MTIS MIAMI TRANSPLANT INSTITUTE SYMPOSIUM 2026

Gut Check: Optimizing Gut Microbiome for Transplant Success

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Yu F, Jiang R, Han W, Zhan G, Xu X, Jiang X, Wang L, Xiang S, Zhou Q, Liu C, Zhu B, Hua F, Yang C. Gut microbiota transplantation from db/db mice induces diabetes-like phenotypes and alterations in Hippo signaling in pseudo germ-free mice. Aging (Albany NY). 2020 Nov 20; 12:24156-24167 . https://doi.org/10.18632/aging.104101

Overview

- Gut microbiome
- Importance human health
- Relevance organ transplantation
- Few ways to ↑ microbiome health

Goals

- Awareness

- Tool ↑ transplant success

Diet and Inflammation - 2023

Food is a modulator of inflammation, to ↓ inflammation:

- ↓ (ultra processed foods, margarine, seed oils, processed meats, fast foods, juice, sodas, gluten, conventional dairy, etc.)
- Correct nutrient deficiencies: O-3 EFA, Vitamin D, Mg, B12, etc.
- ↑ vegetables/fermented foods intake:

  ↑ microbiome diversity & ↓ inflammatory cytokines (IL-6, IL-10, and IL-12b)*

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*Gut-Microbiota-Targeted Diets Modulate Human Immune Status. Hannah C Wastyk, Gabriela K Fragiadakis, Dalia Perelman, Dylan Dahan, Bryan D Merrill, Feiqiao B Yu, Madeline Topf, Carlos G Gonzalez, William Van Treuren, Shuo Han, Jennifer L Robinson, Joshua E Elias, Erica D Sonnenburg, Christopher D Gardner, Justin L Sonnenburg. Cell . 2021 Aug 5;184(16):4137-4153.e14.

Gut Microbiome

- “the community of microorganisms—including bacteria, viruses, fungi, and other single-celled organisms—that live in the human gut, as well as their combined genetic material, genes, and metabolic products”

microorganisms genetic material metabolites

https://www.genome.gov/genetics-glossary/Microbiome

Many Different Microbiomes

Oral

Sinus

Skin

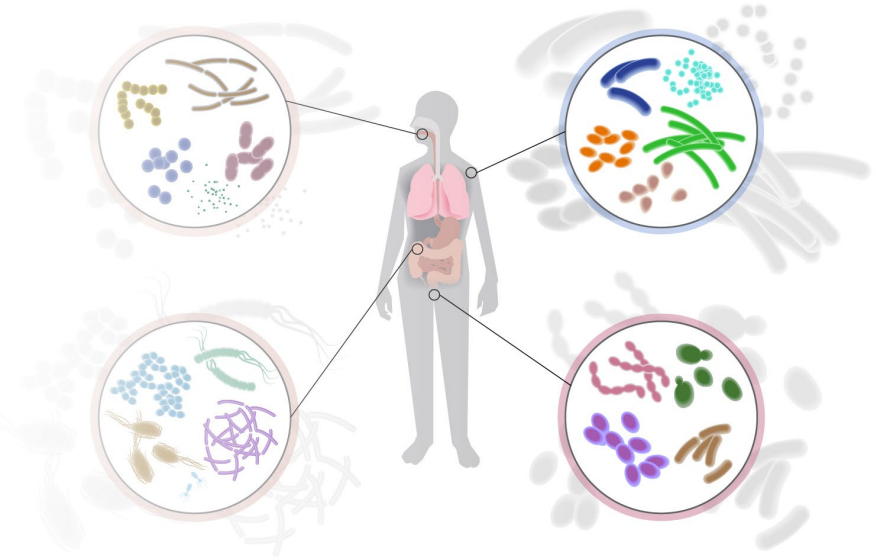
Lung

Gut

Genital

Placenta*

Organs



https://www.genome.gov/genetics-glossary/Microbiome

*The placenta harbors a unique microbiome. https://pubmed.ncbi.nlm.nih.gov/24848255/

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The Roles of the Gut Microbiome

- Nutrients/energy (carbohydrates, proteins, polyphenols, bile acids).
- Detoxify (foreign molecules and drugs).
- Maintain gut barrier structure/mucosal integrity.
- Immunomodulation (mucosal and systemic immune system).
- Protection against infections/wrong colonization.
- Synthesize vitamins and enzymes.
- Influence host's lipid/sugar metabolism.

Shreiner AB, Kao JY, Young VB. "The gut microbiome in health and in disease." Current Opinion in Gastroenterology. 2015;31(1):69–75.Rowland I, Gibson G, Heinken A, et al. "Gut microbiota functions: metabolism of nutrients and other food components."European Journal of Nutrition.2018;57(1):1–24

Eubiotic (normal) vs Dysbiotic (abnormal)

- **Eubiotic:** balanced/flexible/resilient/redundant/symbiotic (↑ diversity)

vs.

- **Dysbiotic:** imbalanced/fragile/opportunistic/pathogenic (↓ diversity)

High vs. Low Diversity Ecosystems

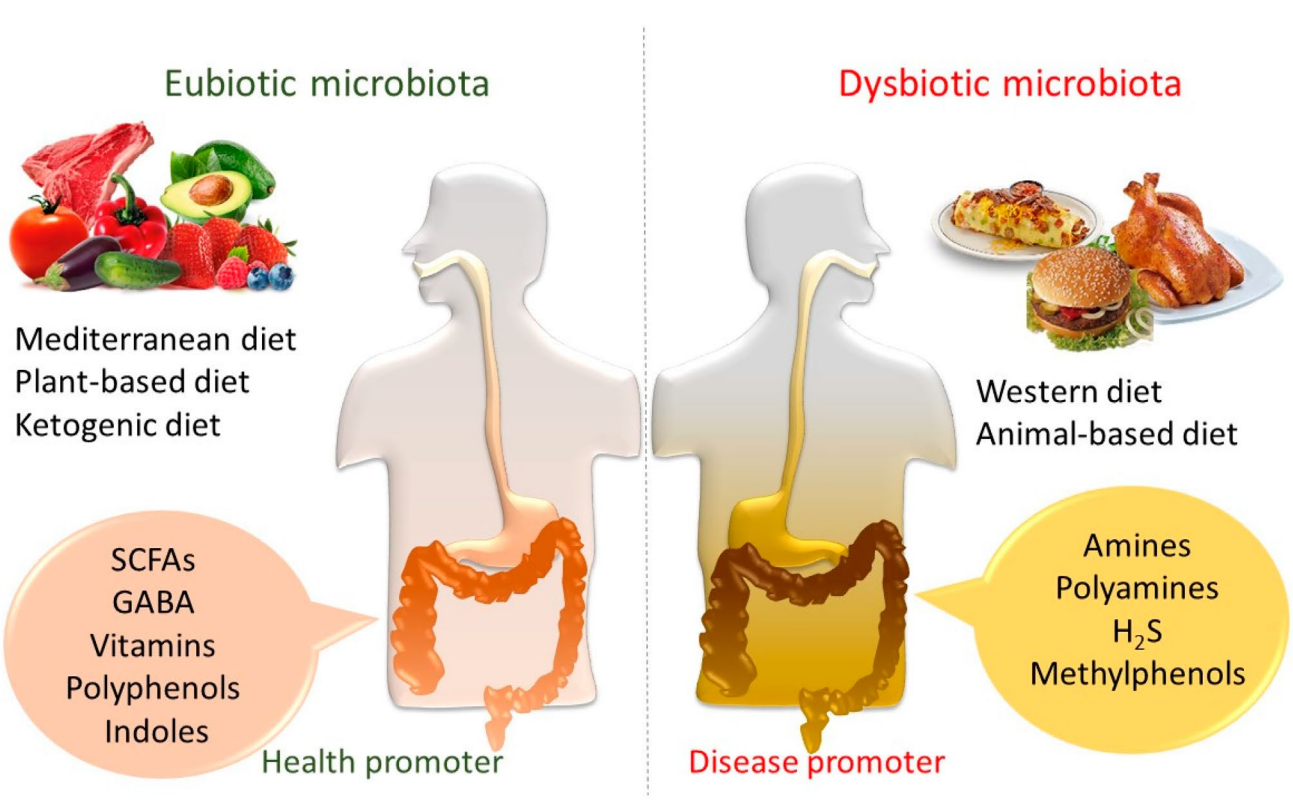
Tropical Forests ~ 1000 dominant species
resilient/flexible/balanced
(n = 21,092 vertebrate species)[1]

Citrus Groves ~ 12 dominant species
fragile/imbalanced/vulnerable
(n = 40-300 vertebrate species)

Factors that Promote Dysbiosis

1) Type of birth (C-section)
2) Early feeding (formula)
3) Medications (antibiotics, antacids, iron supplements, binders, etc.)
4) Pesticides exposure (glyphosate/Round Up)
5) Pro-inflammatory diet (ultra processed foods)

Diet and Microbiome



Gut Microbiota Metabolism and Interaction with Food Components. Int. J. Mol. Sci. 2020, 21(10), 3688; https://doi.org/10.3390/ijms21103688

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Common Signs of Dysbiosis

1) Gas
2) Bloating after meals
3) Abdominal pain/discomfort
4) Diarrhea or constipation
5) Fatigue, mood changes, skin issues

Segal LN, Blaser MJ. Approach to the diagnosis and management of dysbiosis. Frontiers in Nutrition. 2024;11:1330903. doi:10.3389/fnut.2024.1330903.

Dysbiosis in Dialysis Patients?

1) HD and PD ↓ microbial diversity

2) Functional Shifts (↑ bacteria that produce uremic toxins and ↓ SCFA-producing bacteria)

↑ abundance (ex: *Proteobacteria*, *Enterobacteriaceae*, and *Escherichia-Shigella*) and ↓ abundance (ex: *Bacteroidaceae*, *Bacteroides*, and *Faecalibacterium*)

3) Intestinal Barrier Dysfunction and Toxin Accumulation

↑ serum levels of gut-derived toxins (e.g., D-lactate, p-cresyl sulfate, TMAO), and ↓ fecal levels of beneficial bile acids and SCFAs.

Zhao YY. Recent advances of gut microbiota in chronic kidney disease patients. Explor Med. 2022;3:260–74. https://doi.org/10.37349/emed.2022.00090
The Effects of Hemodialysis and Peritoneal Dialysis on the Gut Microbiota of End-Stage Renal Disease Patients, and the Relationship Between Gut Microbiota and Patient Prognoses, Front. Cell. Infect. Microbiol., 22 March 2021 Volume 11 - 2021 | https://doi.org/10.3389/fcimb.2021.579386
Specific gut microbiome and metabolome changes in patients with continuous ambulatory peritoneal dialysis and comparison between patients with different dialysis vintages. Front. Med., 04 January 2024, Sec. Nephrology. Volume 10 - 2023 | https://doi.org/10.3389/fmed.2023.1302352

Dysbiosis in Post Transplant Patients?

Changes in gut microbiome composition, ↑ pathogenic bugs:

a) immunosuppressive drugs

b) use of antibiotics

Relevance? → graft outcomes

acute rejection, metabolism of immune suppressive drugs, renal infections, diarrhea, renal interstitial fibrosis

Salvadori M, Tsalouchos A. Microbiota, renal disease and renal transplantation. *World J Transplant* 2021; 11(3): 16-36 [PMID: 33816144; DOI: 10.5500/wjt.v11.i3.16]

Eubiotic Gut Microbiome

1) Vitamins, SCFA, enzymes, anti-inflammatory molecules
2) Detoxify hormones, xenobiotics, de/conjugate bile acids
3) Mucosal integrity, modulates inflammation and immune system
4) Insulin resistance, ghrelin, appetite, weight gain

- **Dysbiotic microbiome**: ↑ inflammation, gut permeability, obesity, autoimmunity, lose stools, ↓ absorption/digestion, anxiety, depression, etc.

Microbiome Optimization

1) Probiotic supplements

Lactobacillus plantarum (including strain 299v):
Shown to decrease incidence of *C. difficile* infection, improve kidney function, and reduce uremic toxins.

Lactobacillus paracasei:
Used in combination with *L. plantarum* to enhance renal function and improve immunosuppressant drug levels.

Lactobacillus acidophilus:
Associated with improved renal function and quality of life in CKD and transplant patients

Bifidobacterium species (e.g., B. infantis, B. longum, B. lactis):
Contribute to gut barrier integrity and reduction of infections post-transplant

Streptococcus thermophilus:
Included in probiotic mixtures that have shown renal benefits and infection reduction

https://www.frontiersin.org/journals/cellular-and-infection-microbiology/articles/10.3389/fcimb.2023.1169500/full
https://academic.oup.com/ckj/article/17/8/sfae214/7733822

Microbiome Optimization

2) Improving diet - habits

↓ sugar, seed oils, sodas, juices, fast foods, ultra processed foods/snacks

↑ fiber intake (low K vegetables, low sugar fruits, minimally processed plant matter)

↑ variety/diversity plants foods (veggies, berries, spices, herbs, infusions, etc.)

Microbiome Optimization

3) Fermented foods: sauerkraut, kimchi, organic miso, fermented low K veggies

Microbiome Optimization

4) Targeting medications: antibiotics, antacids, poly-pharmacy, etc.

Summary

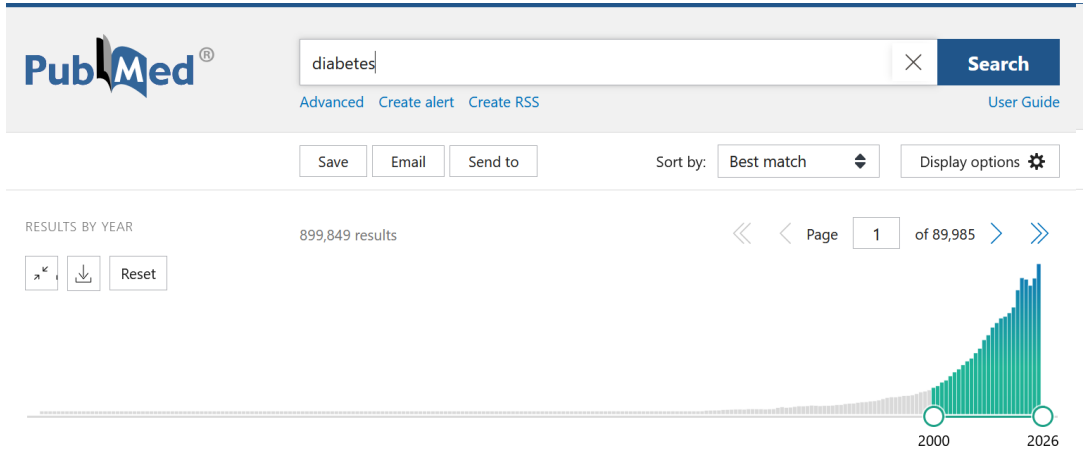
1) A balanced microbiome is very important.

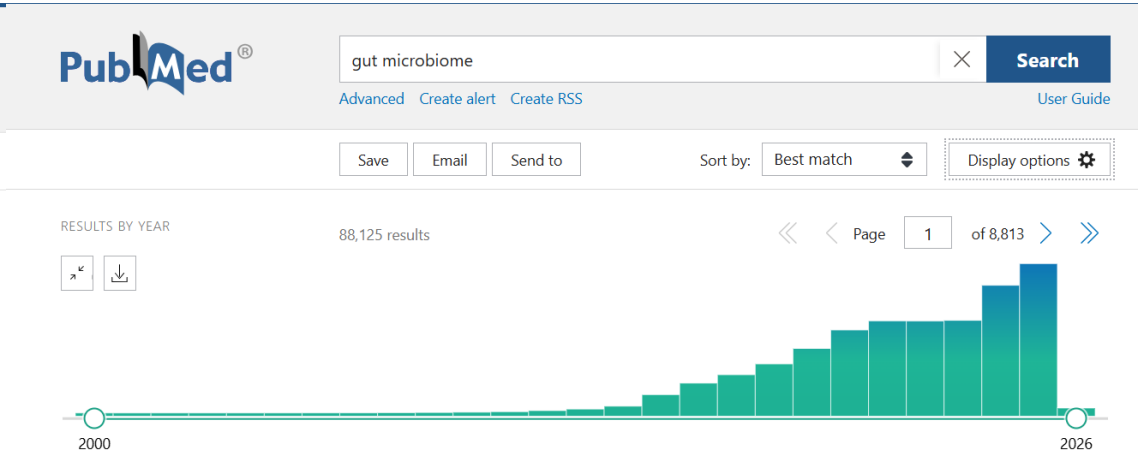
1) Dysbiosis may occur in pre/post-transplant pts.

1) Optimization: clean diet, ↑vegetables/fermented foods, probiotics, medications.

Thank you!

Gut Microbiome Research





Diabetes ~ 900,000 – 26 years

Gut Microbiome ~ 88,000 – 26 years

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