

Role of parasites in remodeling of microbiota and in Colonic neoplasia

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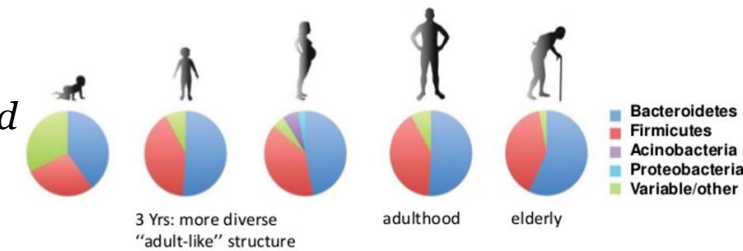
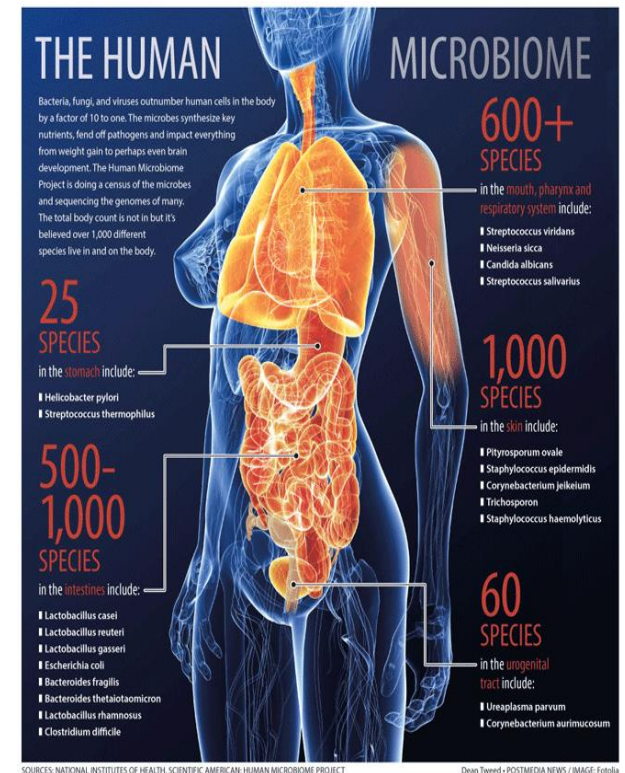
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Gut microbiota

- The human gut represents a complex ecosystem composed by a large microbial community regulating
 - nutrition,
 - metabolism,
 - homeostasis,
 - development and function of immunity,
 - inflammation
 - etc
- The species composition varies among individuals
 - *Firmicutes* and *Bacteroidetes* groups (90%)
 - *Cyanobacteria*, *Proteobacteria*, *Actinobacteria*, *Fusobacteria* and *Verrucomicrobia* (10%)



Aleksandar D. Kostic, Michael R. Howitt and Wendy S. Garrett; *Genes Dev.* 2013 27: 701-718

Human Parasites

Two broad groups:

- **Protozoa** includes a number of gastrointestinal parasites, such as
 - *Entamoeba histolytica*,
 - *Giardia lamblia*, *Cryptosporidia*,
 - *Trypanosoma cruzi*
 - etc
- The multicellular **helminths** are further divided into three groups,
 - cestodes/tapeworms (e.g., *Taenia solium* and *Diphyllobothrium latum*),
 - nematodes/round worms (e.g., *Ascaris lumbricoides*, *Strongyloides stercoralis*, and *Enterobius vermicularis*), and
 - trematodes/flukes (e.g., *Schistosoma japonicum* and *Schistosoma mansoni*)
- Notably, **industrialization** is also correlated with a nearly complete **disappearance** of **intestinal** helminths and other gut **eukaryotes**

Question...

Gut eukaryotes

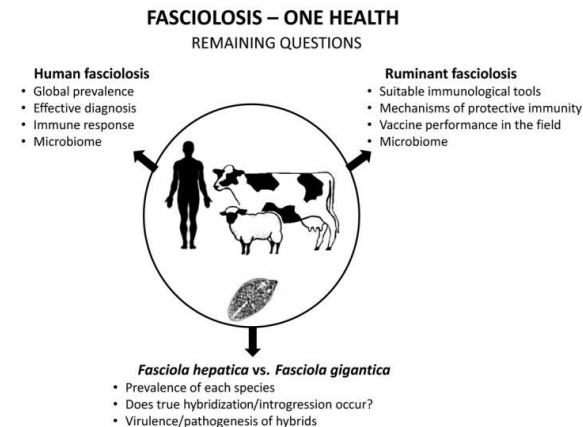
- Are they simply parasites that are detrimental to human health or whether, on the contrary, they could provide, after millions of years of co-evolution, some beneficial effects to their hosts?
- What is their role in shaping the taxonomic and functional variability of the human gut bacterial flora ?
- We need to focus more on the gut microbiota in non-industrialized populations, which still have a high prevalence of gut eukaryotes
- In this way, we will also be able to understand the complex interactions that occur within the human gut ecosystem and their implications for public health.

Human Parasites and Microbiota Remodeling

- **Protozoa and helminths** have been considered **parasites** and assumed to have a **detrimental** effect on the host organism

Kirk, M.D. et al. (2015); Yang, K. et al. (2012)

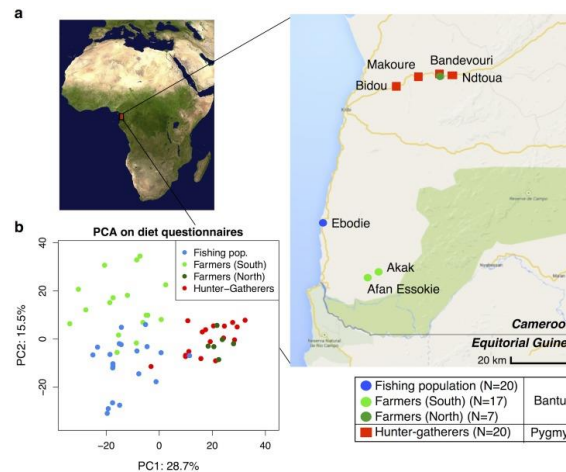
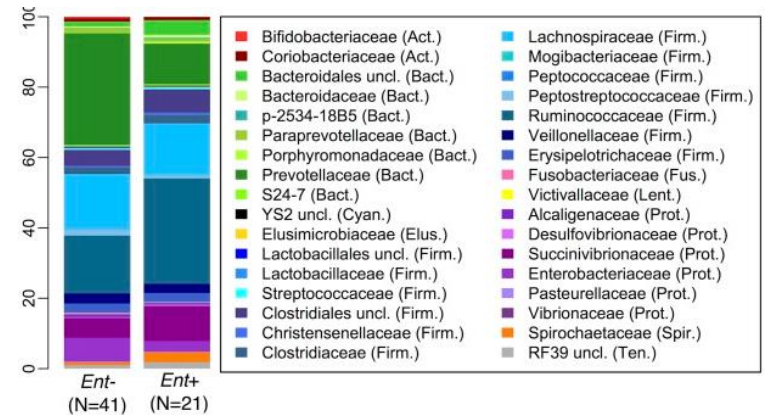
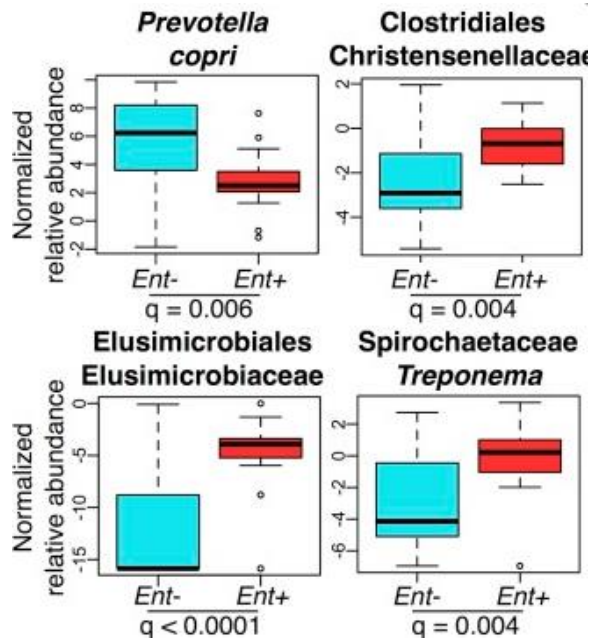
- **Commensal and/or Beneficial**
 - E.g. Fasciolosis (Helminthic disease) can cause severe illness
 - However, infections are often asymptomatic
 - This reflects the 500 million years of co-evolution history and tolerance by humans



- **Increasing evidence** that helminths can have a **beneficial** effect
 - Clinical improvements **in individuals with diarrhea or bowel inflammation** following **experimental infections** have even led to the idea of **helminthic therapy**

Broadhurst, M.J. et al. (2012); Cantacessi, C. et al. (2014); Ramanan, D. et al. (2016)

Presence of commensal protozoa *Entamoeba* spp. (other than *E. histolytica*) associated with increased intra-host gut microbiome diversity in the group of people originated from rural areas in Cameroon



Experimental Plan

- Microscopic Examination of stool samples
- DNA extraction from blood, **stool**, skin and buccal samples
- 16S rRNA Sequencing by Next Generation Sequencing and/or Metagenomic shotgun sequencing