Antarctic bacteria as a source of bioactive compounds

LOY GROUP

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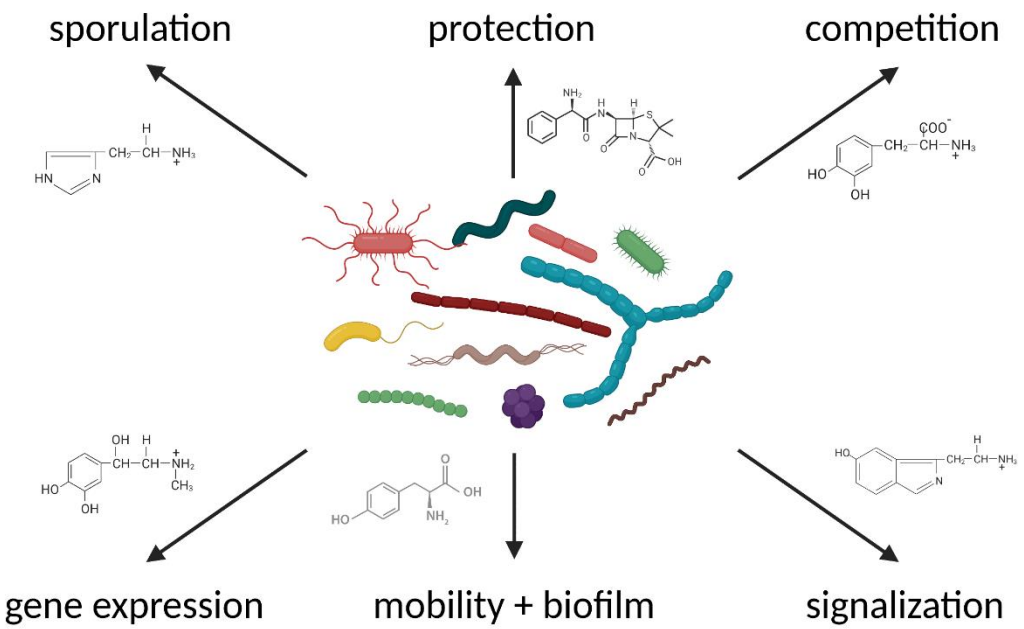
Dr. Stanislava Kralova, 24.11. 2022

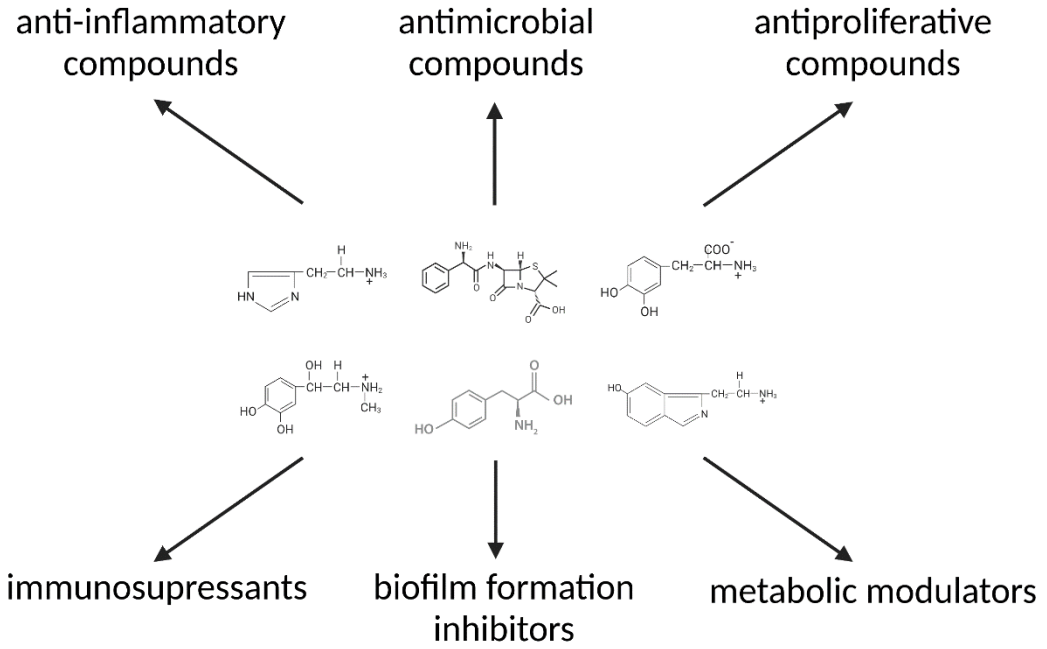
LOY Group

- Project DEFCOMANT (MSCA) → **Establishing defined communities of Antarctic soil bacteria as potential sources of antimicrobials**
- **Research platform METABAC →** tractable microbial communities that produce novel secondary metabolites

Functions of secondary metabolites



Application of secondary metabolites



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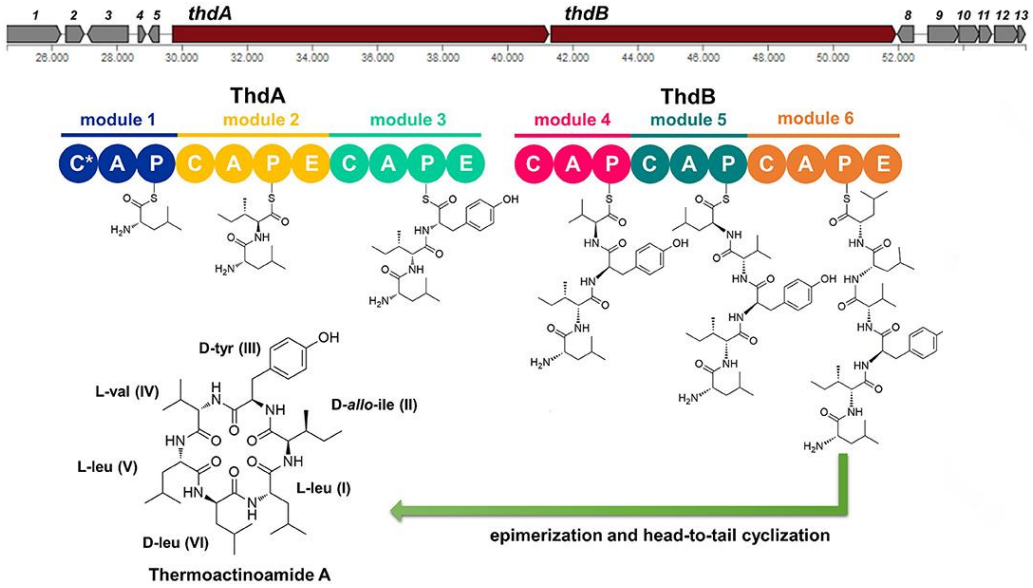
1. Genomic biosynthetic potential

Thermoactinomyces vulgaris DSM 43016

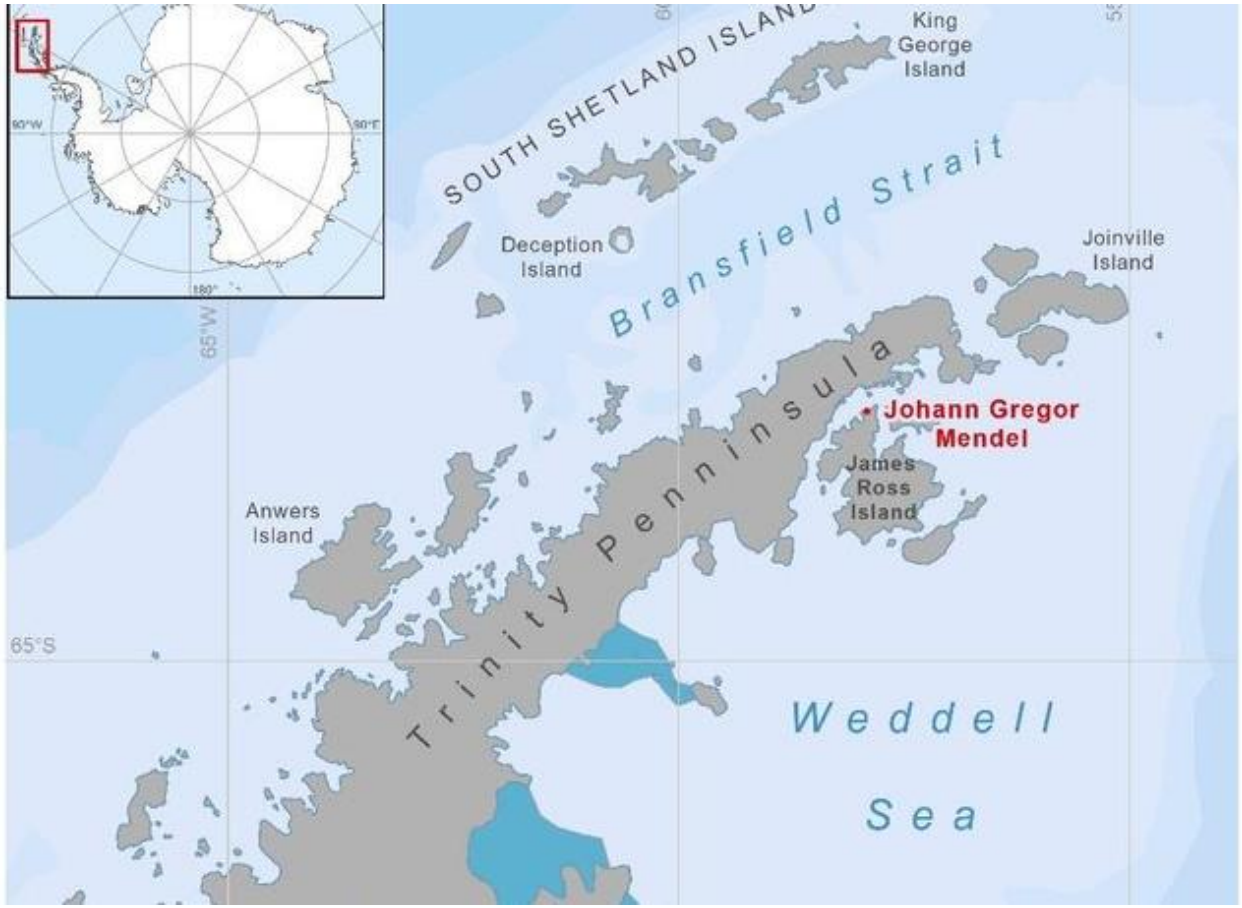


2. Confirmed bioactivities – 62 isolates producing antimicrobials
3. Presence of resistance in soils (not anthropogenic effect)

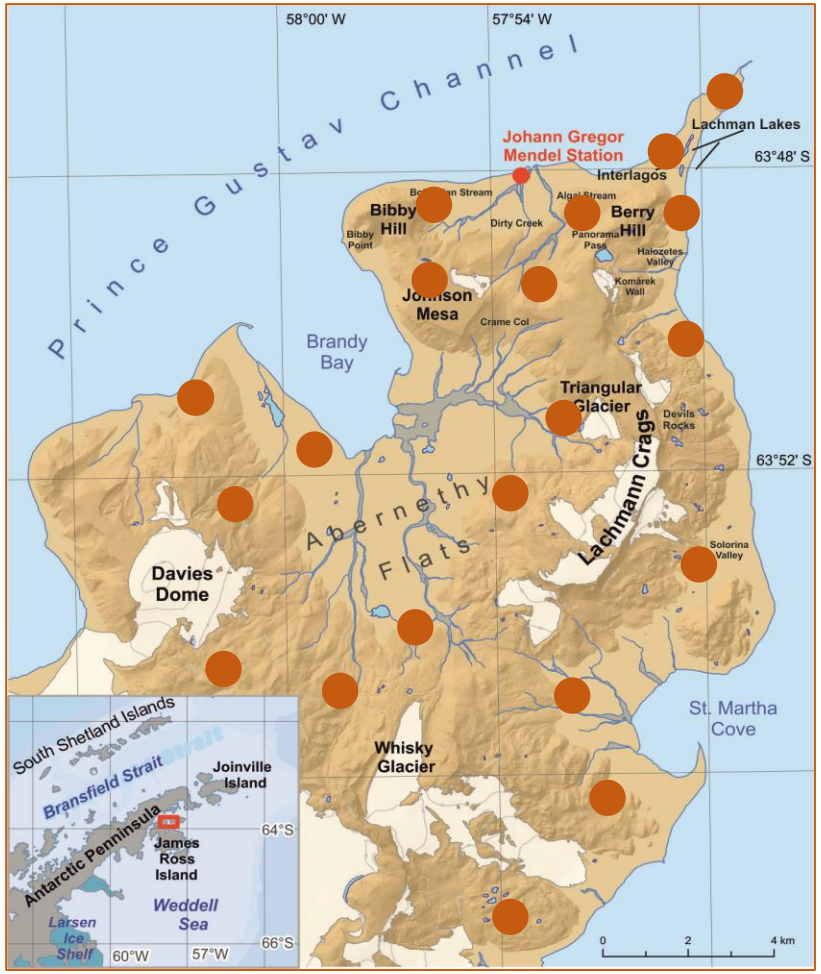
Waschulin *et al.*, 2021

James Ross Island

- Sampling through the Czech Antarctic Research Programme (Masaryk University, Brno, CZ)



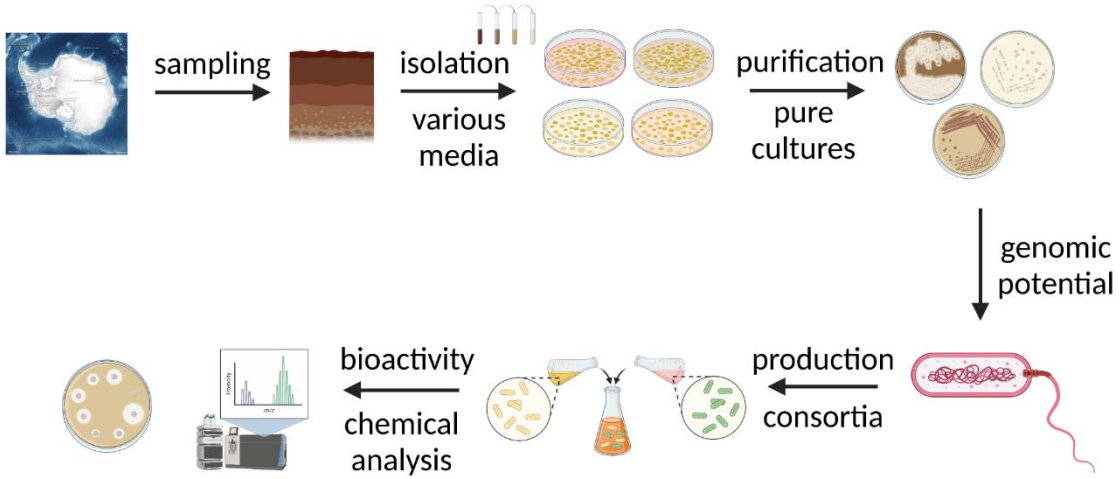
James Ross Island, Antarctic Penninsula



- Johann Gregor Mendel station (since 2007)

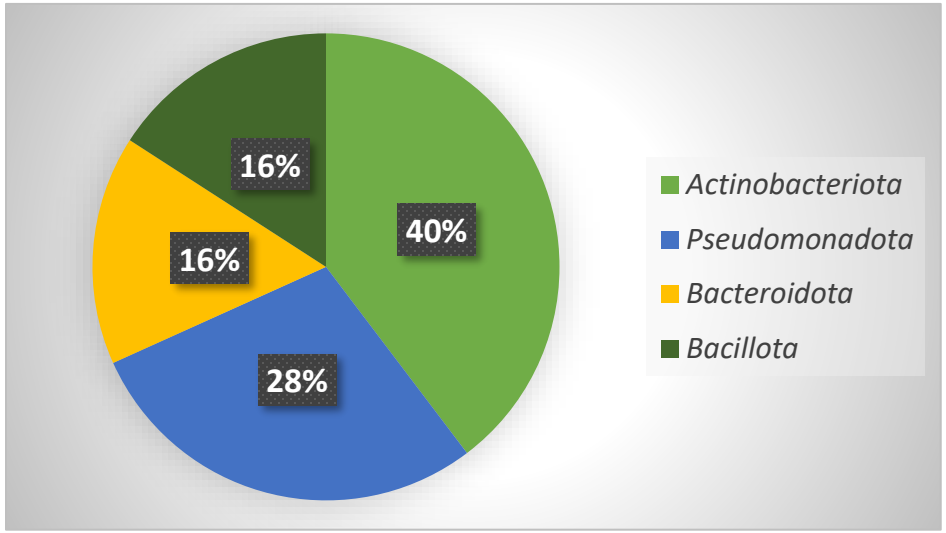
Origin of our isolates:

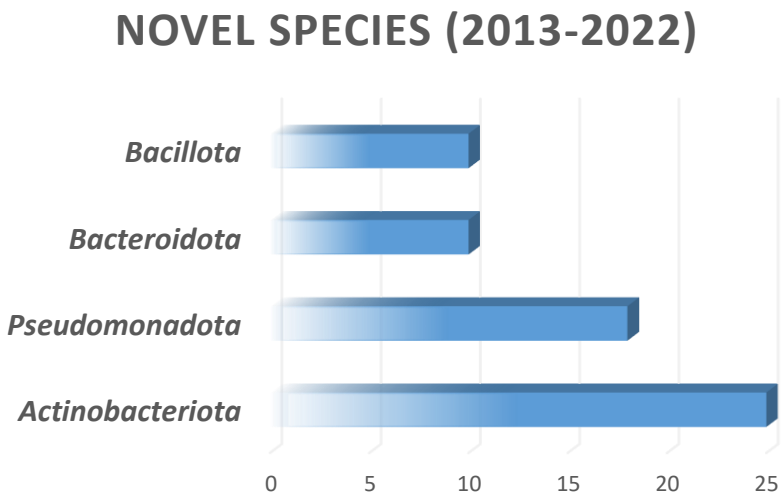
- Multiple sampling sites
- Type of samples: active layer of soil
- Isolates from 2013-2022



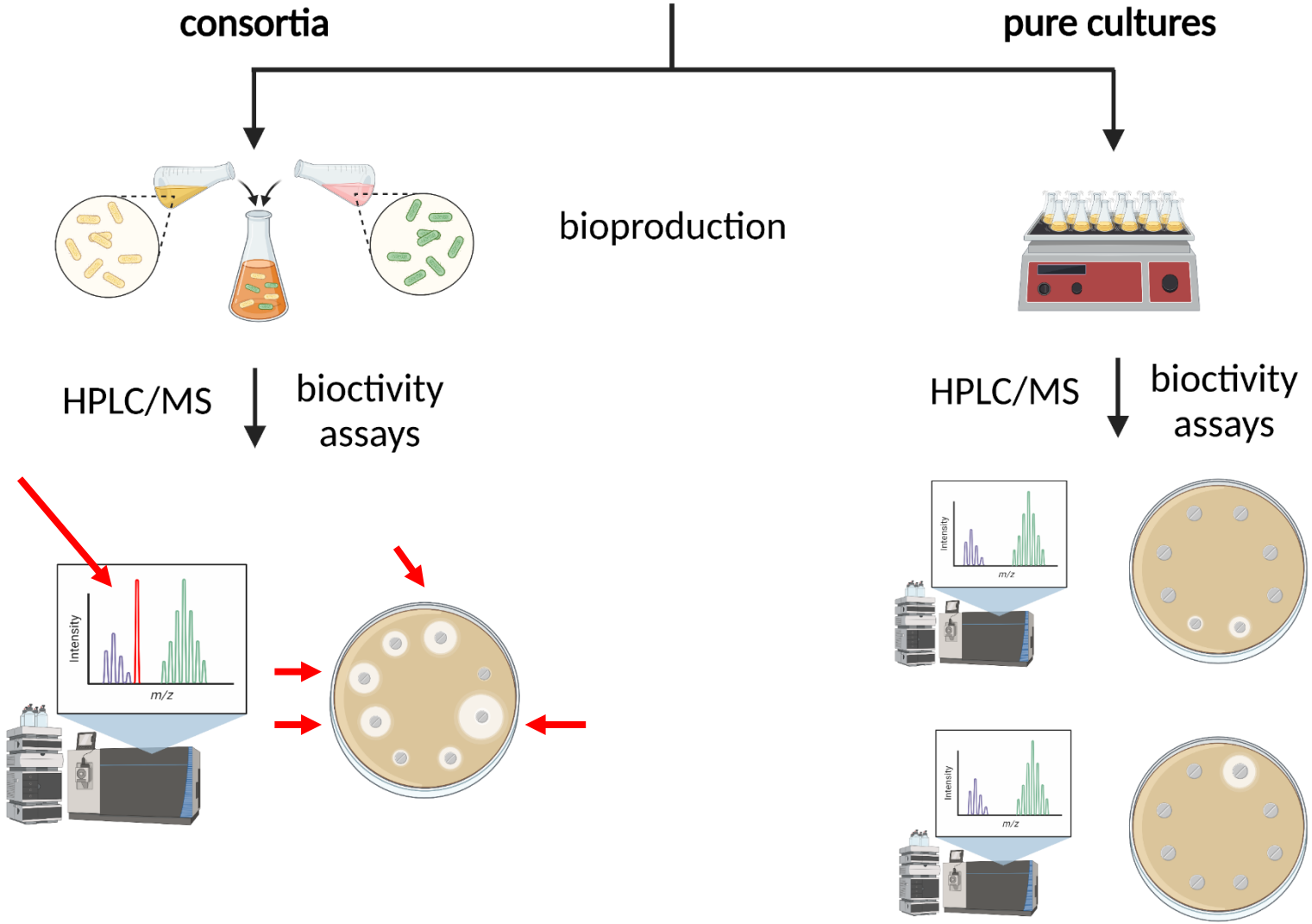
Currently in the bacterial collection:

- 917 bacterial strains (303x UniVie, 614x MU)
- all strains identified → **4 bacterial phyla**
- screened for presence of **novel species: 63 identified**





Bacillus, Paenibacillus, Mesobacillus, Planococcus, Sporosarcina
Hymenobacter, Chryseobacterium, Flavobacterium
Betaproteobacteria – Massilia, Janthinobacterium, Gammaproteobacteria - Pseudomonas
Streptomyces **rarely isolated actinobacteria – *Kribella, Actinoplanes, Longispora***



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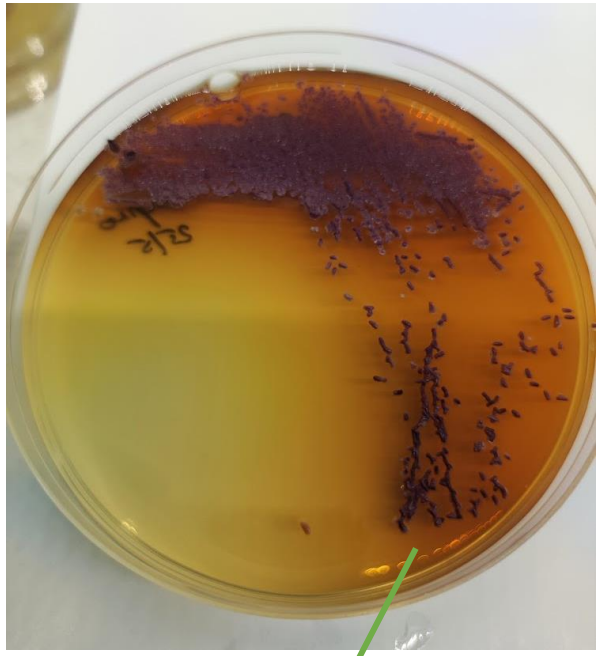
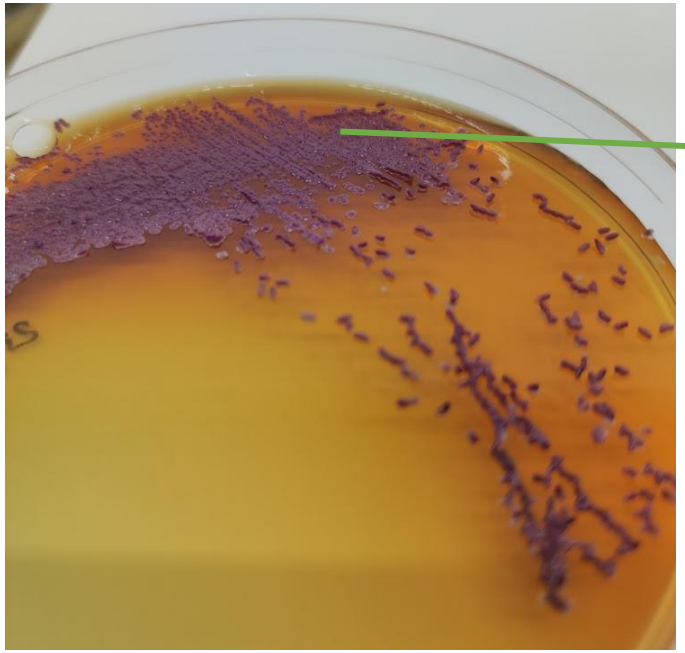
Example – *Streptomyces* sp. P12413





endopigment – unknown type
- violet

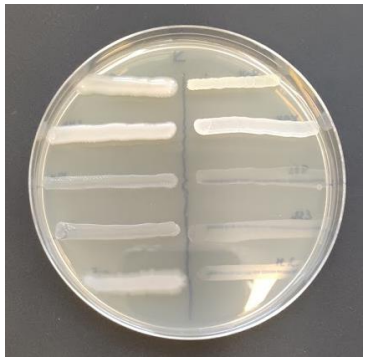
Violet pigments in *Streptomyces* spp.:

- *S. parvus* strains (walls, tombs)
- *S. violaceoruber*
- mixture of granaticins
- separate antibiotic class = **Benzoisochromanequinones**
- so far none in clinical use

exopigment – melanonoid type pigment (brown, soluble)

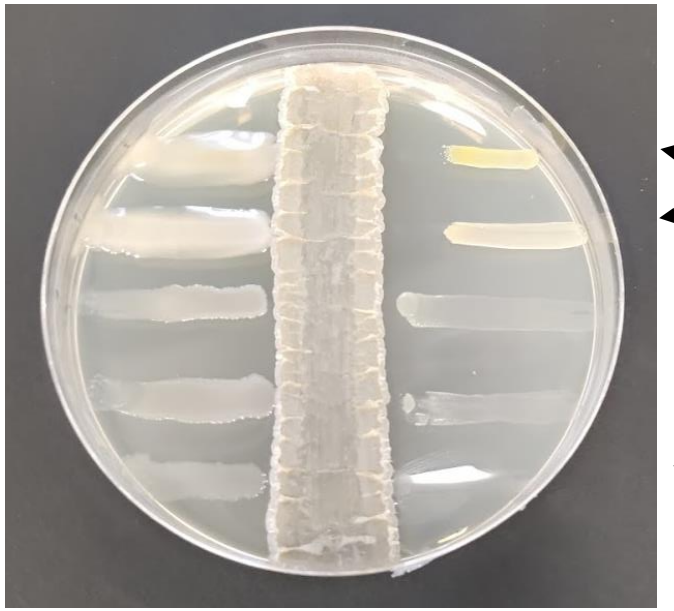
Plate interaction screening – Streptomyces sp. P12413

(partially done in the Faculty Hospital, Brno)



control

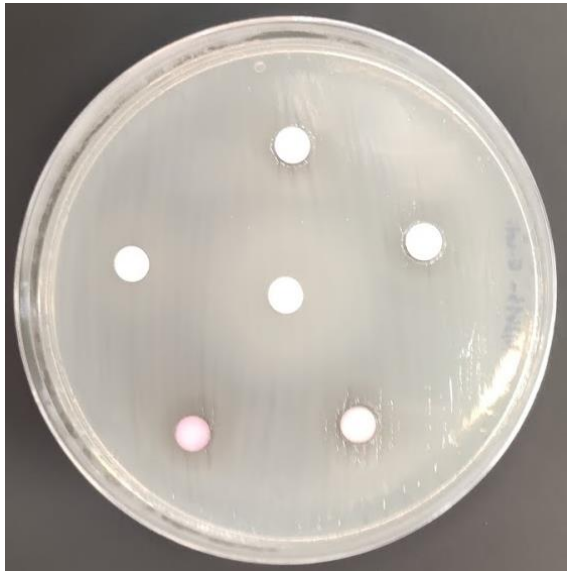
(SM17/10 days)
-inoculum 10 µl of heat activated spores



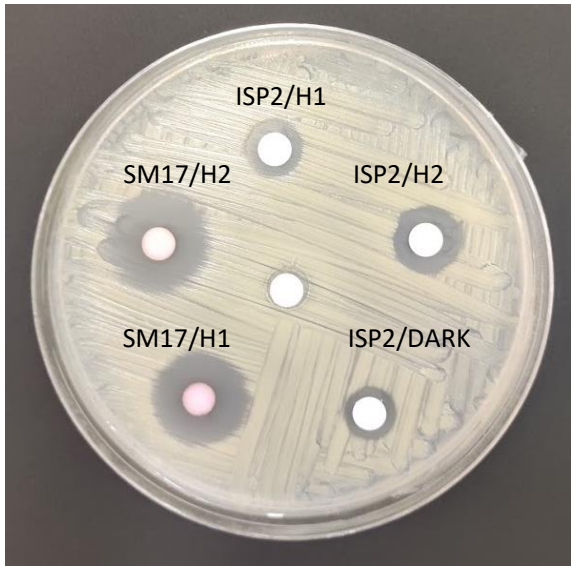
(ISP2/10 days)
-inoculum 10 µl of heat activated spores)

Disc diffusion tests – Streptomyces sp. P12413

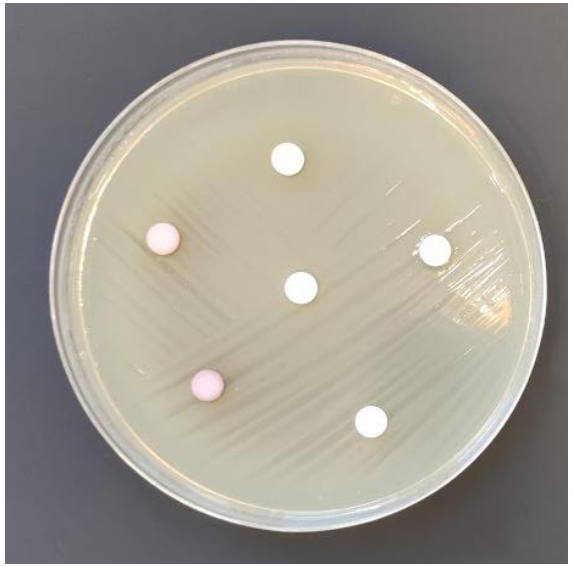
Escherichia coli



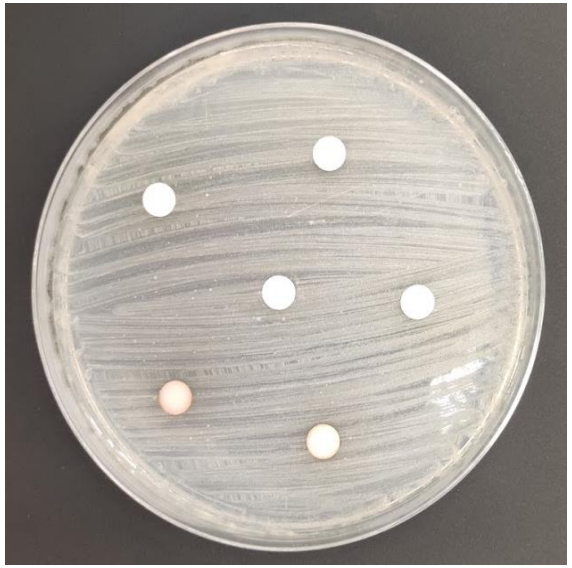
Micoroccus luteus



Pseudomonas putida



Saccharomyces cerevisiae



S. cerevisiae

P. putida

E.coli

M. luteus

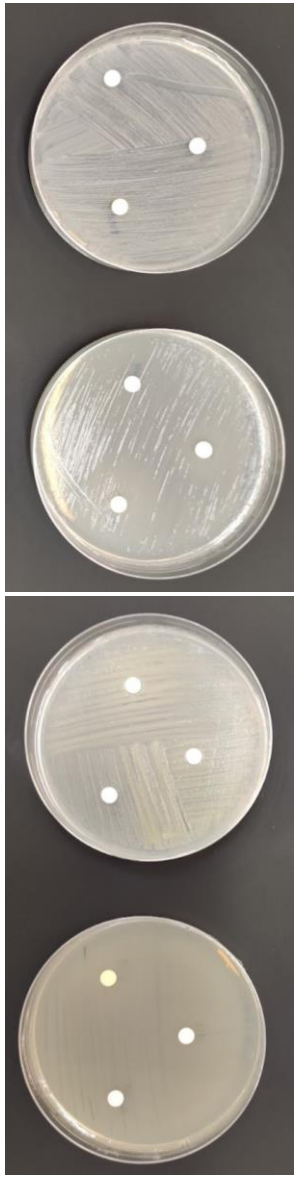
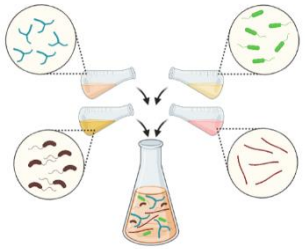
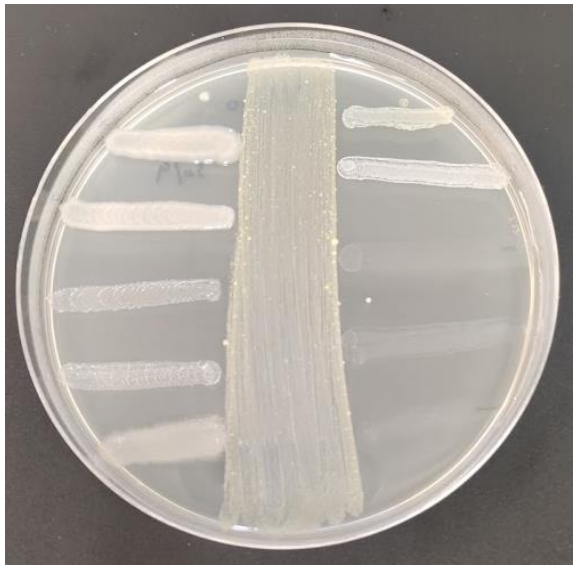
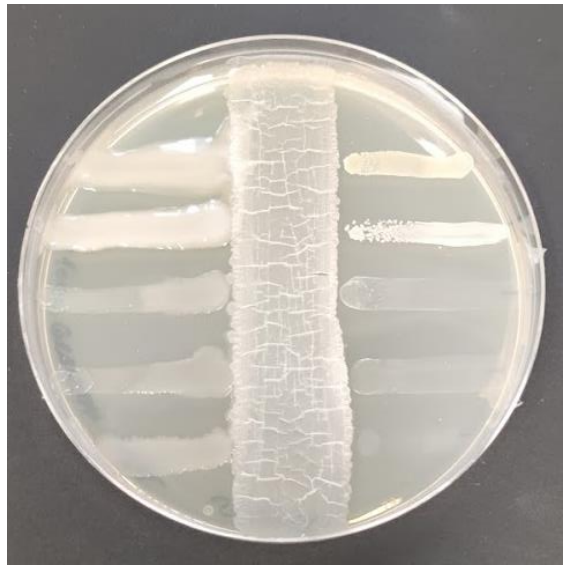


Plate interaction screening – consortia

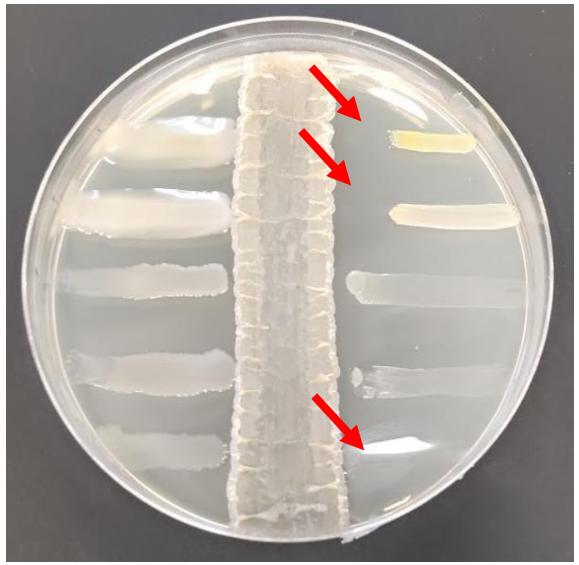




Arthrobacter sp. P12200
(ISP2/10 days)



Streptomyces sp. UV100
(ISP2/10 days)



Streptomyces sp. P12413
(ISP2/10 days)

S. aureus, MRSA, M. luteus

M13 (ISP2/10 days)

all G+ bacteria

universität wien

MetaBac
Secondary Metabolomes of Bacterial Communities

Loy´s group

Thank you for your attention!

JMF JOINT MICROBIOME FACILITY

MARIE CURIE ACTIONS

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MUNI

CZECH ANTARCTIC RESEARCH PROGRAMME