Selection and modification of psychro and xerophilic microorganisms for extra-terrestrial environments and their relationship with extra-terrestrial atmospheres.

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Astrobiology Centre

• Mixed research centre: Physicists, chemists, biologists, engineers...

• Laboratory of Microbial Evolution -> Extremophile Laboratory
Master’s thesis

Extremophiles: Tinto River (SW Spain)
Master’s thesis

• Expression of oxidative stress response genes in the presence of heavy metals in Chlamydomonas acidophila.

• Toxicity of heavy metals:
  • Specific mechanisms
  • Non specific mechanisms: ROS production, oxidative stress

Resistance mechanisms: Exclusion, sequestration, antioxidants
• Results:
  • The expression of each gene depends on heavy metal and exposure time.
  • There is an early and late response.
  • Different isoforms for different metals?
JAE Intro ICU Grant

Rock varnishes
Mn, Fe oxides
Centre for Exolife Sciences

• Current project with *P. syringae*: Transcriptomics under cold conditions/phage infection. Also could be a good model to get started with OVs FBA.
  • What genes are upregulated under cold stress?
  • Does it make different OVs under different conditions?
  • Differences with *D. radiodurans*?
  • When do they make Ice Nucleation Proteins?
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• Isolation of halophiles and psychrophiles: Greenlandish permafrost, dry crust (Mars-like).
• Volatile Organic Compounds (VOCs) as a means of communication
  • Many organisms use them to communicate with one another
  • Could we use them to measure the “mood” of the extremophilic microbiome?
• Alien environment simulation experiments: I’m hoping to see (or make) a microbe grow under Martian conditions -> Potential use for future terraforming! Testing the limits of life?
  • Cold deserts (Mars), subsurface oceans, maybe even temperate gas giants or their moons! We shouldn’t limit our imagination.
Thank you for your attention!