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INFLUENCE OF MICROBIAL COMMUNITY COMPOSITION ON ACTIVATED SLUDGE FLOC PROPERTIES AND DEWATERABILITY

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BACKGROUND

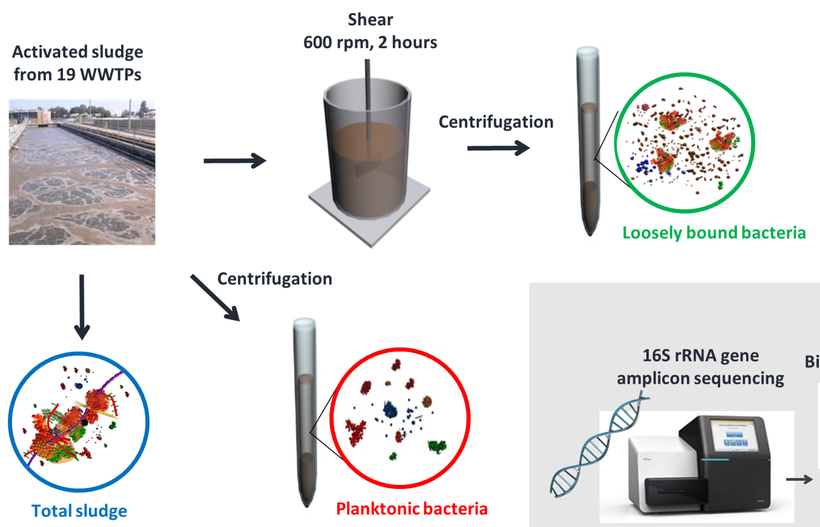
The importance of microbial community composition in the activated sludge process is certain both in terms of nutrient removal and sludge floc properties.

Optimal sludge floc properties are crucial for wastewater treatment plant operation and effluent quality.

This study **aims** to link the microbial community structure of different sludge fractions to the sludge characteristics and dewaterability properties and thereby identify strong floc formers and loosely attached bacteria

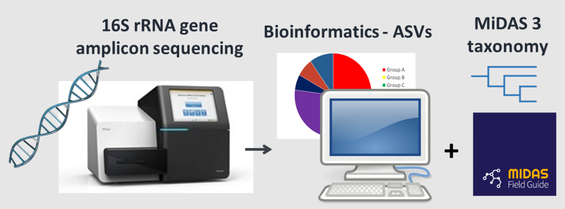
METHODS

Sampling

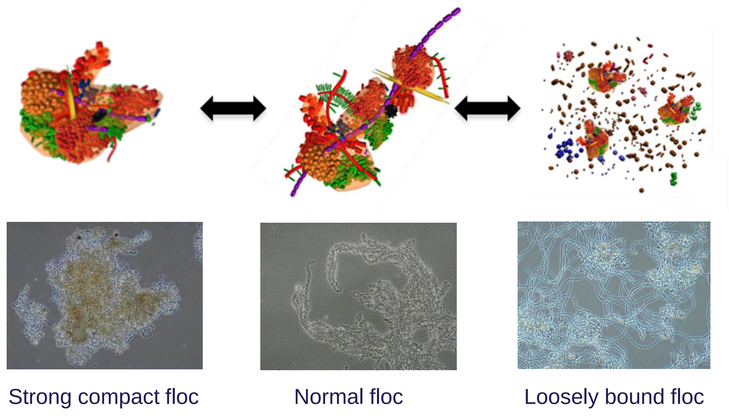


Analysis

- Sludge properties
- Sludge contents
- Floc strength
- EPS content
- Microscopy
- Dewaterability



SLUDGE FLOC PROPERTIES



Critical sludge characteristics

- Degree of flocculation: $\frac{Mean\ floc\ size}{Turbidity_{(time=0)}}$

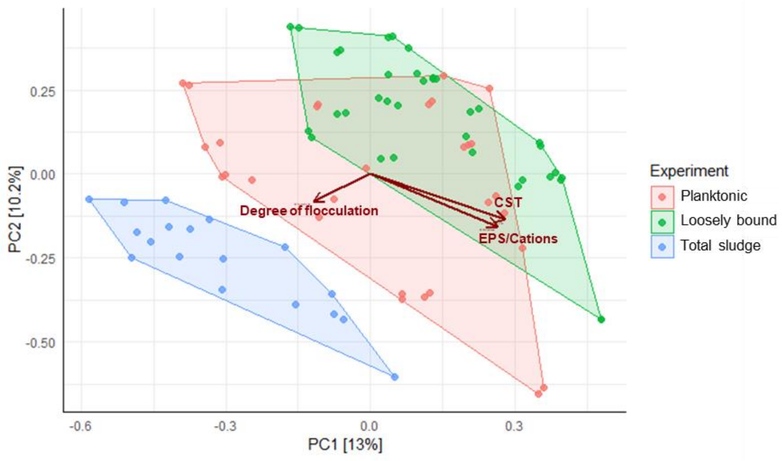
  High degree of flocculation → strong flocs

- High ratio of EPS to polyvalent cations gives compressible, loosely bound flocs.

- CST: Capillary Suction Time

  High CST → releases water slowly

COMMUNITY STRUCTURE AND SLUDGE CHARACTERISTICS



Principal Components Analysis (PCA). Initially, the data has been transformed by hellinger transformation. The relative contribution (eigenvalue) of each axis to the total inertia in the data is indicated in percent at the axis titles. Arrows indicating important sludge properties. The lengths of the arrows are scaled by significance.

Derived parameters important for the liquid-solid separation process such as **CST** and the **ratio of EPS and polyvalent cations** could be associated with the loosely bound sludge fraction.

The **degree of flocculation** could also associated with the microbial composition of the total sludge, that in contrast to the other fractions holds the strong floc formers.

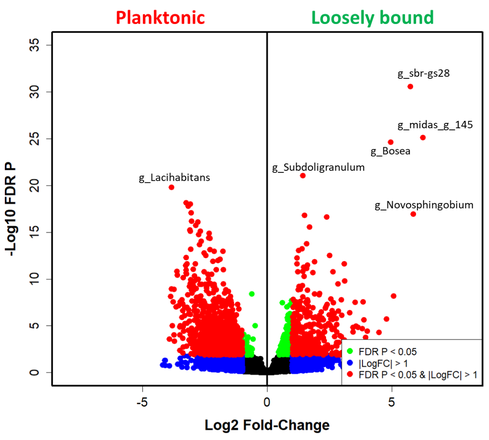
ENRICHED GENERA BETWEEN FRACTIONS

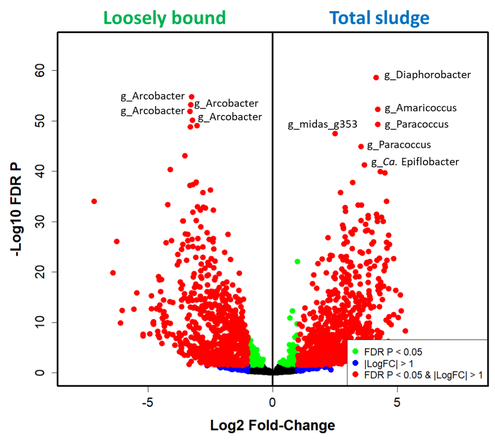
By comparing the abundance data between the sludge fractions several genera showed up as significantly different.

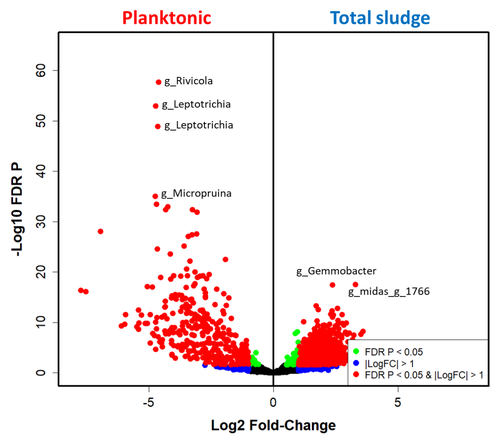
Loosely bound genera included *Bosea*, *Subdoligranulum*, *Novosphingobium* and a novel MiDAS genera.

Potential **strong floc formers** included *Diaphorobacter, Amaricoccus, Paracoccus, Ca.* Epiflobacter and a novel MiDAS genera.

Rivicola, Leptotrichia and Micropruina were dominant in the **planktonic** sludge fraction.







Volcano plots of DeSeq2 significantly differentially abundance of ASVs between the sludge fractions. The red points represent ASVs with statistically significant differences between the fractions.

FINDINGS

- Genera know from influent wastewater *Leptotrichia* and *Arcobacter* were enriched in the planktonic and loosely bound sludge fractions.
- Potential strong floc formers included *Diaphorobacter, Amaricoccus, Paracoccus, Ca*. Epiflobacter and a novel MiDAS genera.
- Sludge parameters describing poor solid-liquid separation were associated with the planktonic and loosely bound fraction.

MIDAS Field Guide

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