DO MICROBIOMES INTERACT WITH THE ZIKA VIRUS?

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“The development, nutrition, physiology and health of multicellular organisms are influenced by the complex microbial communities they host, hereby shaping their ecology and evolution”

The Holobiont Imperative
Springer-Verlag Wien, 2016
Paradigm shift: the **holobiont** concept (the host and its microbiota) and the **hologenome** (the collective genomes of a holobiont)

The hologenome concept: human, animal and plant microbiota. Springer International Publishing Switzerland, 2013
Review
Disentangling Interactions in the Microbiome: A Network Perspective

Past: Pathogens in hosts

Future: Pathobionts* in microbiotas in hosts

* Defined in next slide
Pathobionts: typically benign and endogenous microbes with the capacity, under altered ecosystem conditions, to elicit pathogenesis (NEJM)

Pathobiome: a perturbed microbiome
AIDS

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*Staph aureus*

Zika virus

ID’s and non-ID’s
Vaginal microbiome affects HIV risk
Unusual bacteria in vagina help explain high infection rates in South African women

HIV, the gut microbiome, and the mucosal immune system

Maternal HIV infection influences the microbiome of HIV-uninfected infants
Nasal colonization  $\textit{Staphylococcus aureus}$  Invasive infection
Nasal colonization \( \rightarrow \) \textit{Staphylococcus aureus} \( \rightarrow \) Invasive infection

\textit{Staphylococcus lugdunensis} \( \nrightarrow \) Nature, 2016
Nasal colonization

*Staphylococcus aureus*

Invasive infection

*Corynebacterium striatum*

Front Microbiol, 2016
Staphylococcus lugdunensis

Corynebacterium striatum

Pervert other bacteria
i.e. *Pseudomonas aeruginosa*

Sci Transl Med, 2016

Nasal colonization

*Staphylococcus aureus*

Invasive infection
Nasal colonization

Staphylococcus aureus

Staphylococcus lugdunensis

Corynebacterium striatum

Invasive infection

Immunol Infect, 2015

J Infect Chemother, 2016
Mosquito microbiota modifies behavior and carriage of arboviruses

Curr Opin Virol, 2015
Triatoma brasiliensis microbiota interferes with carriage of *T. cruzi*
Mosquito microbiota modifies behavior and carriage of arboviruses

Skin microbiota influences propensity for mosquito bites

FEMS microbiology ecology, 2015
Mosquito microbiota modifies behavior and carriage of arboviruses

Skin microbiota influences propensity for mosquito bites

Placental microbiota may hypothetically influence fetal infection by Zika-v and other viruses

References
Mosquito microbiota modifies behavior and carriage of arboviruses

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Placental microbiota may hypothetically influence fetal infection by Zika-v and other viruses
• All multicellular organisms are **holobionts**
• Keystone **pathobionts** may influence the transformation of the microbiome into a **pathobiome**
• Our hypothesis: every disease is associated with some **perturbation of the microbiota**

I am a holobiont too! I hope to preserve my healthy microbiome for many years...

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