Urine Treatment in the MELiSSA loop

Key words: Nitrogen loop, urine treatment, MELiSSA loop, Nitrogen recycling, heterotrophy.

Abstract: The MELiSSA loop as a regenerative life support system has to maximize the recovery of the main elements from the mission wastes, as a key to develop a closed and self-sustainable process. Urine is one of these wastes, and the main sources of Nitrogen in the MELiSSA loop.

Demonstration of urine nitrification at high salinity has been performed. However, several challenges remains, mainly: - pH control and stability, - inhibition due to inorganic compounds or phosphate. Nitrogen recovery is not the only expected function. Urine contains a large numbers of metabolites, which can be harmful for successive processes in the loop (e.g. Arthrospira, higher plants). Consequently, there is a need to recover/reduce/remove this metabolite load to avoid toxicity effects.

Starting from the state of the art, the proposed PhD project would focus, in axenic conditions, on the efficiency of the nitrification and its pH stability and the characterisation of the heterotrophic function (i.e. capacity to use organic carbon as a source of energy).

The project will comprise experimental work on microbial consortium and the demonstration of what at bench scale. This work would be done at laboratory scale.

Impact on MELiSSA: Definition of technologies and strategies for urine treatment in the MELiSSA loop

MELiSSA partners: UClermont Auvergne (F), UAB (E), U Gent (B), U Mons (B).

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Desired knowledge: Candidates preferably possess a degree in biology, chemistry, biotechnology or bioengineering. They have to be familiar with metabolic pathways analysis and nitrification processes