



**New insights into the oral microbiome
interspecies interactions**

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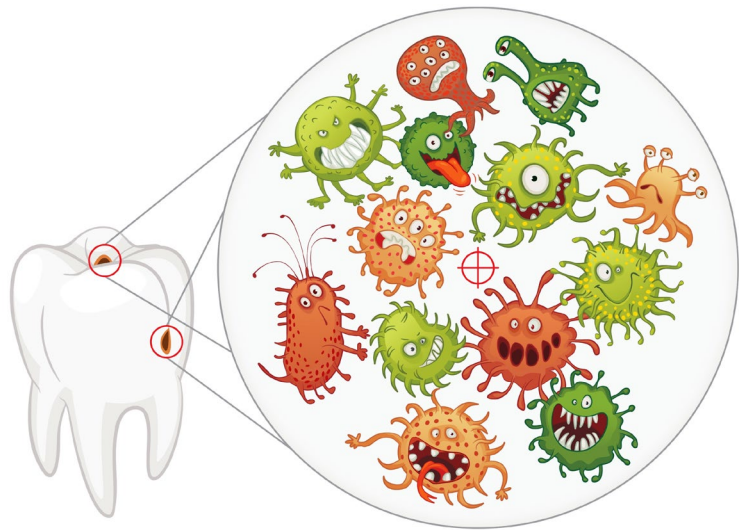
OHSU Research Week Virtual Presentations

June 12th, 2020

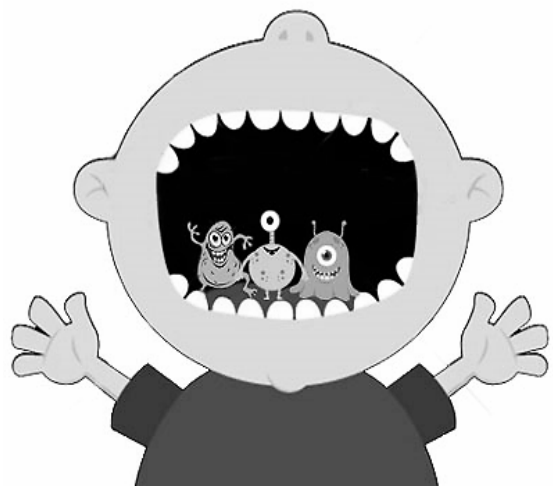


Different habitats

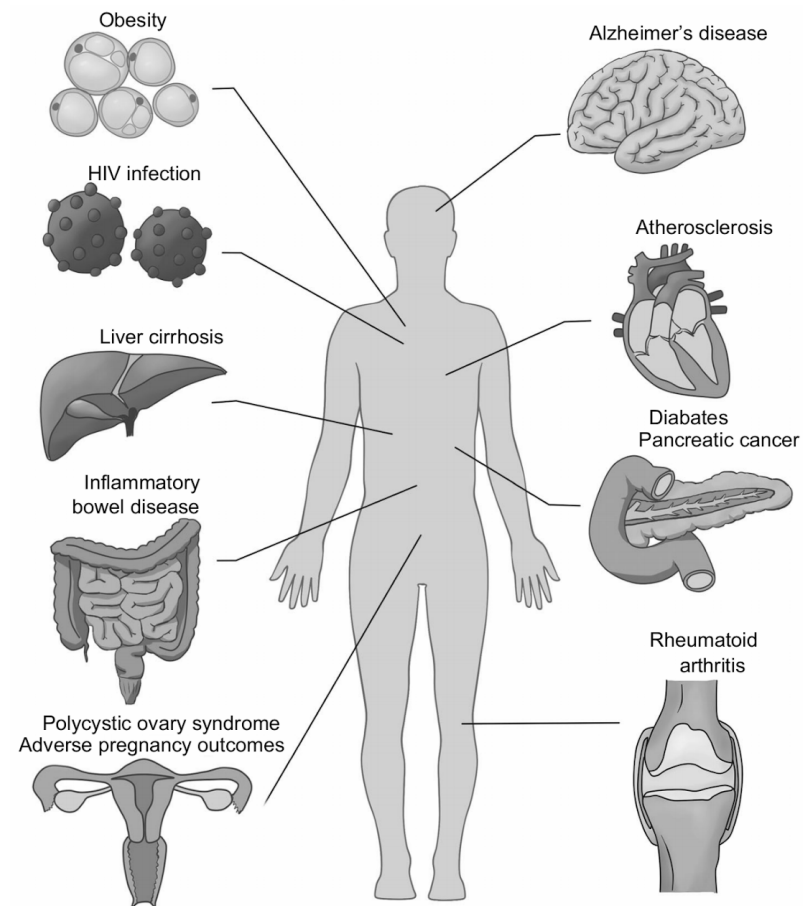
Oral microbiome



Oral cavity



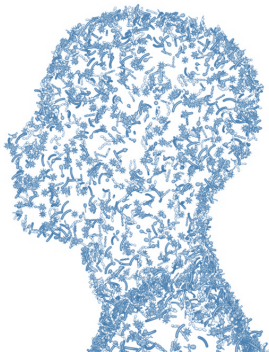
Dysbiosis





Oral microbiome

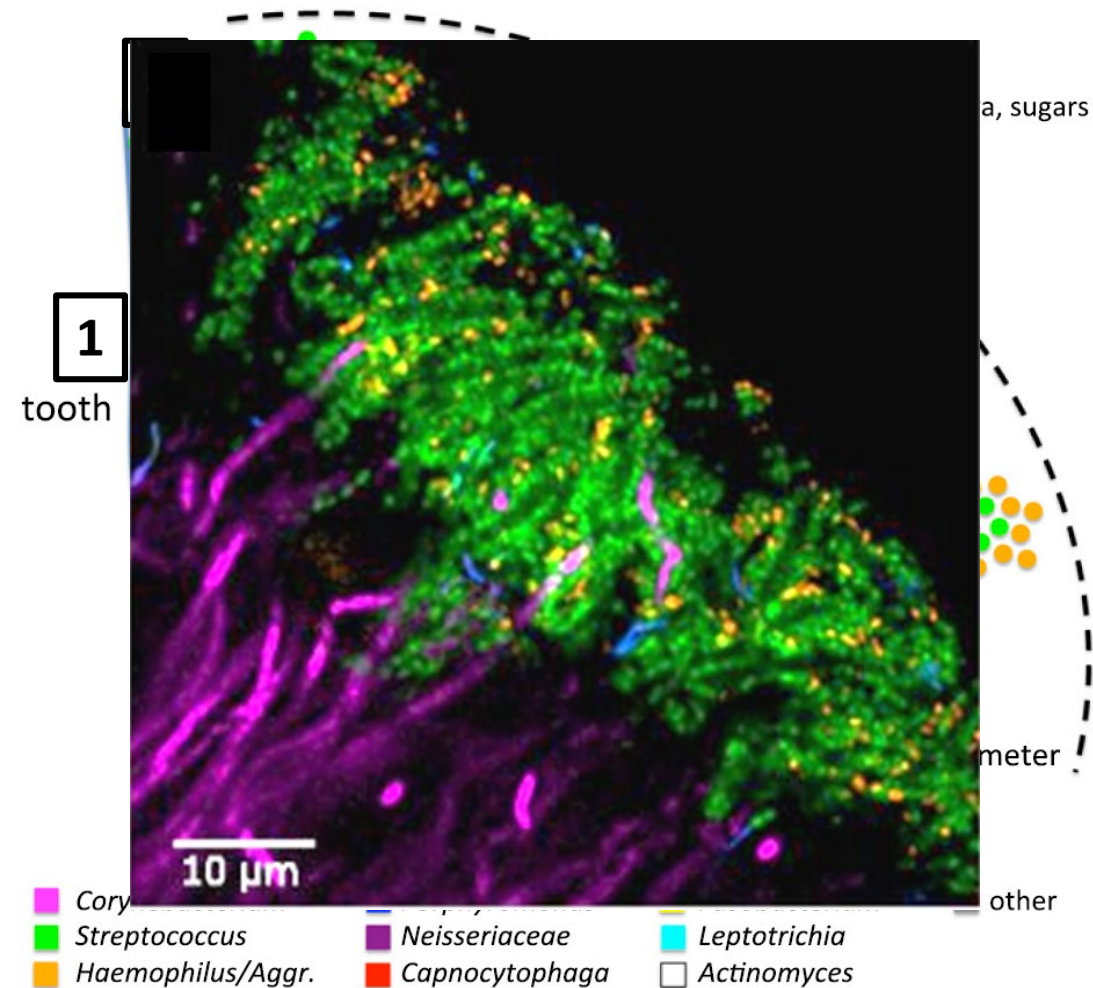
- **≥600 taxa predominating at different habitats (Dewhirst et al 2010).**
- **Can be found in healthy and disease-affected subjects.**
- **Substantial increase of certain bacteria in oral disease patients**
 - **Imbalance among oral ecosystems (Becker et al 2002; Aas et al 2005).**
- **Oral infections ➤ Commensals + Host + Environment.**

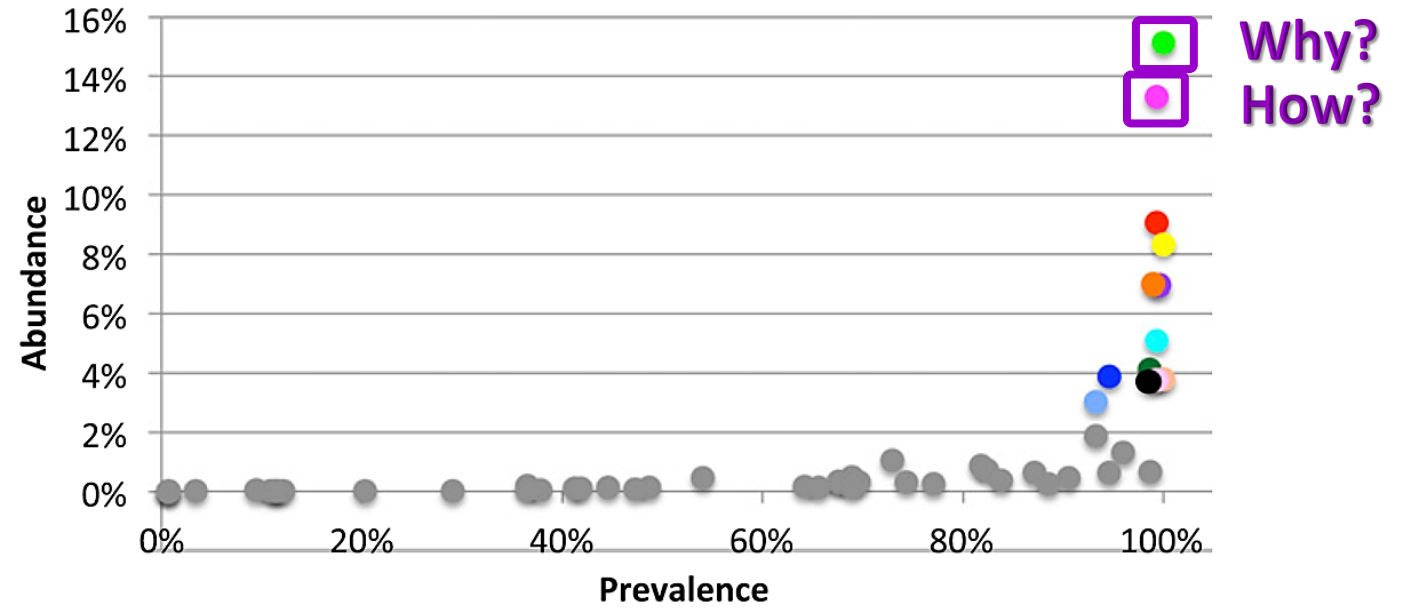
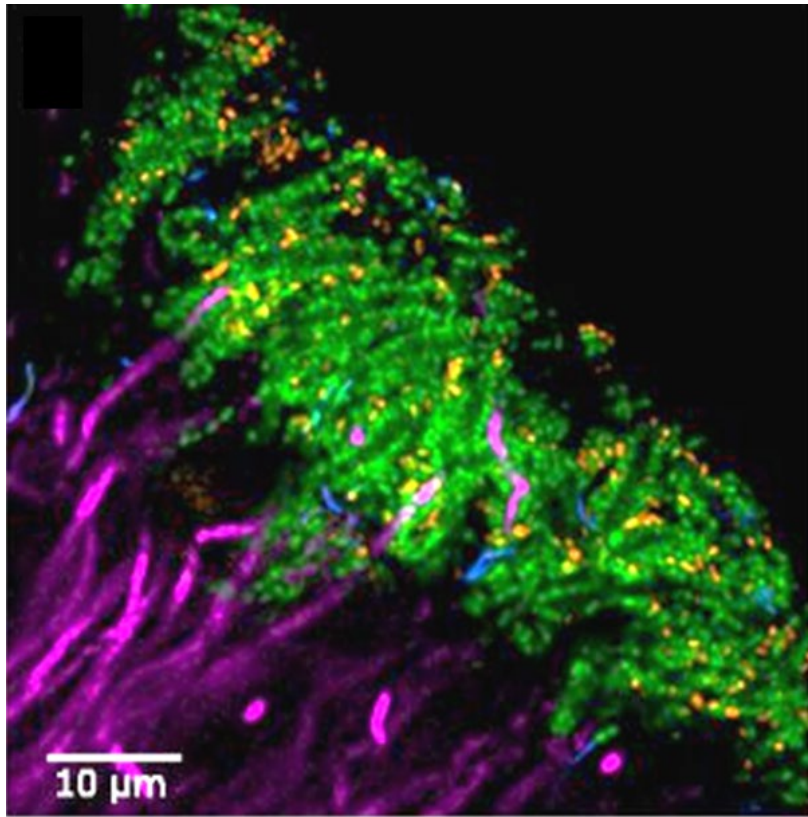


Oral microbiomes (cont.)


A model for plaque microbiome:

1. Salivary pellicle coating the teeth
2. Initial attachment of *Streptococcus* to the pellicle
3. Binding of a variety of other colonizers (*Corynebacterium*)
4. Formation of *Streptococcus* at the distal tips of the filaments
5. Formation of other colonizers e.g. *Neisseriaceae*, *Fusobacterium*, *Capnocytophaga*, and *Leptotrichia* clusters in low-O₂, high-CO₂ environment (annulus)

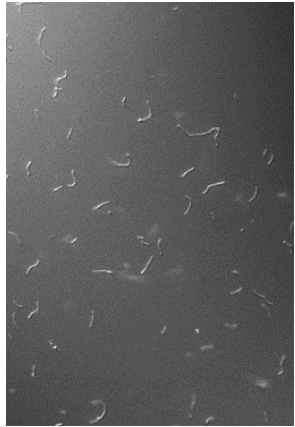




 *Corynebacterium*
C. durum (Cd)

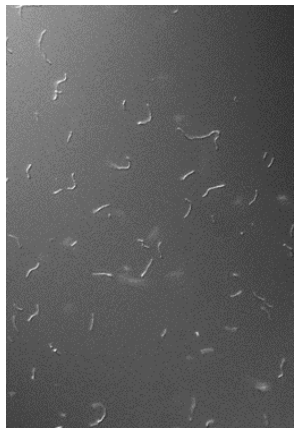
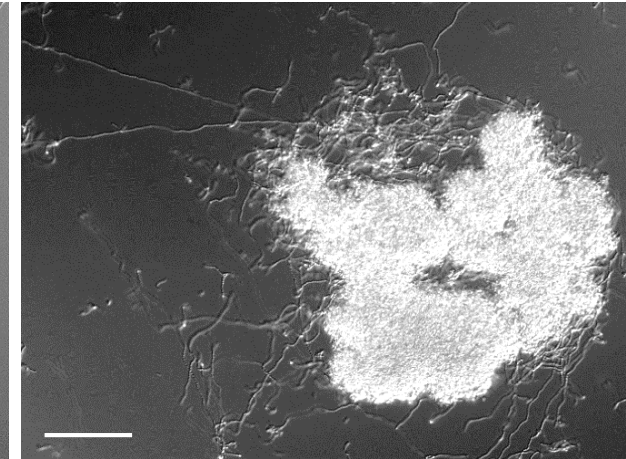
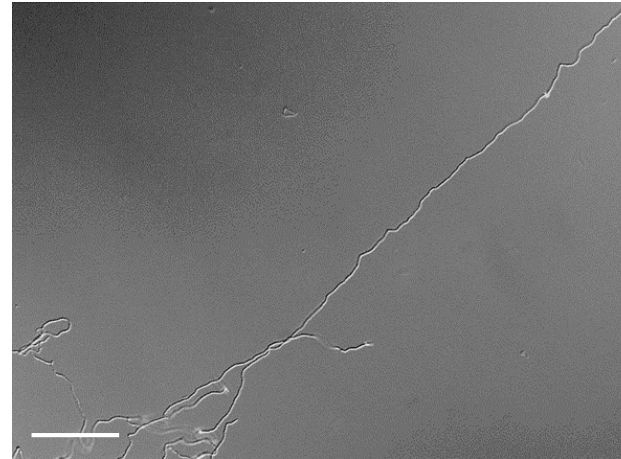
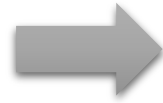
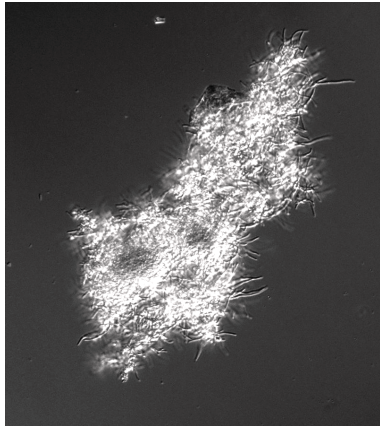
 *Streptococcus*
S. sanguinis
(SK36)

Interspecies interaction between *C. durum* and SK36



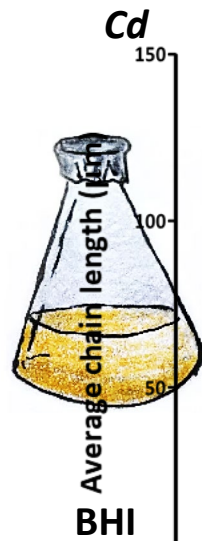
SK36

+

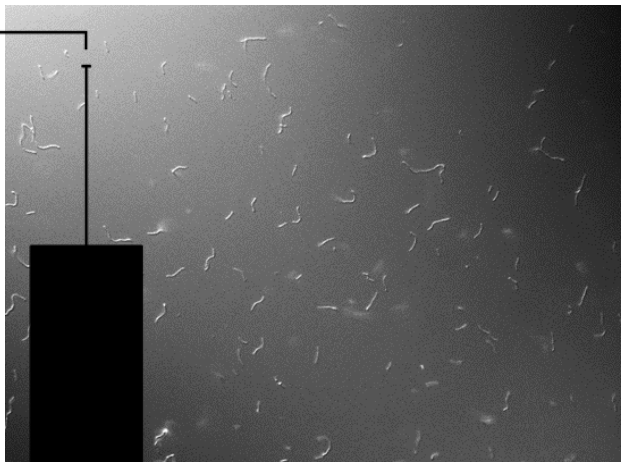


SK36

+

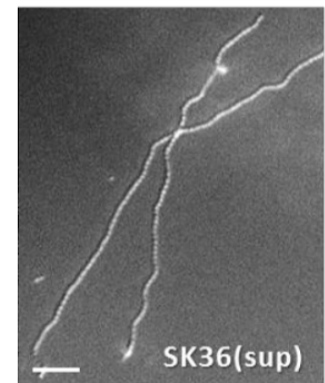
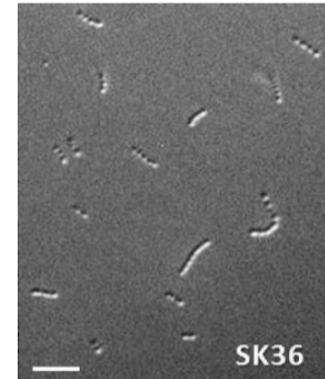


SK36

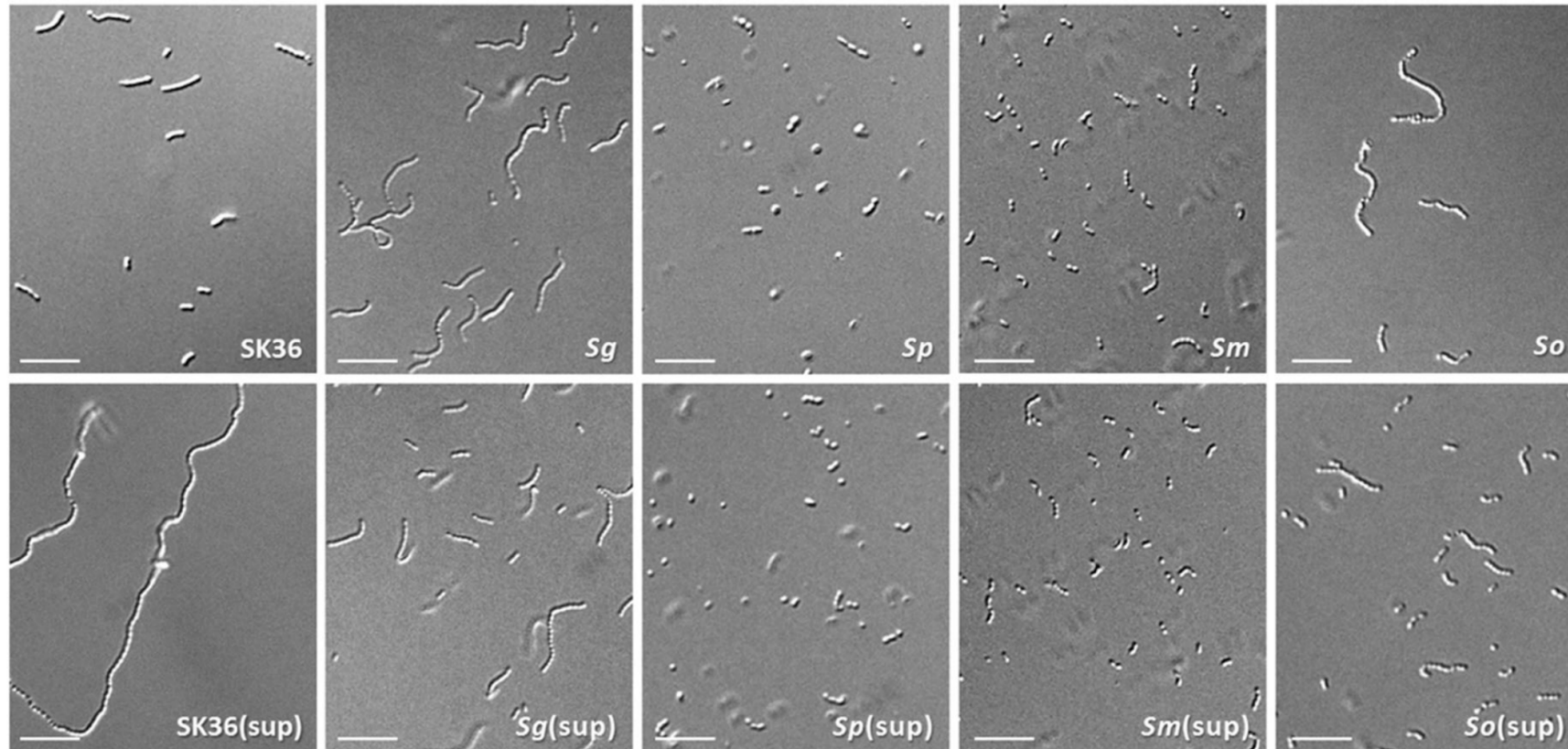


SK36+Cd

Chain elongation induction in other *S. sanguinis* strains by *C. durum*



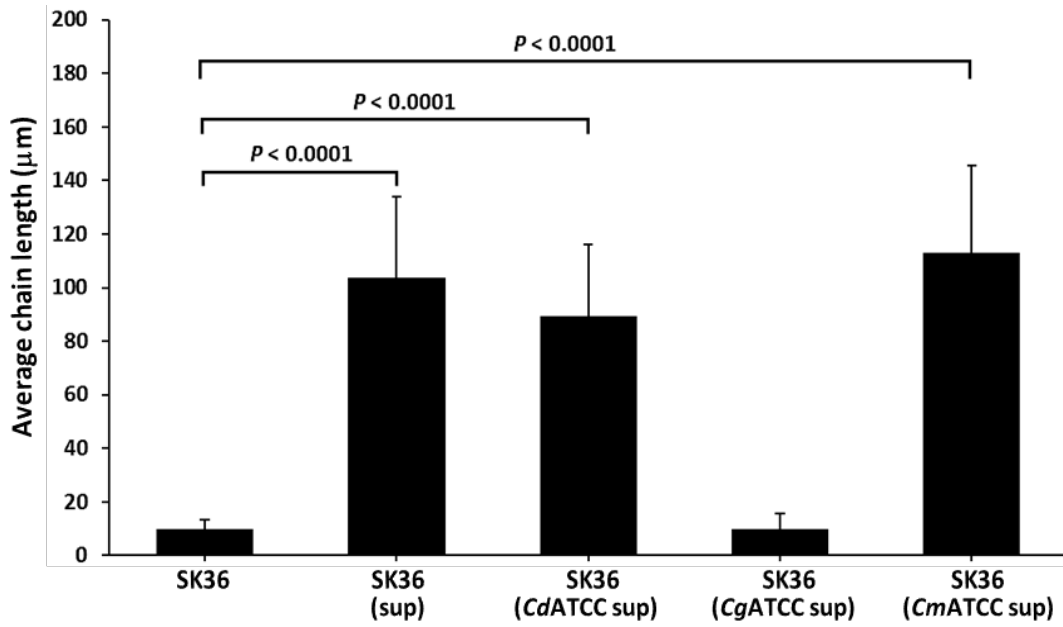
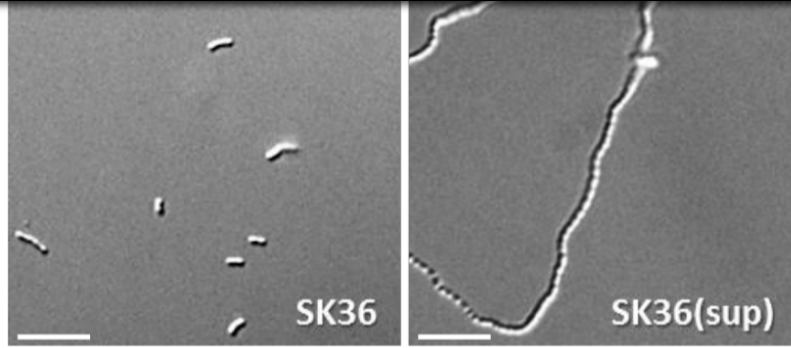
No morphological changes in other streptococci by *C. durum*



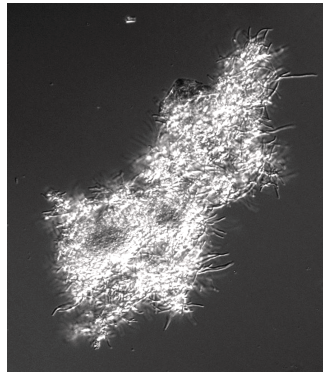
- *S. gordonii* DL1 (Sg)
- *S. parasanguinis* (Sp)
- *S. mutans* UA159 (Sm)
- *S. oralis* J22 (So)

Specific interaction between oral

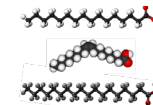
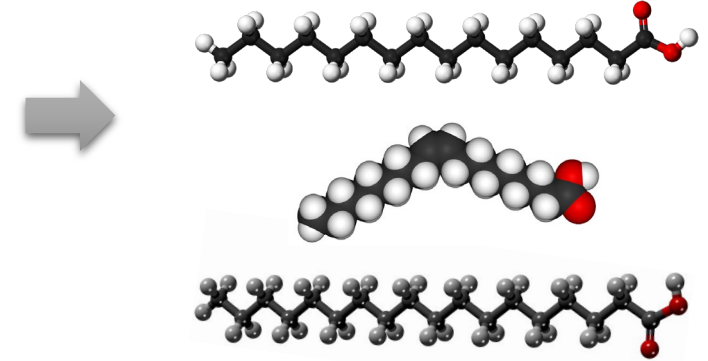
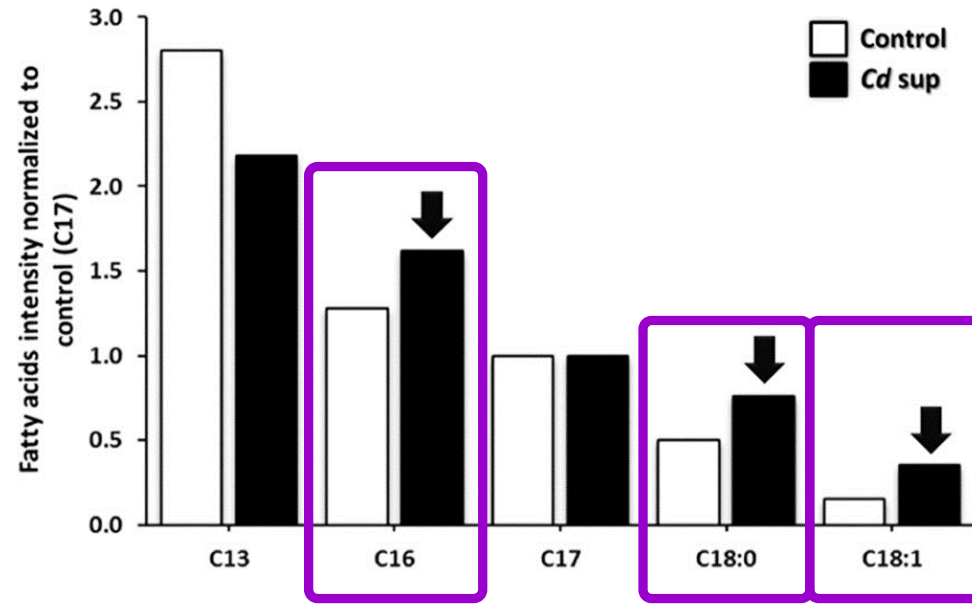
phology



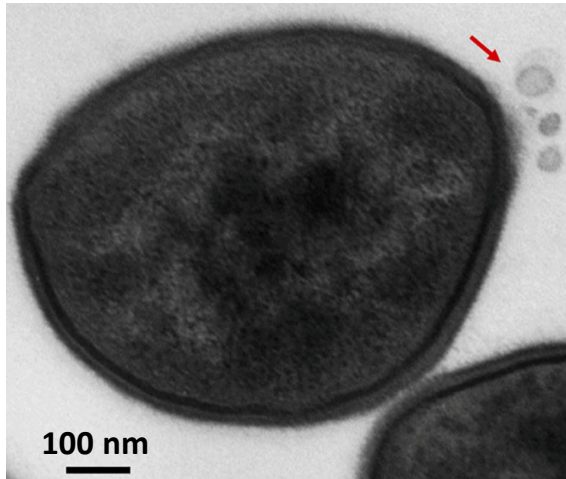
C. durum produces certain fatty acids during growth



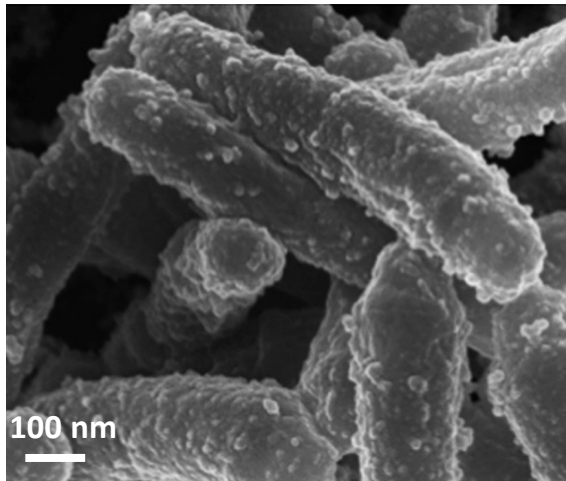
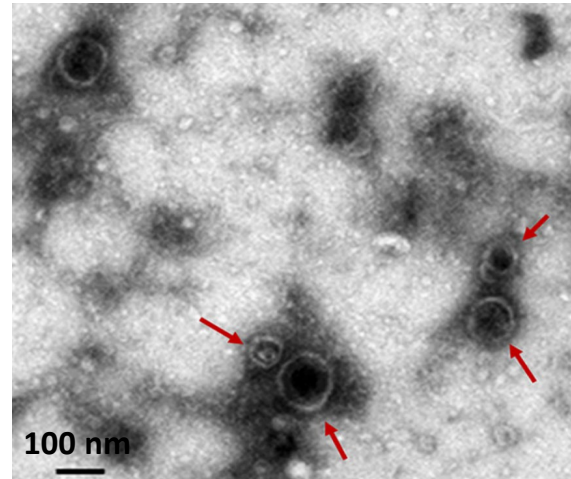
Cd



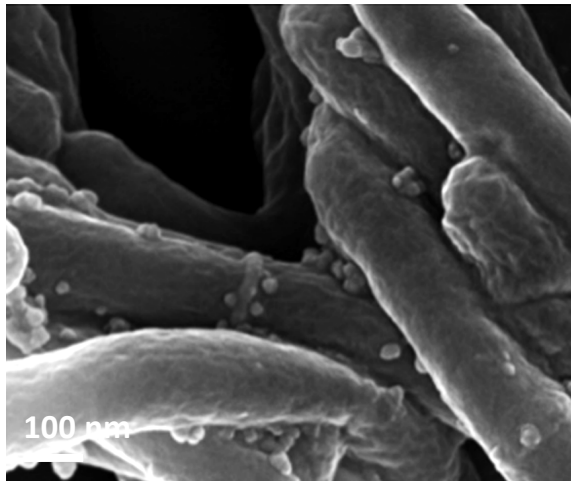
Membrane vesicles (MVs)



Wang et al 2018

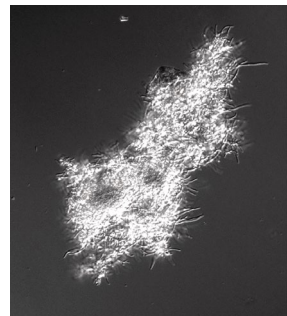


Prados-Rosales et al 2014



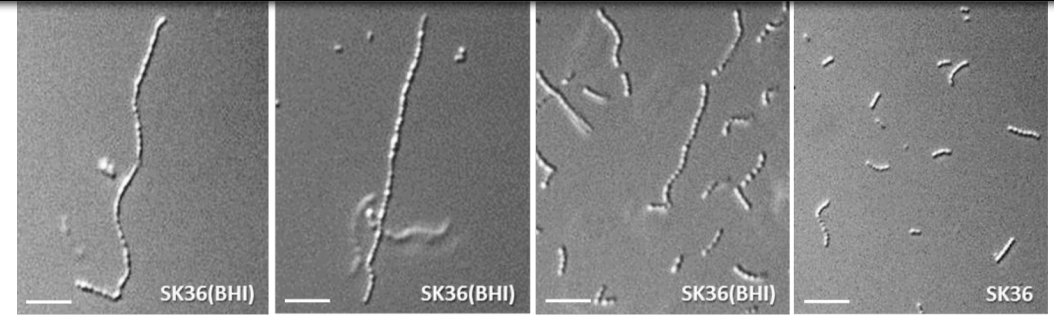
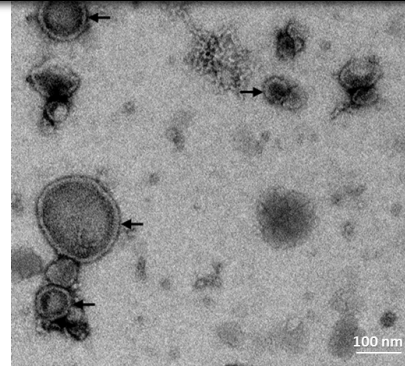
- Nano-sized, spherical, double-layered particles (10-400 nm).
- Contain various molecules e.g. proteins, nucleic acids and lipids.
- MVs content determines the roles of MVs:
 - Survival
 - Intercellular communication/interaction
 - Material exchange
 - Pathogenesis
- Environmental factors affect MVs production and composition.

C. durum MVs induce SK36 chain elongation

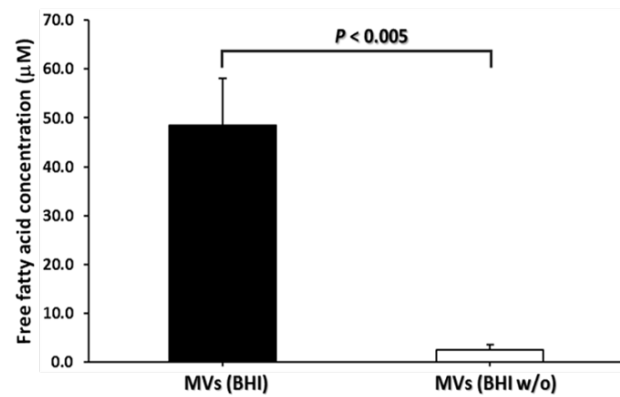
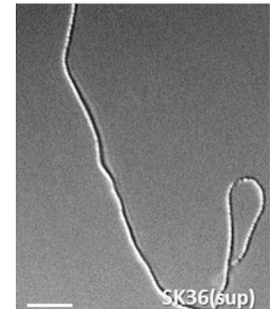
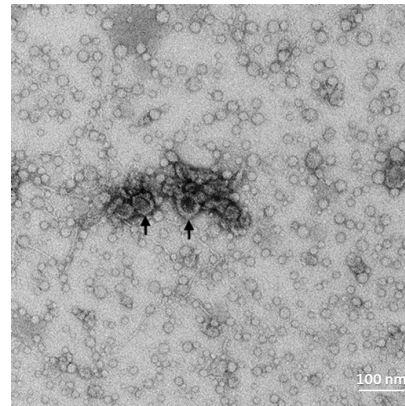


C. durum

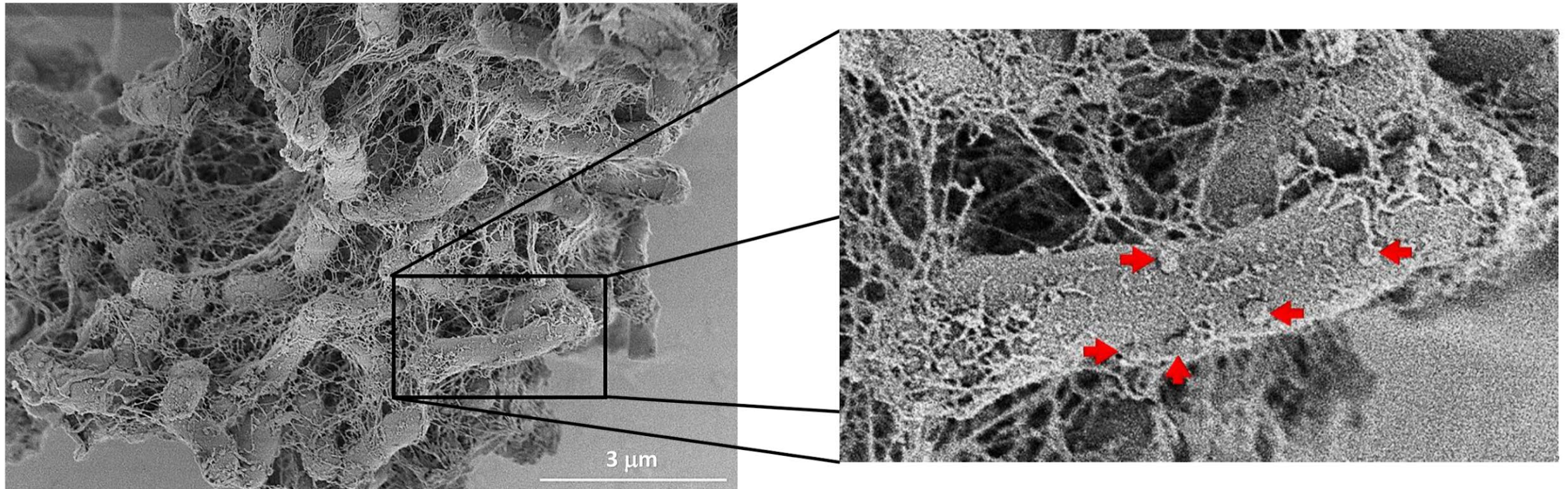
BHI



BHI w/o



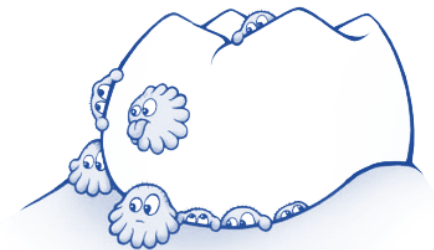
C. durum MVs in biofilm condition





Conclusions

- **Strain-specific, beneficial interactions between *C. durum* and *S. sanguinis* >> Oral cavity protection**
- ***C. durum* can produce membrane vesicles containing fatty acids for interactions with *S. sanguinis***
- **Glucose affects *C. durum* fatty acid production >> Interactions with *S. sanguinis***





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Acknowledgements



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Merritt lab

OHSU Proteomics Shared Resource

**OHSU Bioanalytical Shared Resource/
Pharmacokinetics Core**



*Lab alumni