

# Microbiome: recent insights and future challenges

A green-themed background illustration featuring a silhouette of a human figure on the right. The figure is surrounded by various representations of microbes, including several large, detailed virus-like particles with spikes, smaller spherical bacteria, and elongated rod-shaped bacteria. A dotted line with small circles follows a path from the bottom left towards the center. The background is composed of various shades of green with abstract shapes.

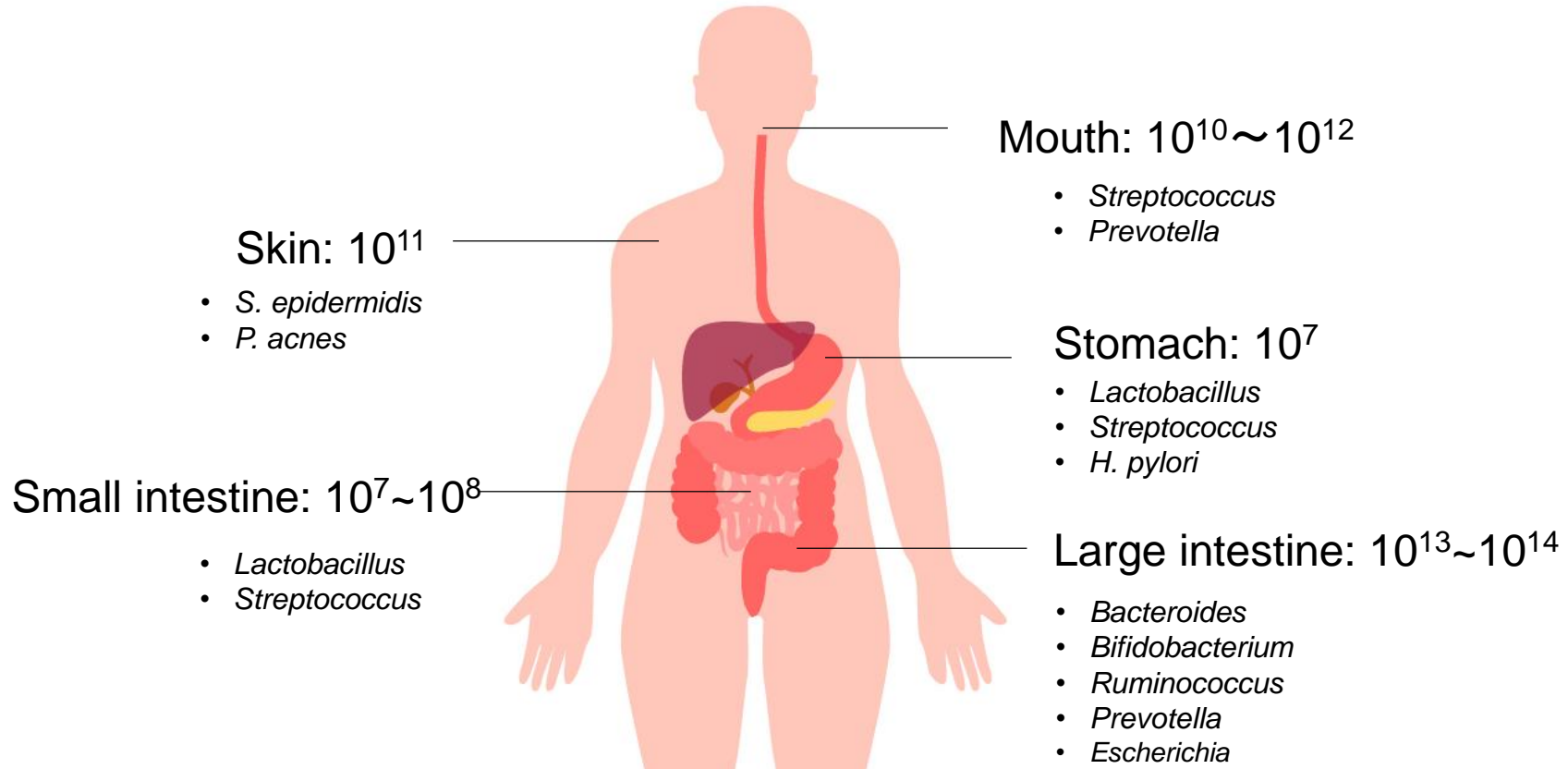
**Suguru Nishijima, Ph. D.**

Postdoctoral fellow, Bork group

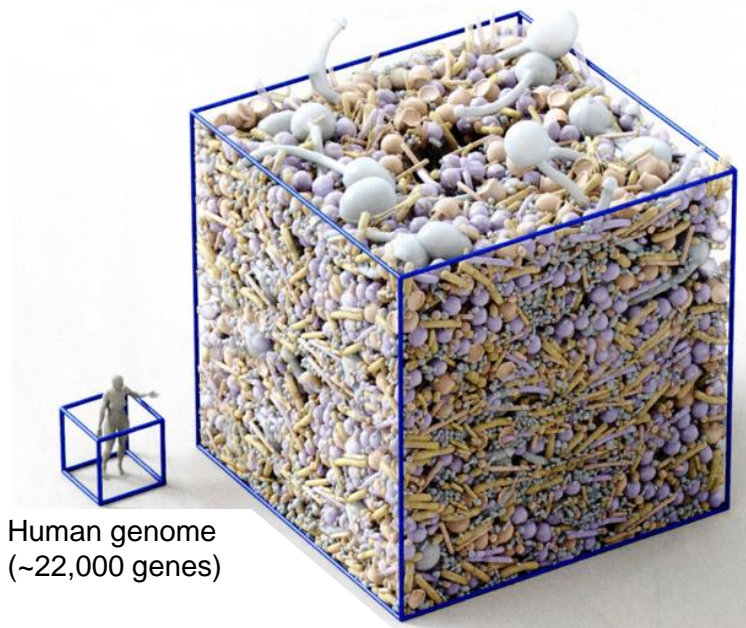
2 September 2021



# Microbes and their number in the human body



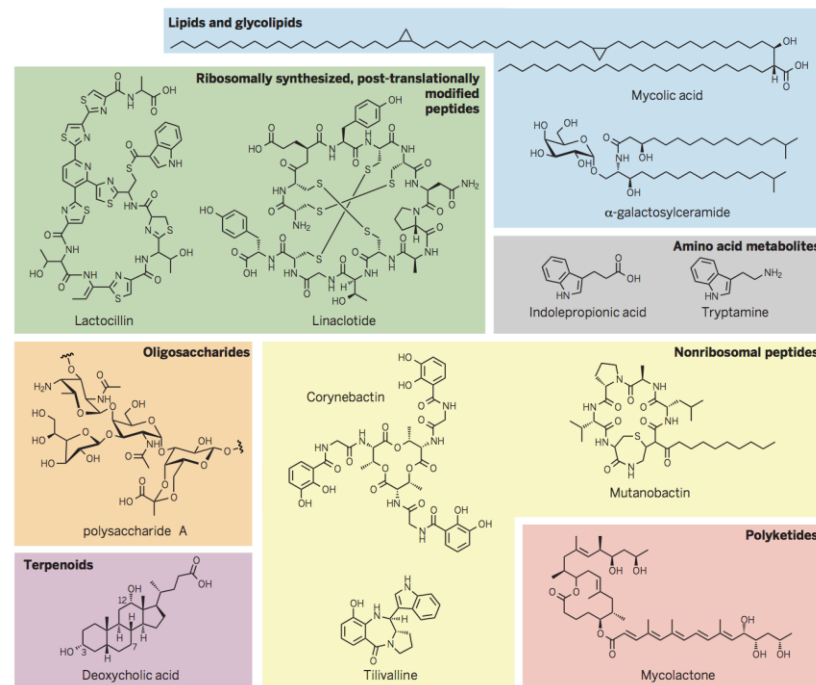
# The human gut microbiome encodes diverse genes



Human genome  
(~22,000 genes)

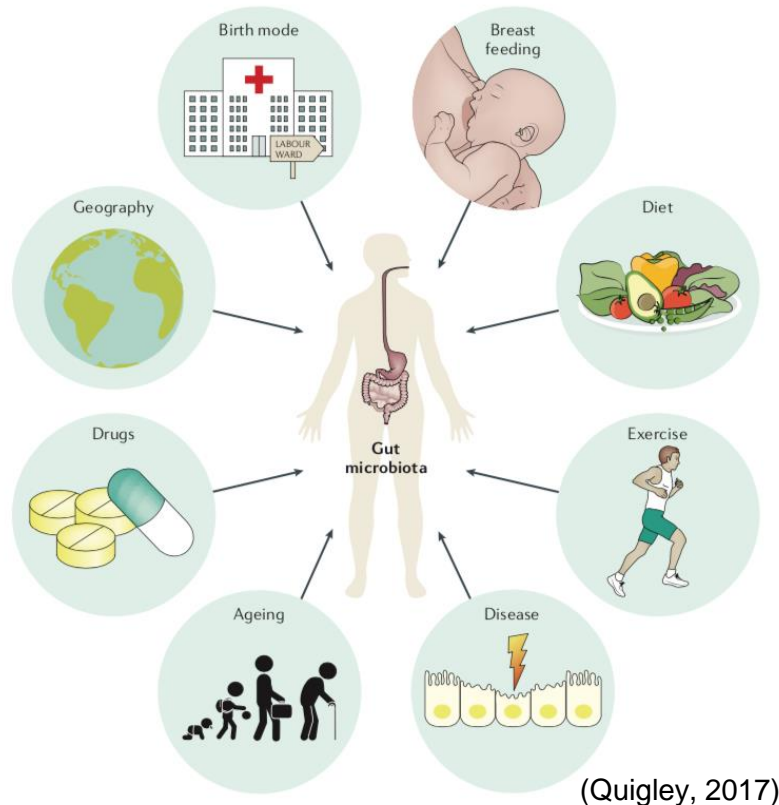
Gut microbiome (500,000 ~ 1,000,000 genes)

(Scientific American, 2012)



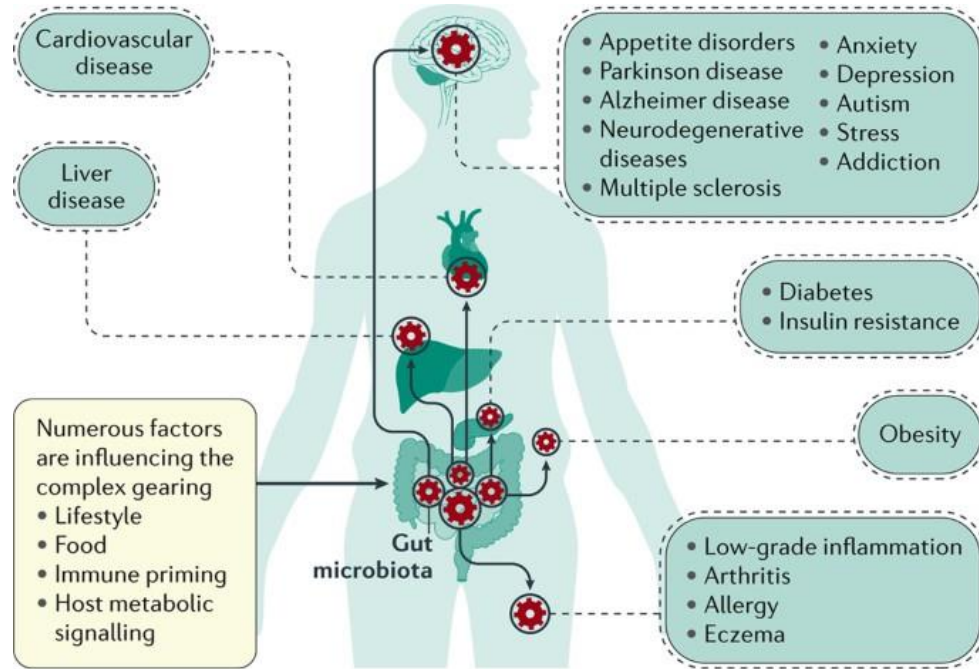
(Donia et al, 2015)

# Various factors interact with the human gut microbiome



- There is high inter-individual diversity in the gut microbiome composition  
(Chen et al, 2021)
- Only 10 – 15% of microbiome variation between individuals can be explained by known factors  
(Schmidt et al, 2018)

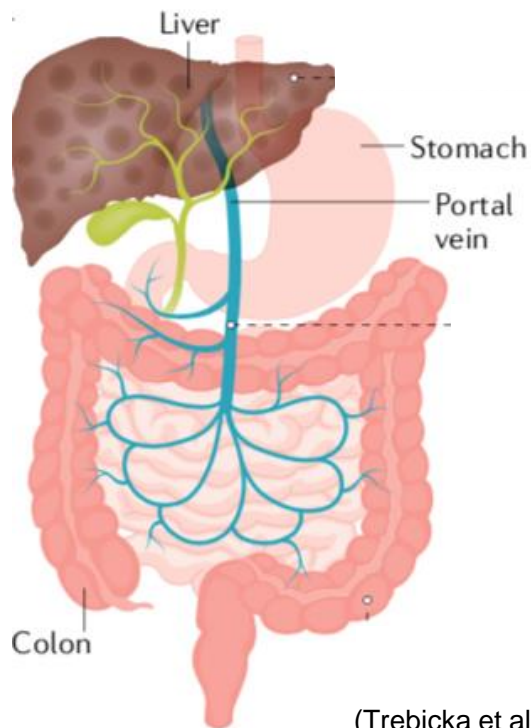
# Association between the gut microbiome and diseases



(Cani, 2017)

- The gut microbiome is associated with not only intestinal diseases but also those in the whole body
- Not only being associated, but can cause some diseases

# Gut-liver interactions in liver diseases



(Trebecka et al, 2020)

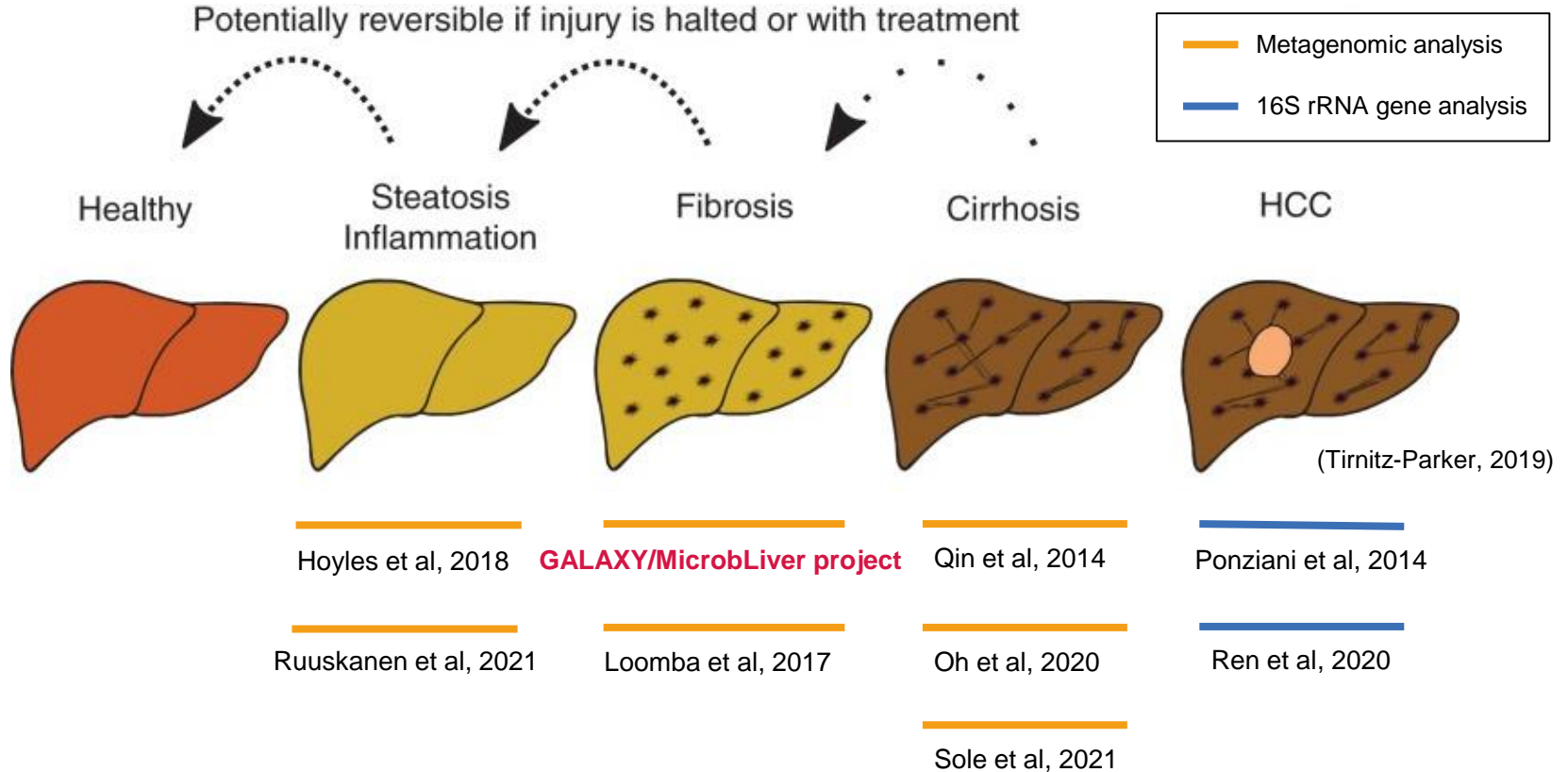
## Altered gut microbiome

- ↓ Diversity of the microbial community
- ↓ **Short chain fatty acids** (e.g., butyrate, propionate and acetate)
- ↑ **Secondary bile acids**
- ↑ Ethanol production

## Liver

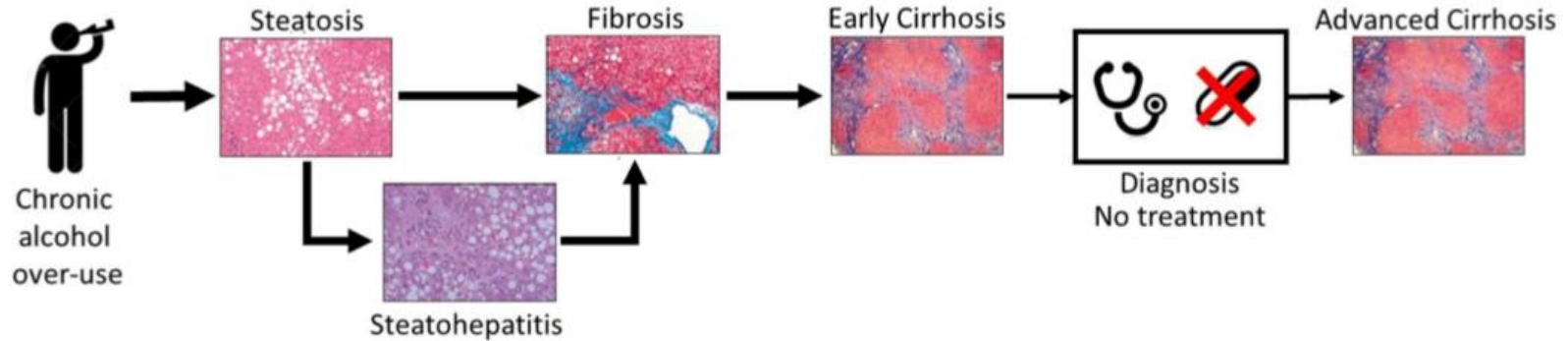
- ↑ **Inflammation**
  - ↑ Bacterial translocation
  - ↓ Primary bile acids
- Disrupted epithelial barrier results in **leaky gut** which may enable increased translocation of bacteria and their metabolites

# Gut microbiome research across liver disease stages





# GALAXY : Gut-and-liver axis in alcoholic liver fibrosis



## Aim of this project

- 1) Identify microbial signatures during disease development and progression of alcoholic liver disease (ALD)
- 2) Identify biomarkers for diagnosis/prognosis, and targets for intervention

