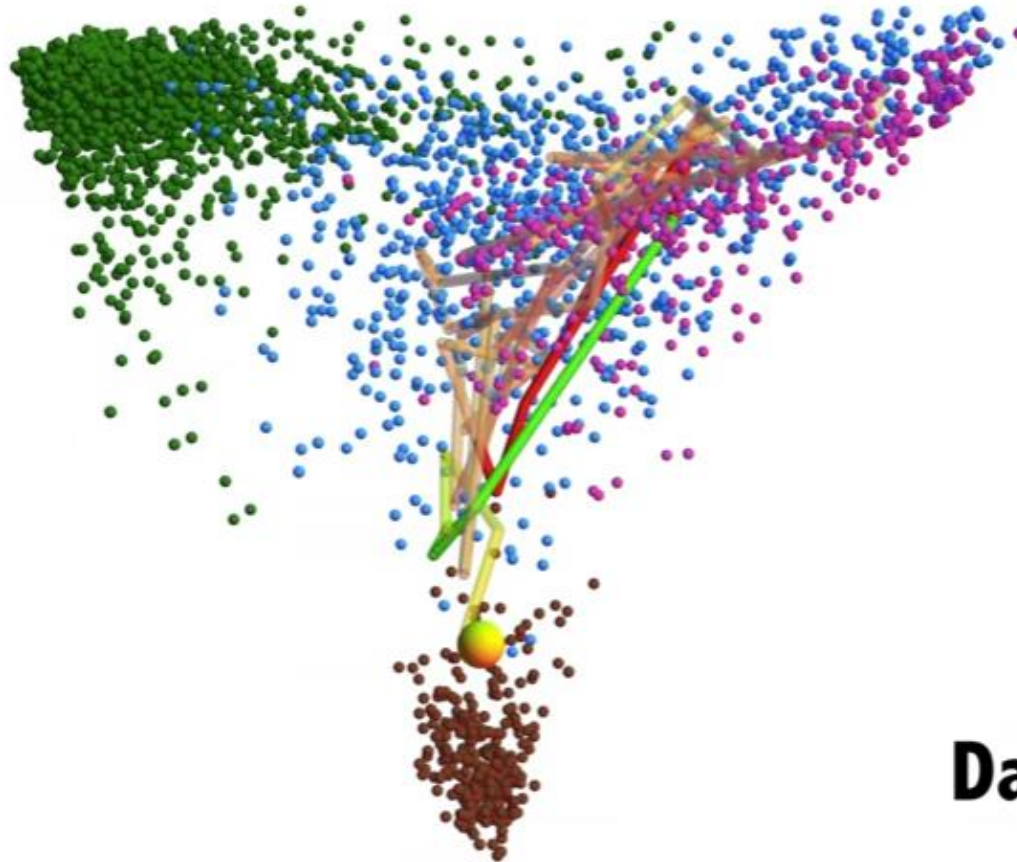
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The human microbiome: friend or foe?



Day 838

https://www.ted.com/talks/rob_knight_how_our_microbes_make_us_who_we_are?language=en#t-617423



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,^{a,b} Alison A. Bowman,^b Vincent B. Young^{b,c}



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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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

References, detailed credits
and more in the description



The human microbiome: friend or foe

Neptune Studios
presents

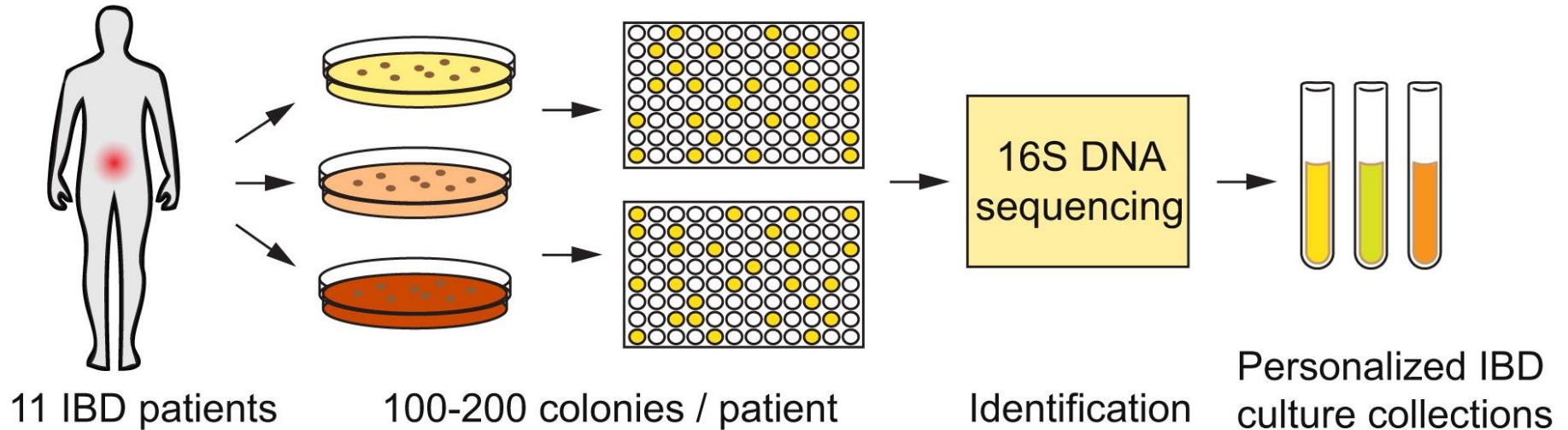
The human microbiome: friend or foe?

Table 1. Role of Pathogenic Gut Microbiota in Gastrointestinal Diseases

Risk factor	Microbial change	Possible mechanisms	Ref.
IBD			
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 wadsworthia</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



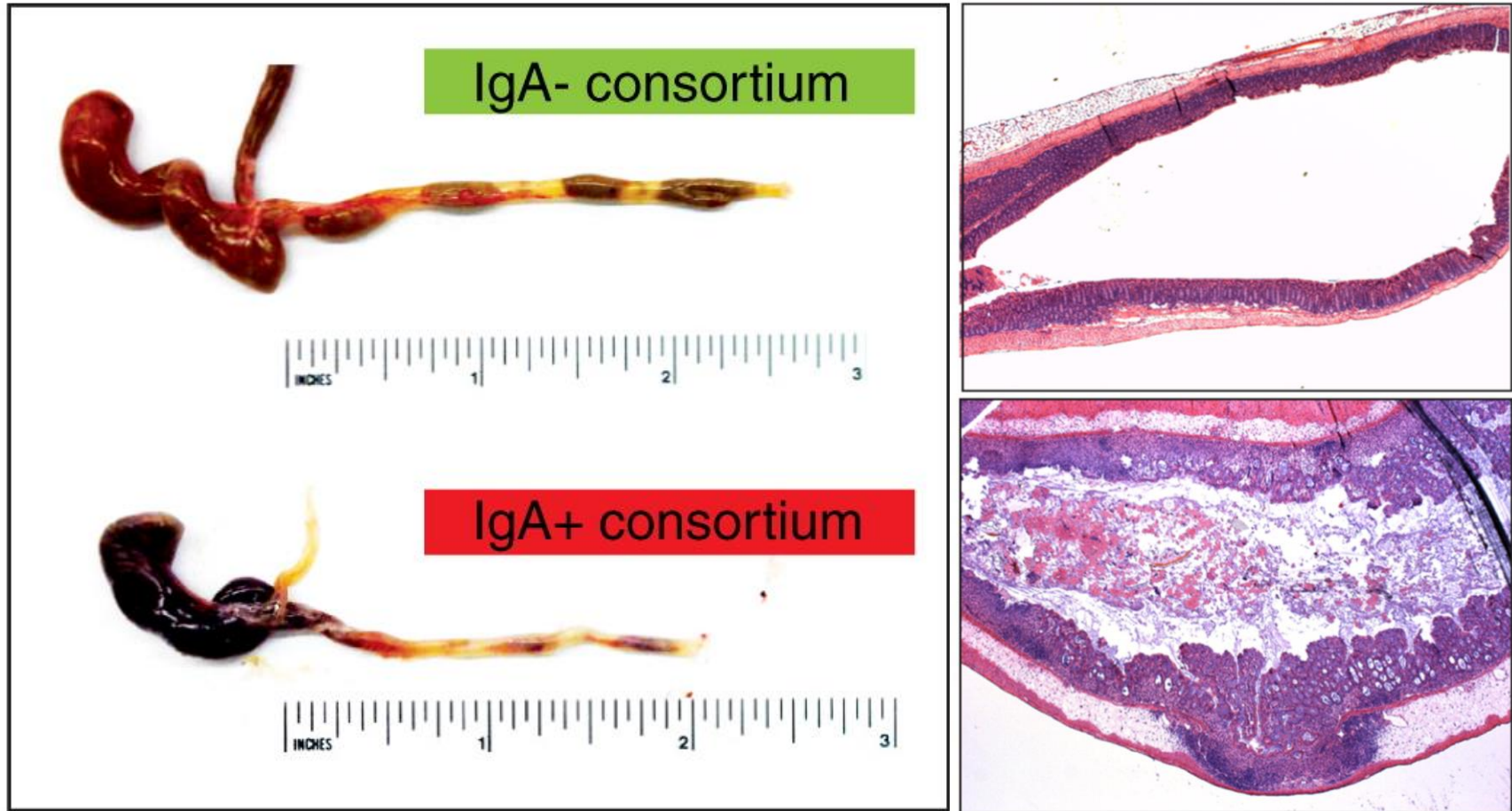
Selected individual bacterial isolates comprising of IgA+ and IgA– bacteria and colonized germ free mice.

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

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”.