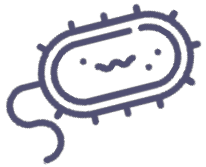
The planarian microbiome in response to external stressors

- Focus on SilverNanoparticles



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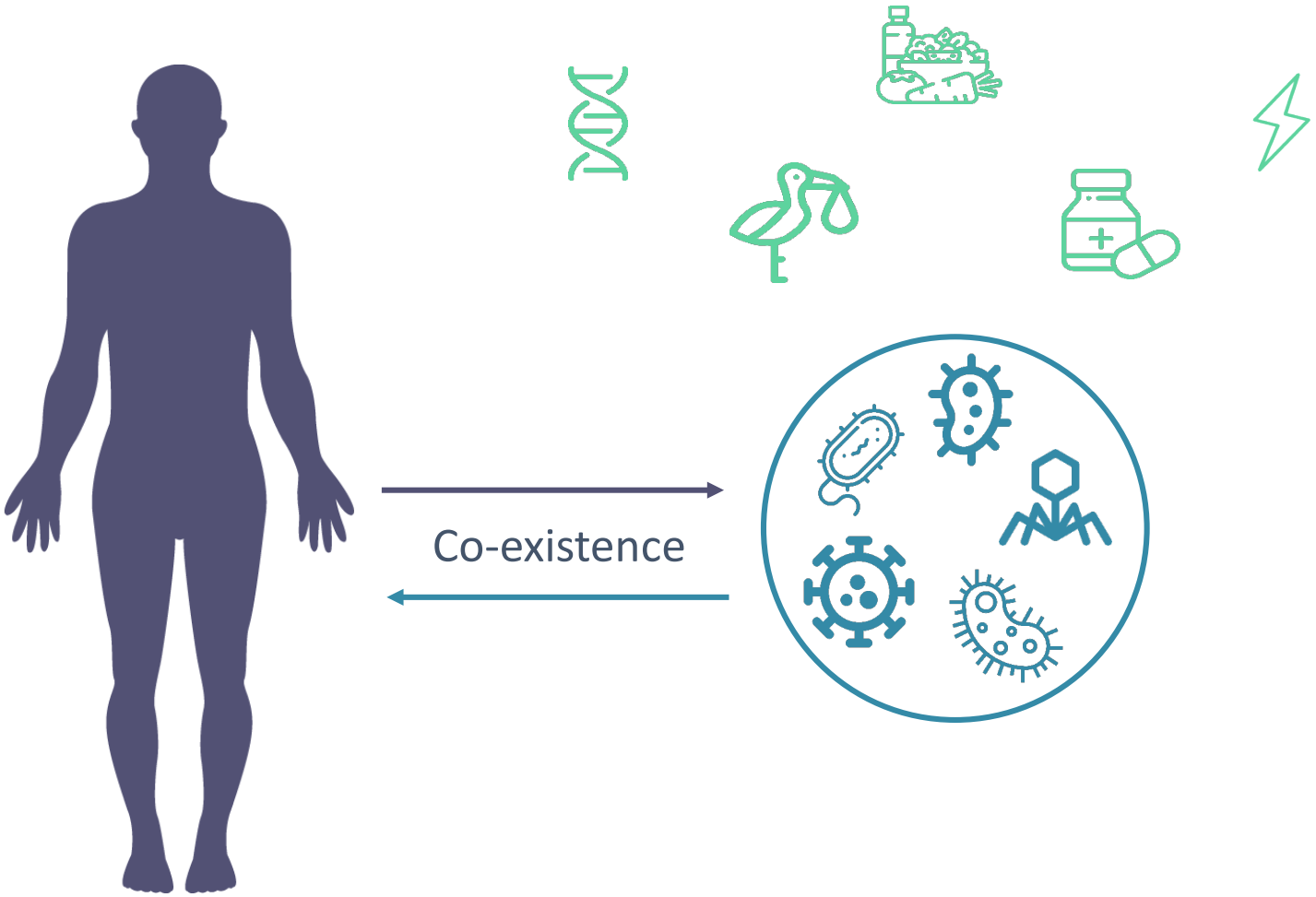
Centre for environmental sciences, Hasselt University, Belgium

What is the microbiome and its function?



Invertebrate microbiomes?

Fruitfly

Earthworm

Starfish

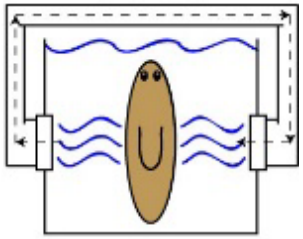
Sponge

Schmidtea mediterranea

- Freshwater planarian
- Predator
- Pluripotent stem cells
- Model organism in regeneration research

Little is known about the planarian microbiome

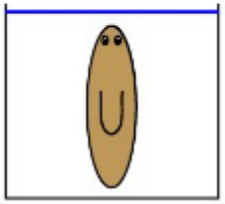
recirculation



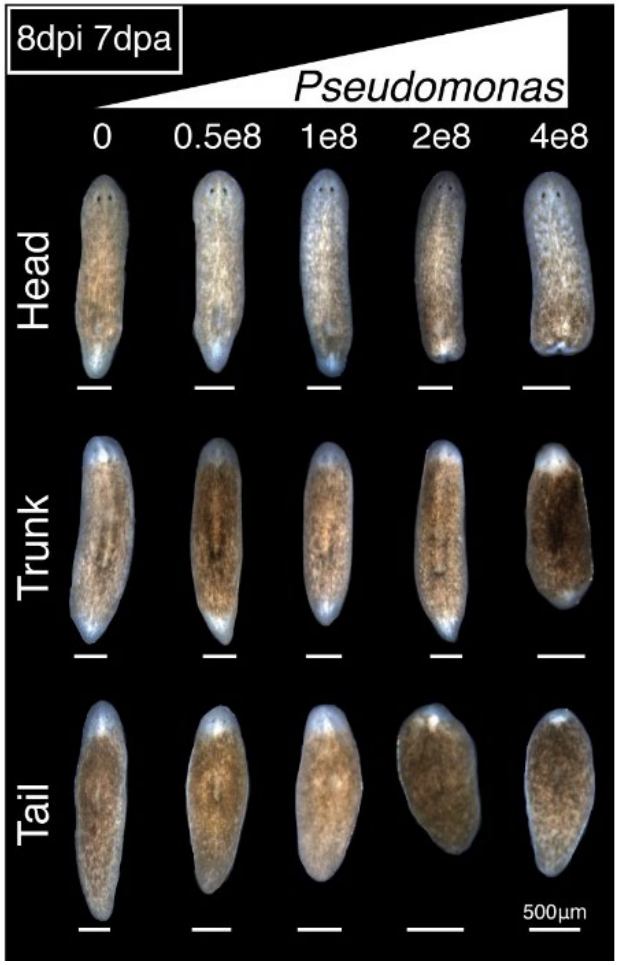
1. Bacteroidetes
2. Proteobacteria

VS

static culture



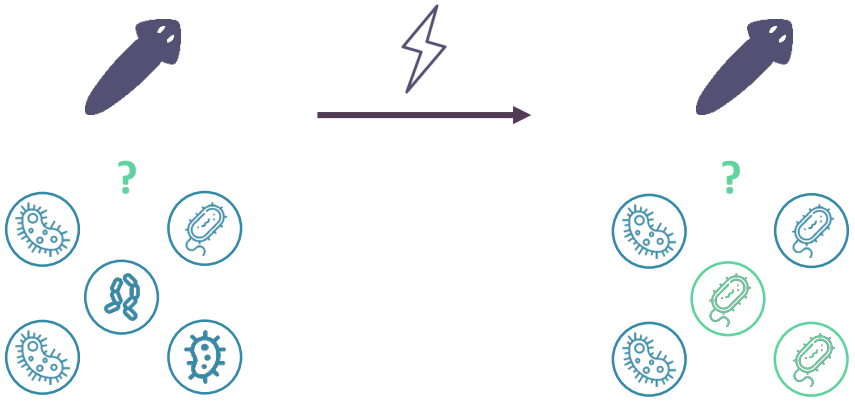
1. Proteobacteria
2. Bacteroidetes



Innate immune system

[Arnold *et al*. (2016). Pathogenic shifts in endogenous microbiota impede tissue regeneration via distinct activation of TAK1/MKK/p38. *eLife* 2016;5e16793]

Research questions

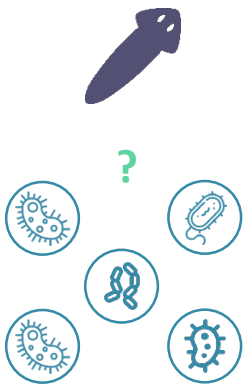


1. Do planaria have associated bacteria and where are they residing?

2. Where does the microbiome come from and how stable is the microbiome?

3. Does the microbial composition change by external stressors?

Research questions



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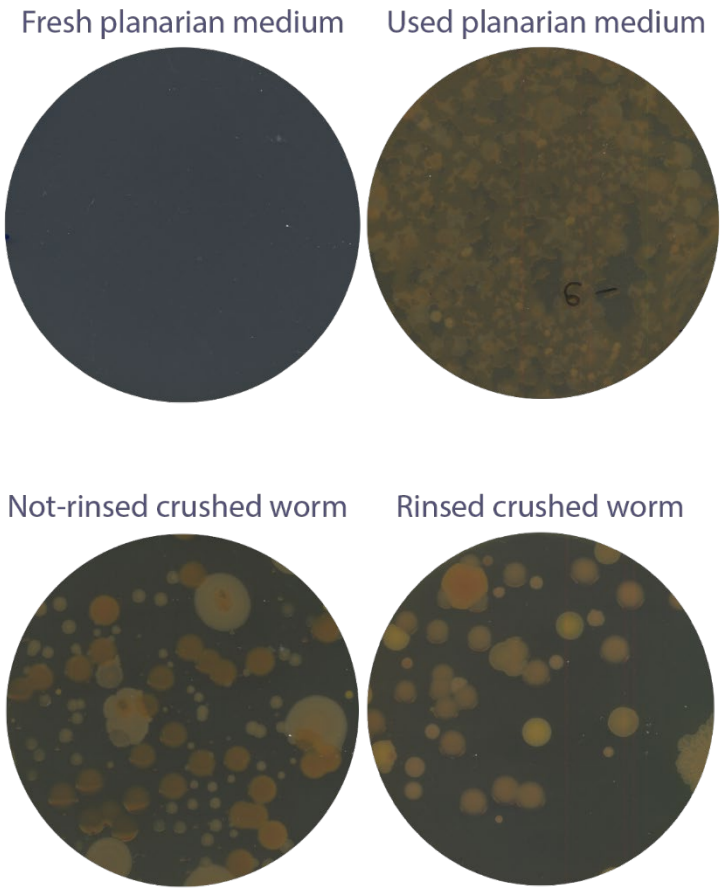
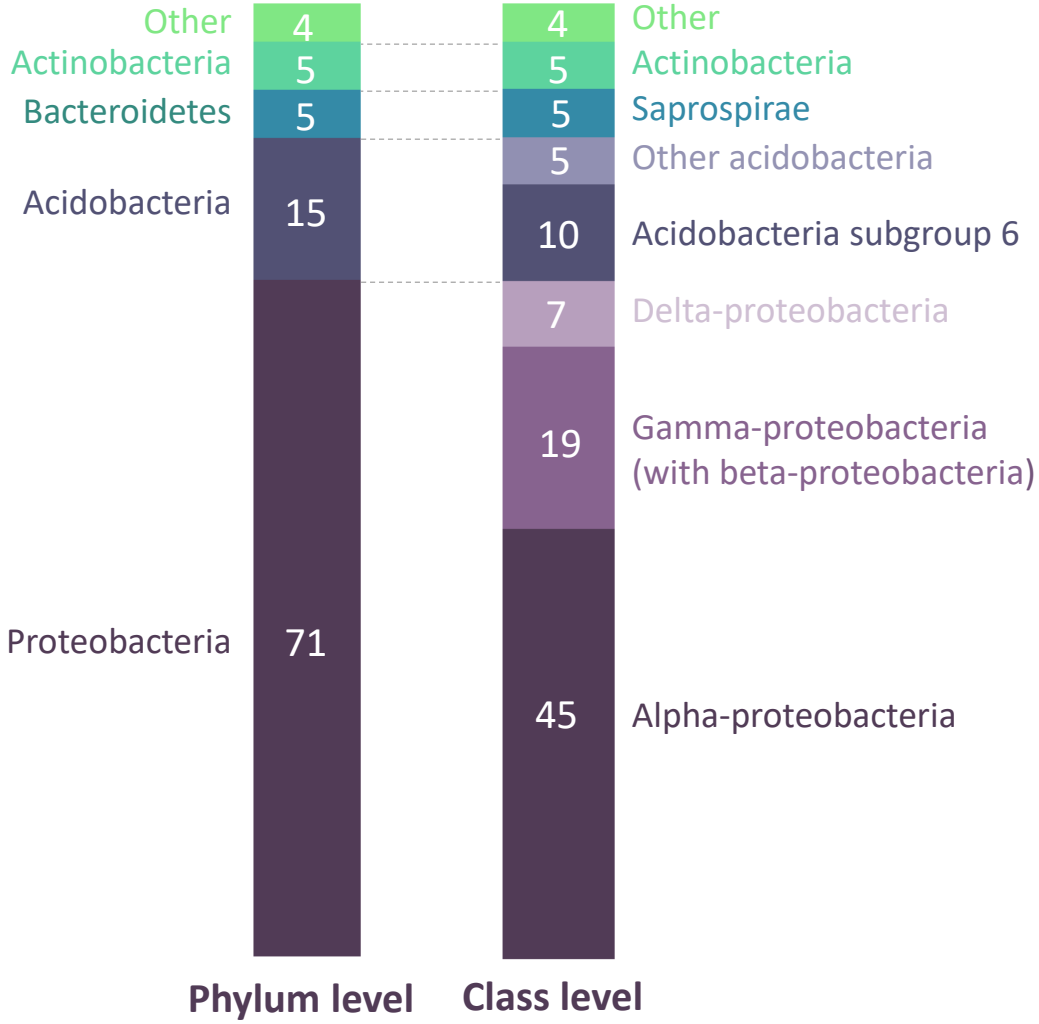
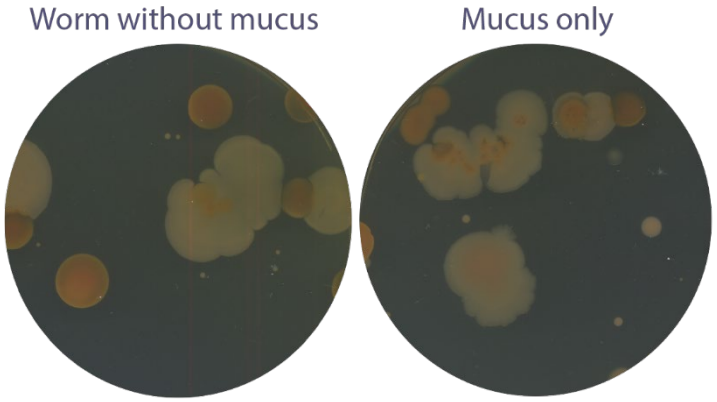
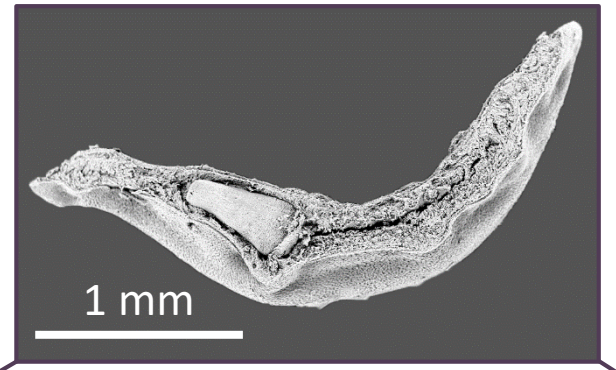
Who is where?

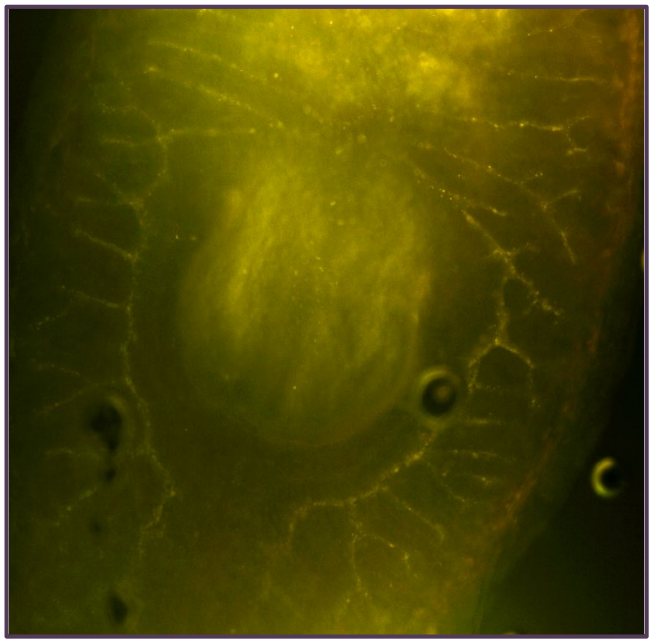

Fresh planarian medium
Used planarian medium
Not-rinsed crushed worm
Rinsed crushed worm


Other
Actinobacteria
Bacteroidetes
Acidobacteria
Proteobacteria
4
5
5
15
71
4
5
5
5
10
7
19
45
Other
Actinobacteria
Saprospirae
Other acidobacteria
Acidobacteria subgroup 6
Delta-proteobacteria
Gamma-proteobacteria
(with beta-proteobacteria)
Alpha-proteobacteria
Phylum level
Class level

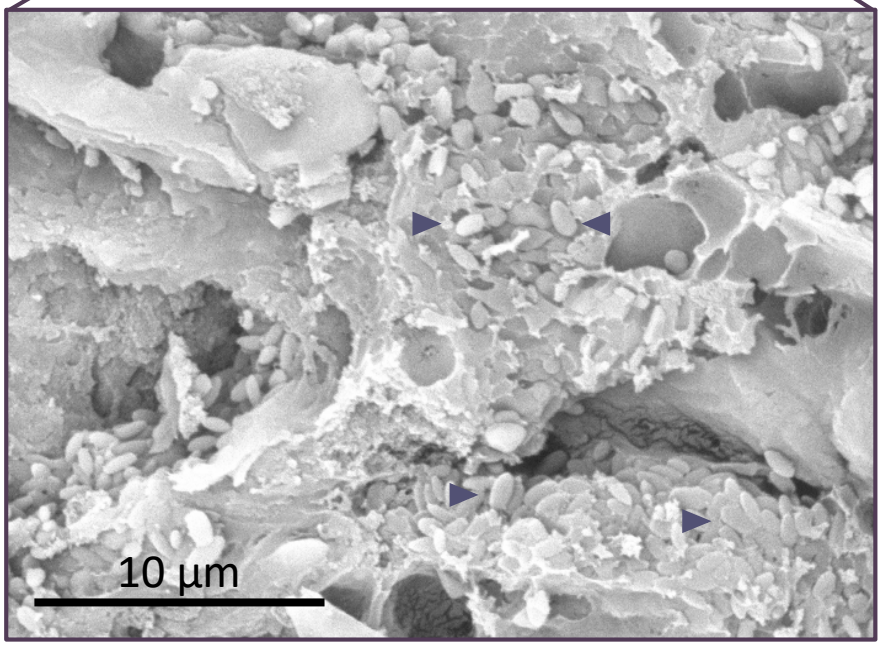
Who is where?





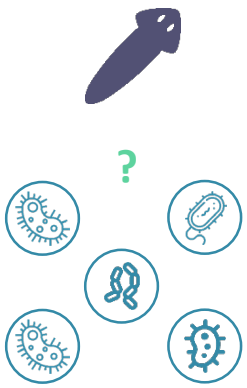


Fluorescent in situ hybridisation



Scanning electron microscopy

Research questions



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2. **Where does the microbiome come from and how stable is the microbiome?**

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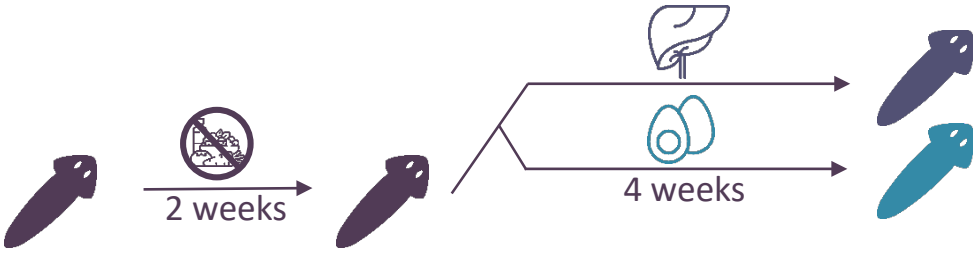
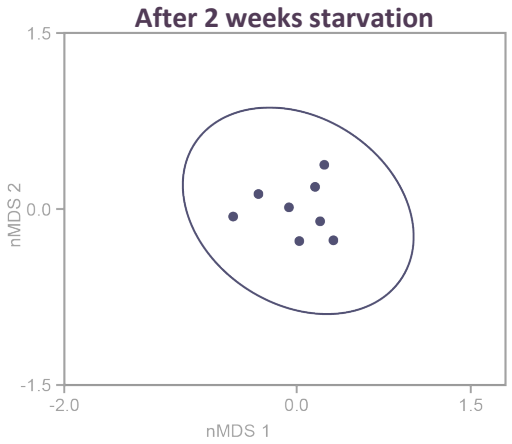
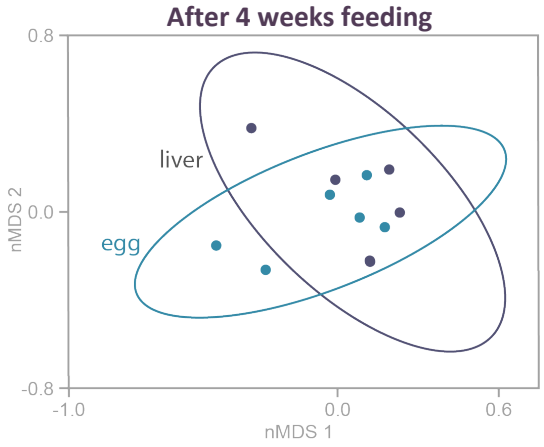
An alternative diet has a limited effect on the bacterial composition



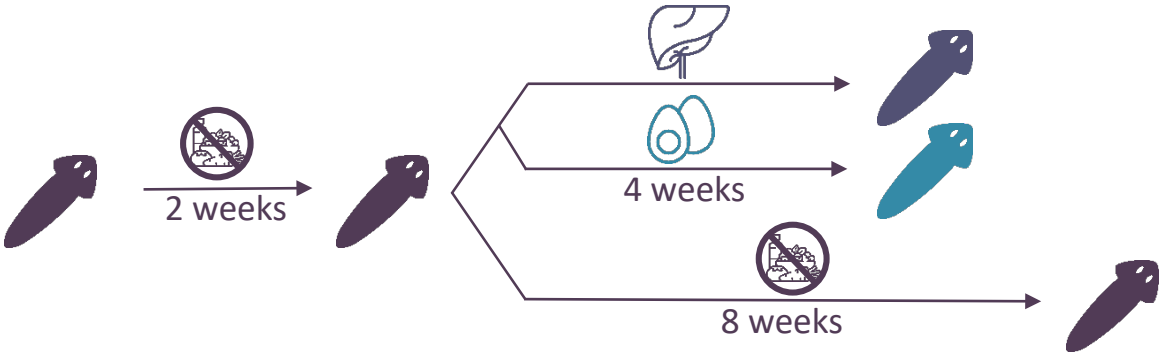


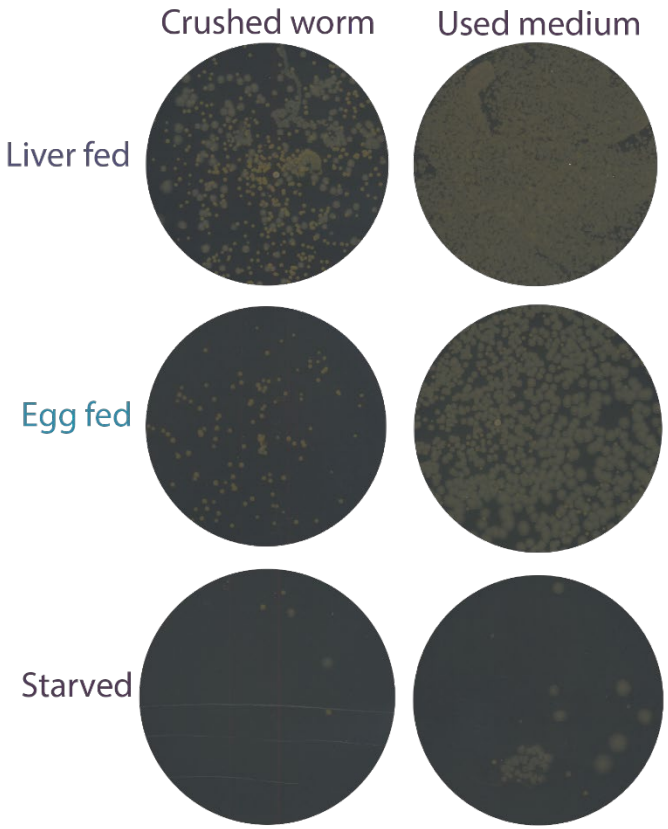
Stress = 0.1622 85% CI

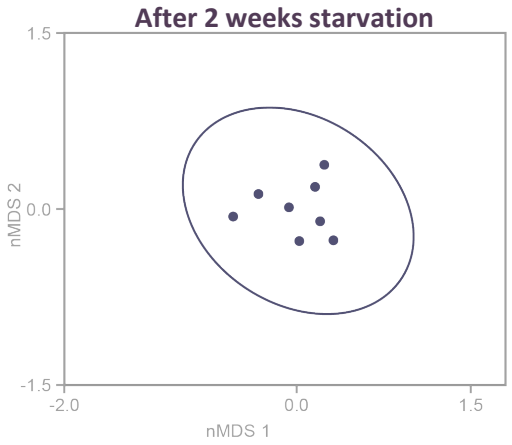


Stress = 0.1633 85% CI
ANOSIM p = 0.4835 R = 0

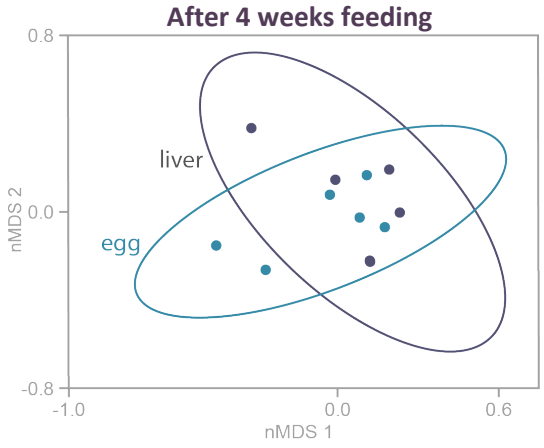
Longterm starvation has a serious effect on the bacterial composition







Stress = 0.1622 85% CI



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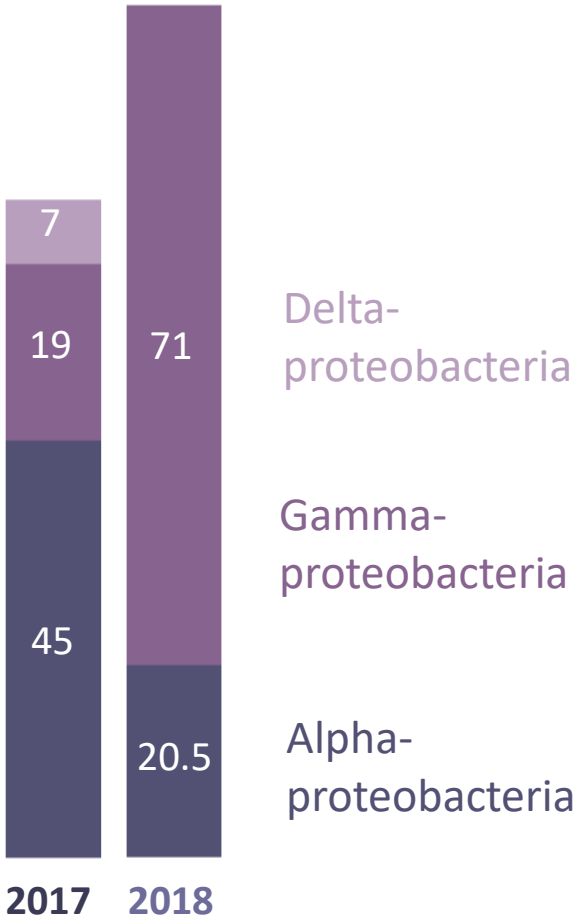
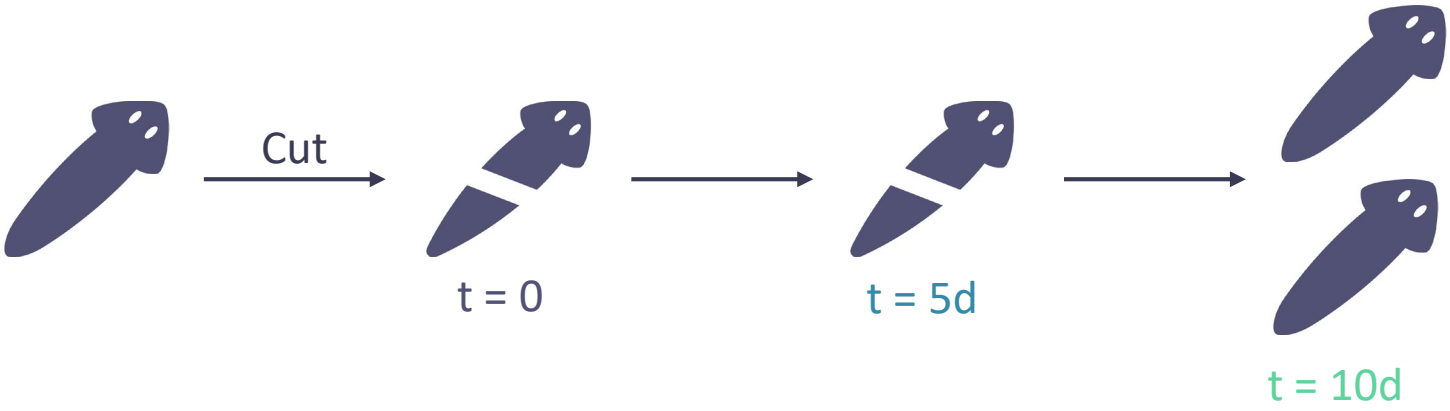
The planarian microbiome changes over time

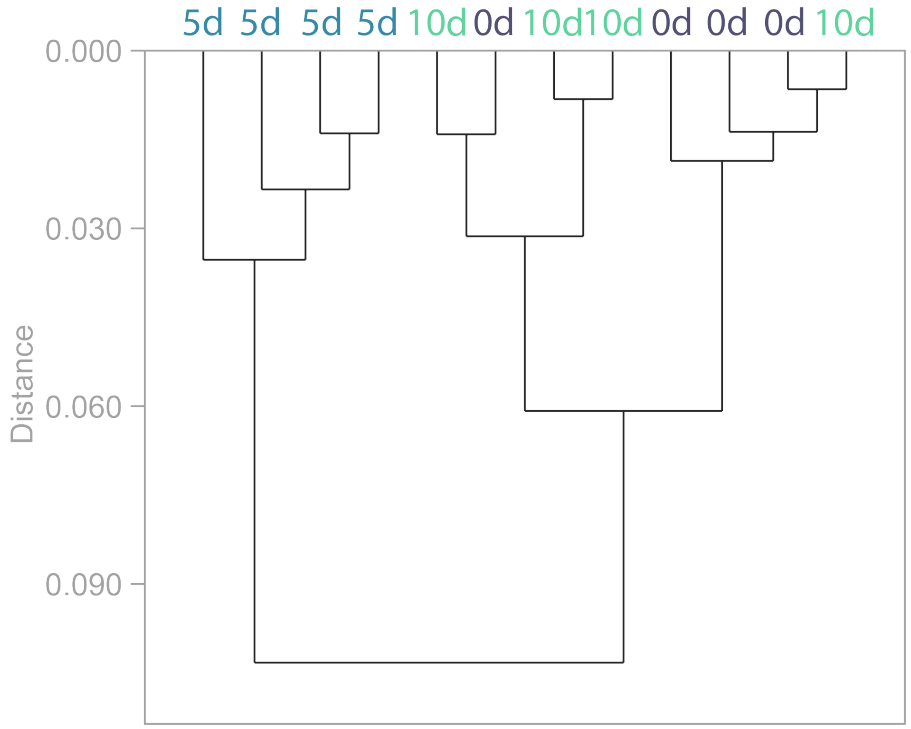
Relative abundance of phylum Proteobacteria

Relative abundance of classes of Proteobacteria

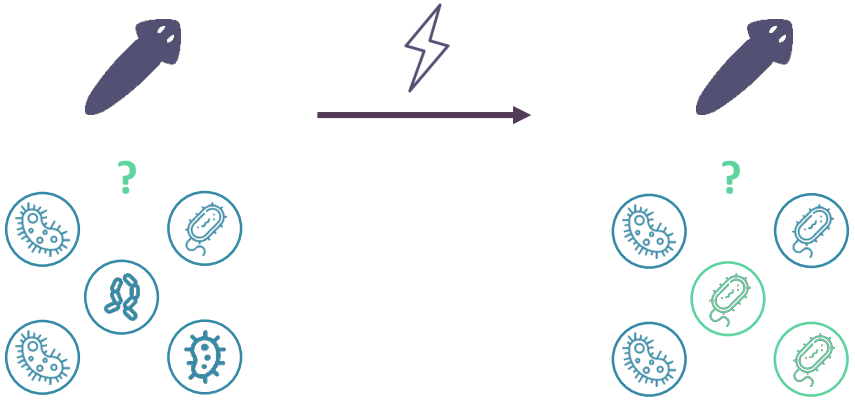


The microbiome changes during regeneration





Research questions



1. Do planaria have associated bacteria and where are they residing?

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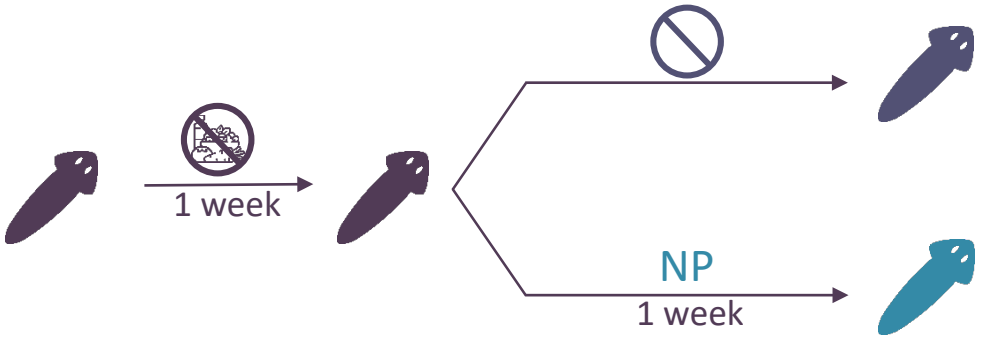
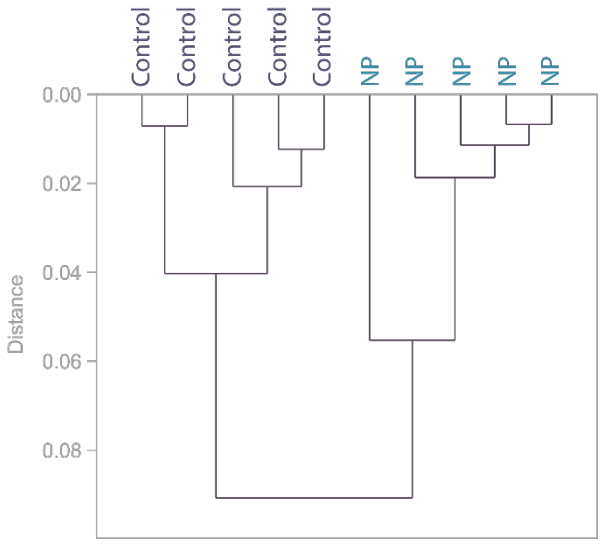
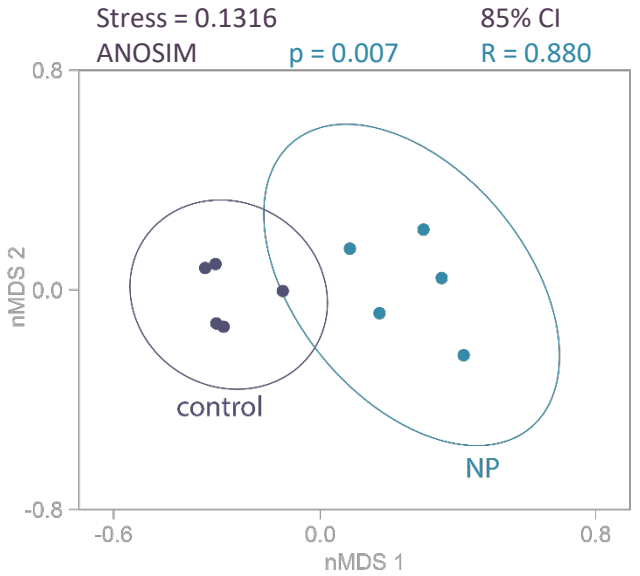
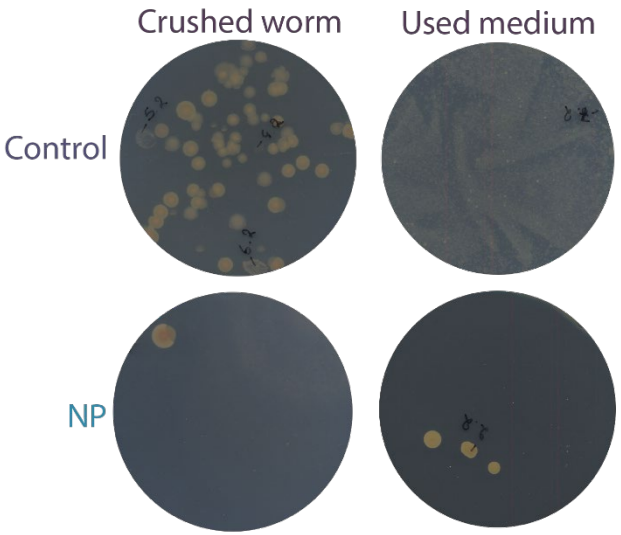
3. **Does the microbial composition change by external stressors? - AgNP**

7 day-exposure to silver nanoparticles significantly changes the bacterial composition

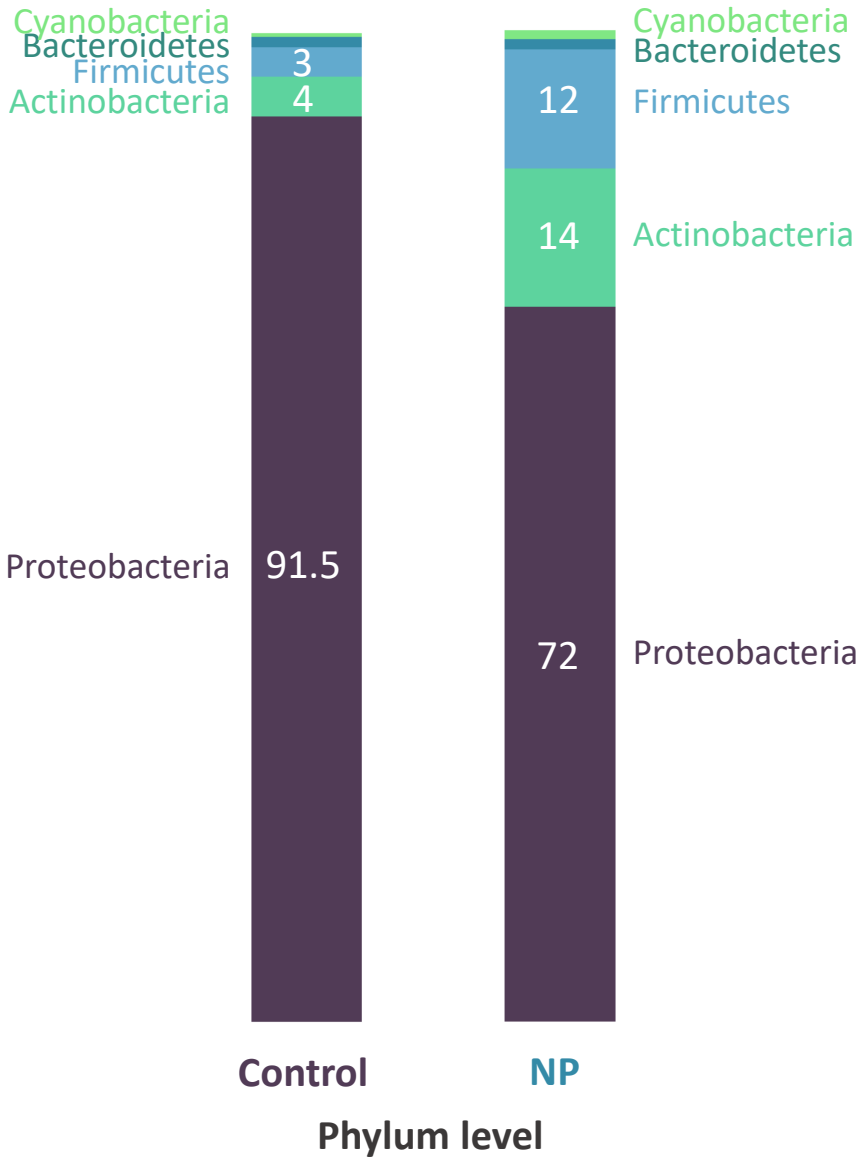


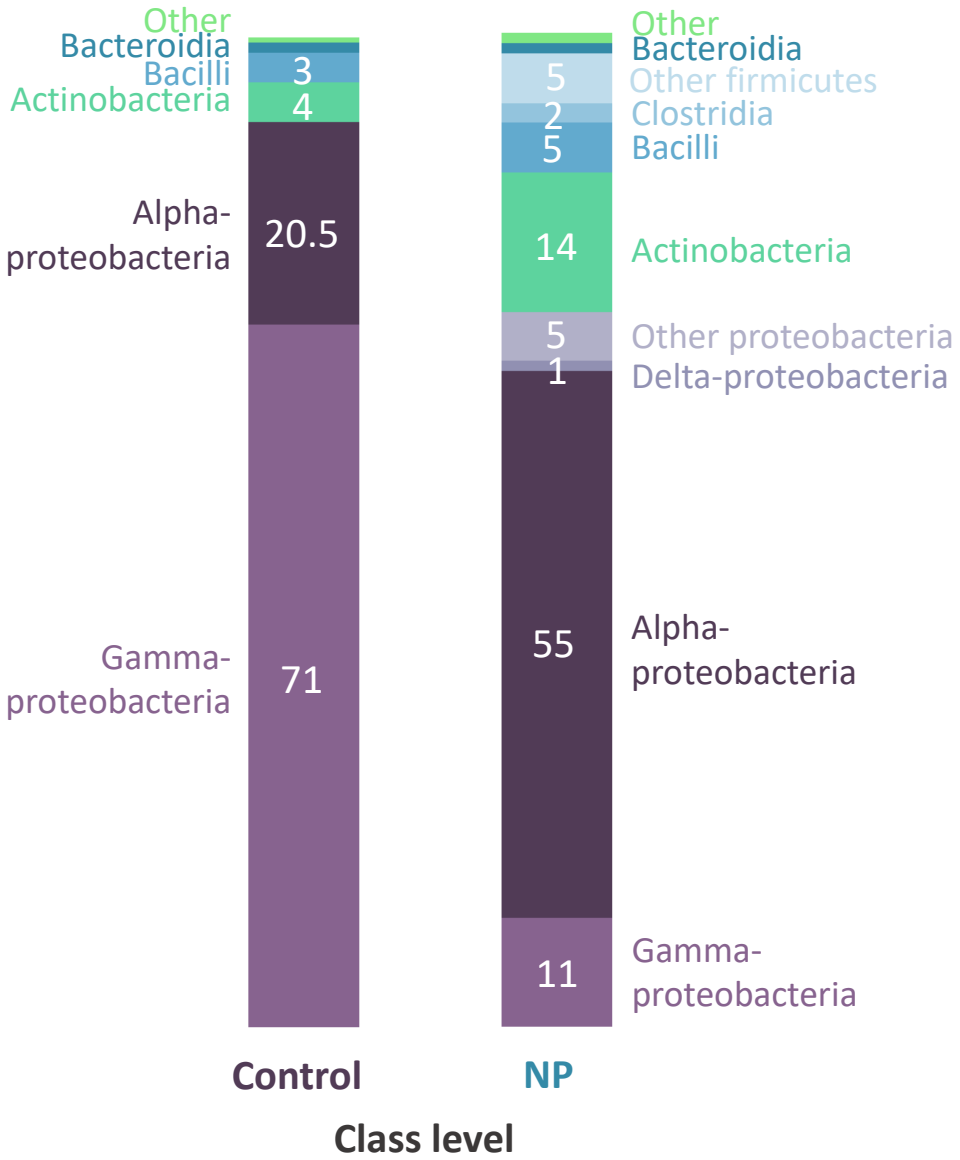




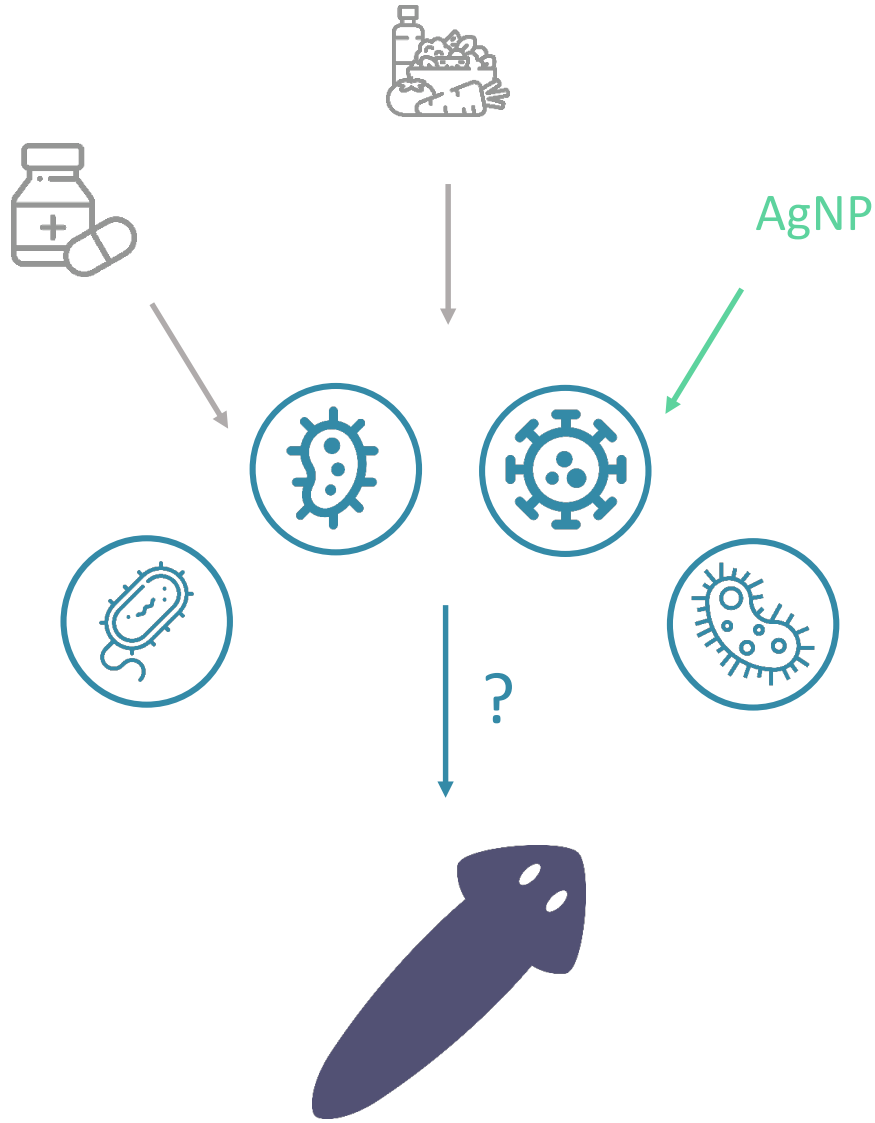


Silver nanoparticle exposure causes shifts





Conclusion and remaining questions



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