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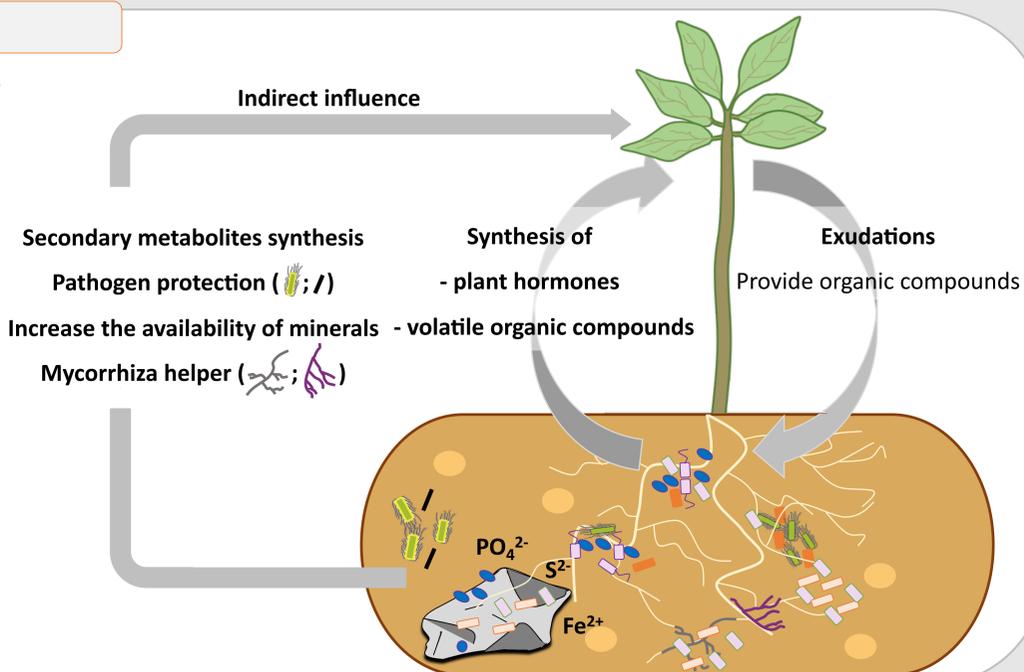
# Interplay between lateral gene transfer and rhizosphere functioning

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## The rhizosphere and its microbiota

The **rhizosphere microbiota** contributes to the **growth, health** of plants and **resilience** of forest ecosystem [1]. In the rhizosphere, bacteria can influence the **plant directly** or **indirectly** and take advantage from **root exudates** in return [2;3]. Until now, it was considered that a bacterial species isolated from a given environment is a homogenous related cells characterized by identical functions. Yet, bacteria in soil are not single clones, but are structured in **populations (sympatric strains of the same species but with different functions)** that might act in **synergy** to achieve a function.



## Genus *Streptomyces* : a model of rhizospheric bacterium

### Genome:

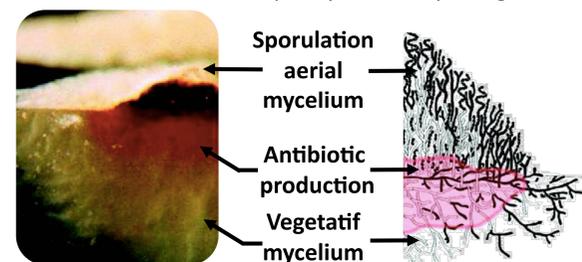
Plasticity: chromosomal rearrangements, linear and circular plasmids [4]

**Phylum:** Actinobacteria

**Habitat:** soil and rhizosphere

**In the lab:** collection of natural populations (rhizospheric and bulk soil)

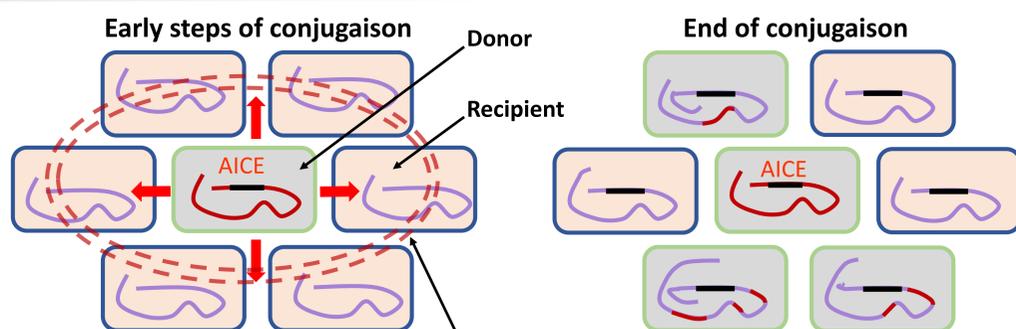
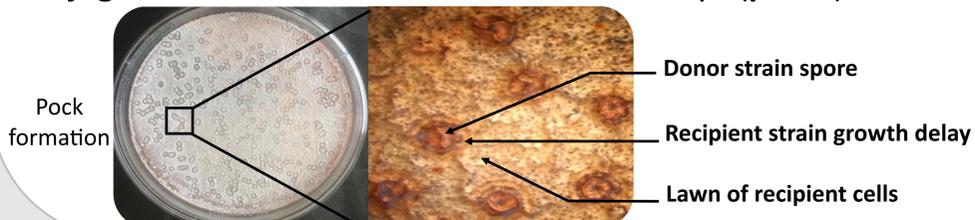
Vertical sections a *Streptomyces* colony on agar [3].



**Horizontal gene transfer (HGT) promotes functional diversity.**

- **AICE** = *Actinobacteria* integrating conjugative element
- **Mobilization of chromosomal locus** (↪)

**Conjugative DNA transfer visible to the mere eye (pocks)**



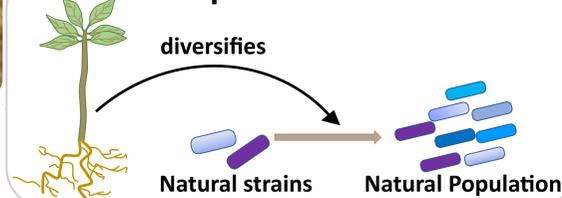
The **transfer of AICE** triggers a **growth and sporulation delay (pock)** in the recipient cell [4].

## What are the drivers of HGT in rhizospheric *Streptomyces* populations?

**Effect on the HGT in presence of:**

- root system
- exudates
- specific compounds (trehalose, flavonoids, chitin, cellulose ...)

**Expected result**

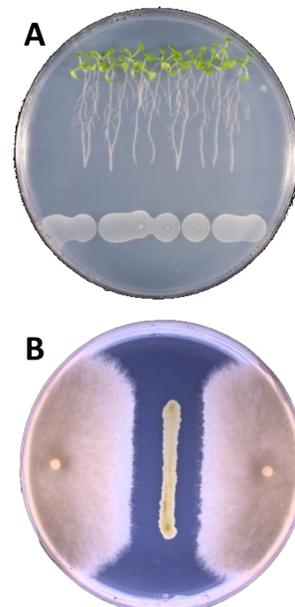
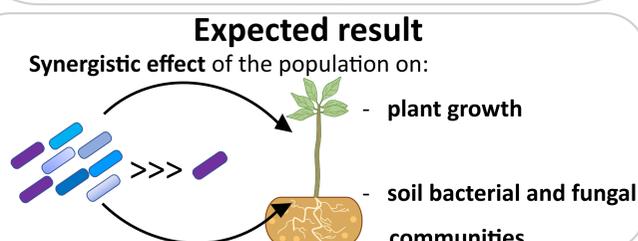


## What are the impacts of HGT on the sharing of labour in natural populations of soil bacteria?

**Tests on the plant:**

- **direct effect:** measure of the root and/or plant development (A)
- **indirect effect:** interaction with other rhizospheric microorganisms (B)

**Comparison between the effect of natural single strains versus populations**



## Prospects

This project will provide an **overview of the effects of plant/rhizospheric microbiota interactions** with two main objectives:

- understanding if a bacterial population constitutes an efficient ecological unit for plant interaction**
- explaining how the plant can affect bacterial genomic diversity.**

Furthermore, this project will reveal if gene transfer allows rapid microbiota and plant **adaptation to environment changes.**

[1] Backer R, Rokem JS, Ilangumaran G, Lamont J, Praslickova D, Ricci E, Subramanian S and Smith DL (2018) Plant growth-promoting rhizobacteria: context, mechanisms of action; and roadmap to commercialization of biostimulants for sustainable agriculture. Front Plant Sci. doi:10.3389/fpls.2018.01473  
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