MELISSA
MICRO-ECOLOGICAL LIFE SUPPORT SYSTEM ALTERNATIVE

eawag aquatic research

Universiteit Antwerpen

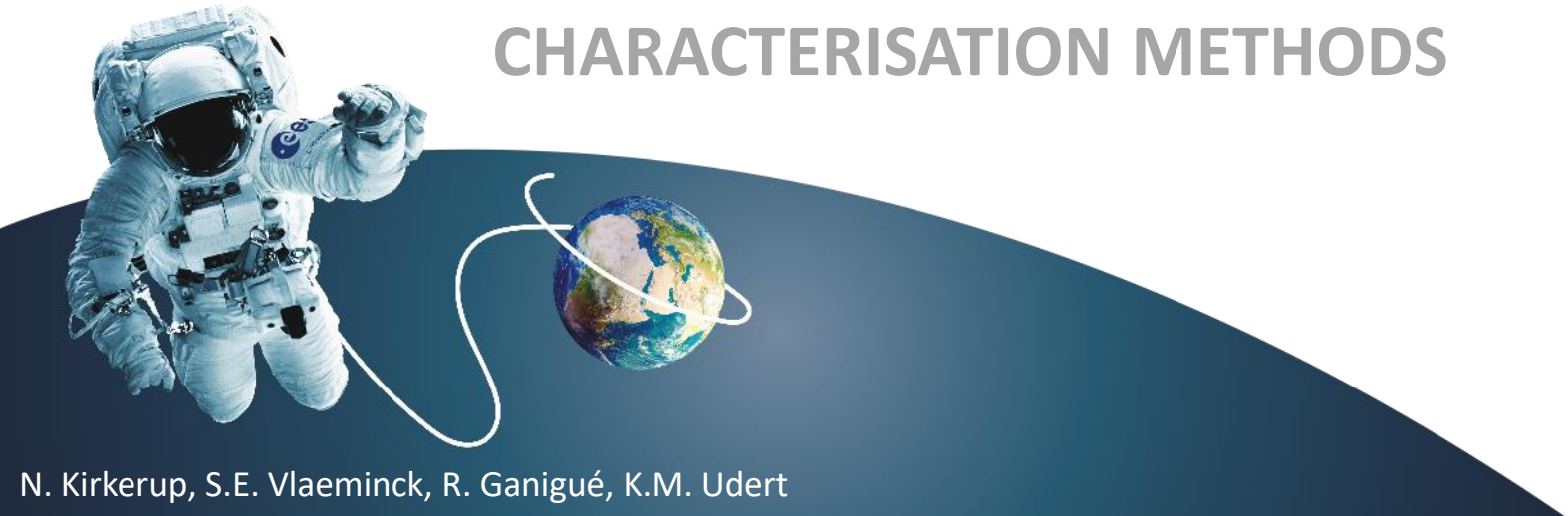
GHENT UNIVERSITY

ETH zürich

CREATING A CIRCULAR FUTURE

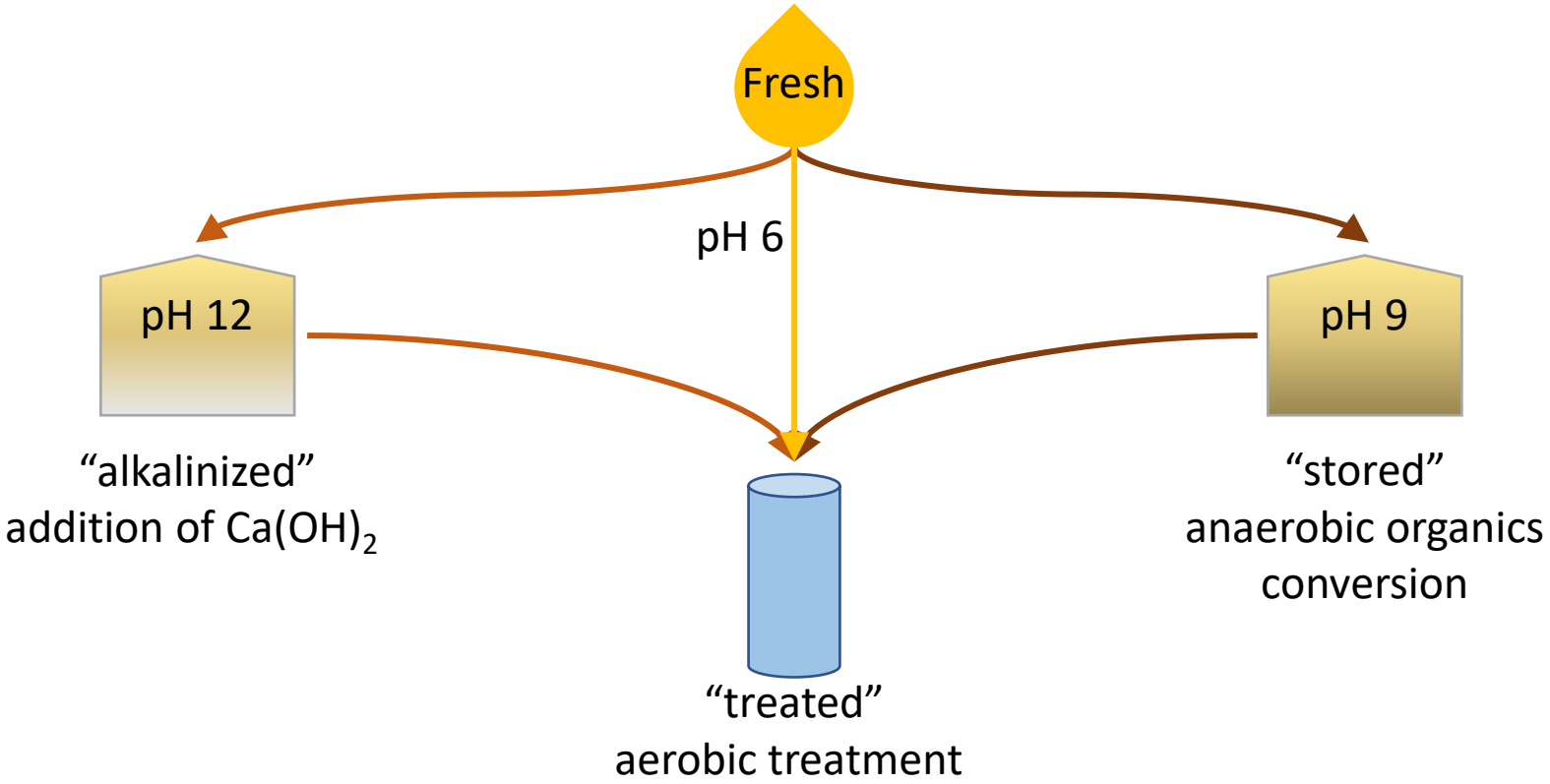
FATE OF ORGANICS IN URINE

CHARACTERISATION METHODS



N. Kirkerup, S.E. Vlaeminck, R. Ganigué, K.M. Udert

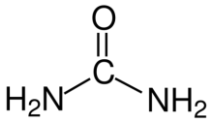
Three different ways to collect urine



Why are organics important?

They are degraded anyway…

organics ≠ organics



Urea ~ 45% of C Carbon

Organics are converted and degraded during urine treatment + microbial by-products

Organics are substrate for biological processes

→ Methane production

→ Sulfate reduction

→ Fermentation

Some organics might inhibit certain organisms

The goal of my project

Organics in the collection and storage

→ Implementation

→ Health & safety

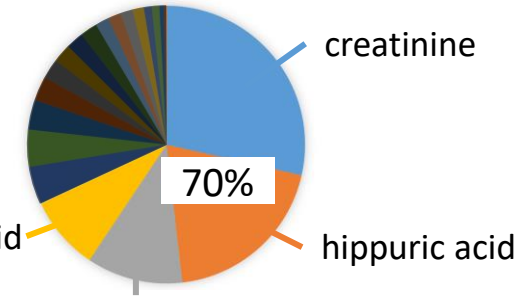
→ Enhanced synthetic urine recipe

Organics in in the aerobic treatment step

→ Inhibitory organic compounds depending on the collection type

What we already know…

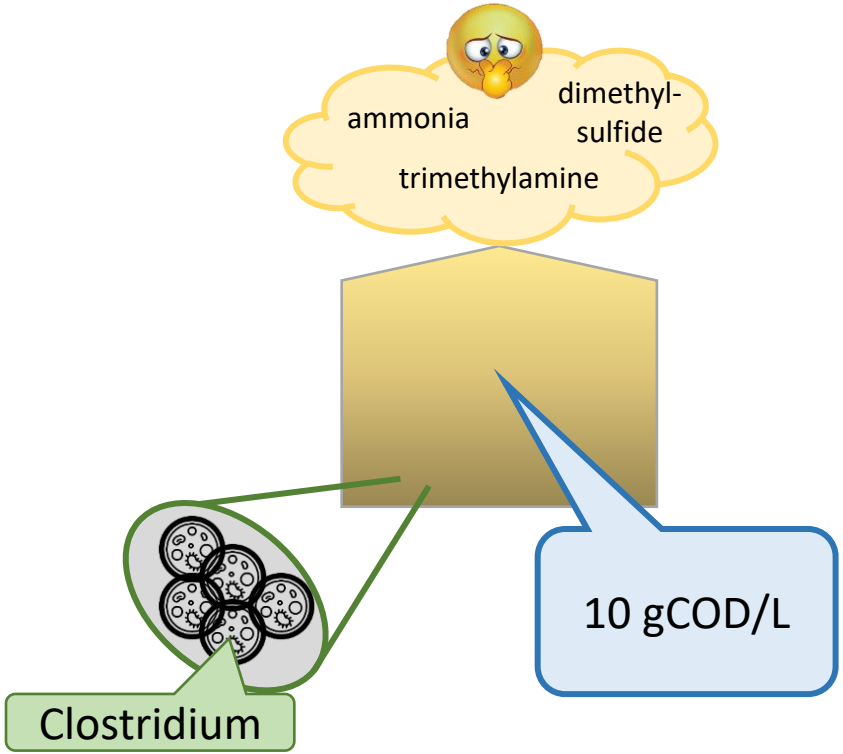
Fresh



Over 200 compounds

by courtesy of Jolien De Paepe based on Bouatra et al., 2013

Literature values show high variation



Identifying and quantifying organics

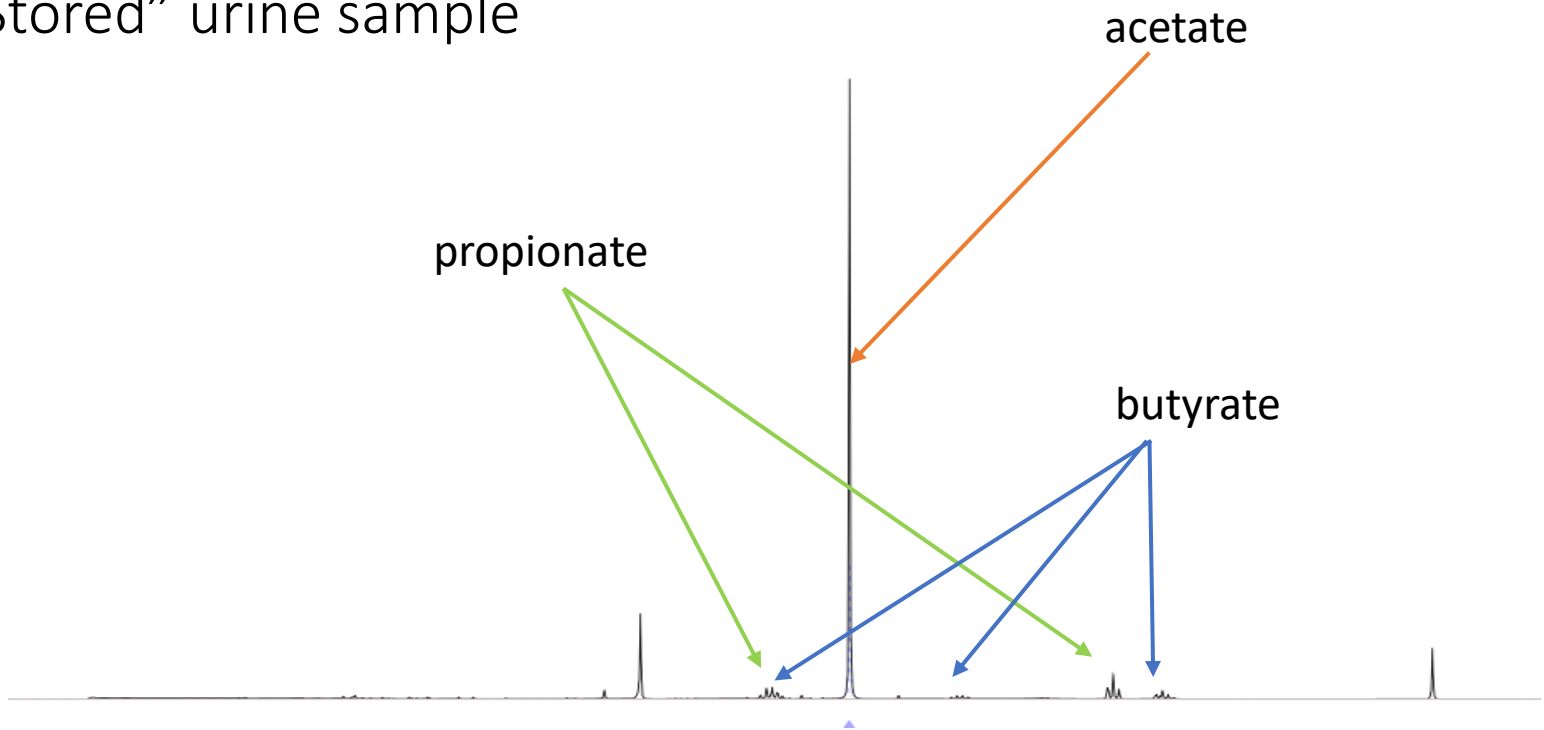
Nuclear **M**agnetic **R**esonance Spectroscopy (NMR)

Ion **C**hromatography for **V**olatile **F**atty **A**cids (IC for VFA)

Liquid **C**hromatography – **O**rganic **C**arbon **D**etection (LC-OCD)

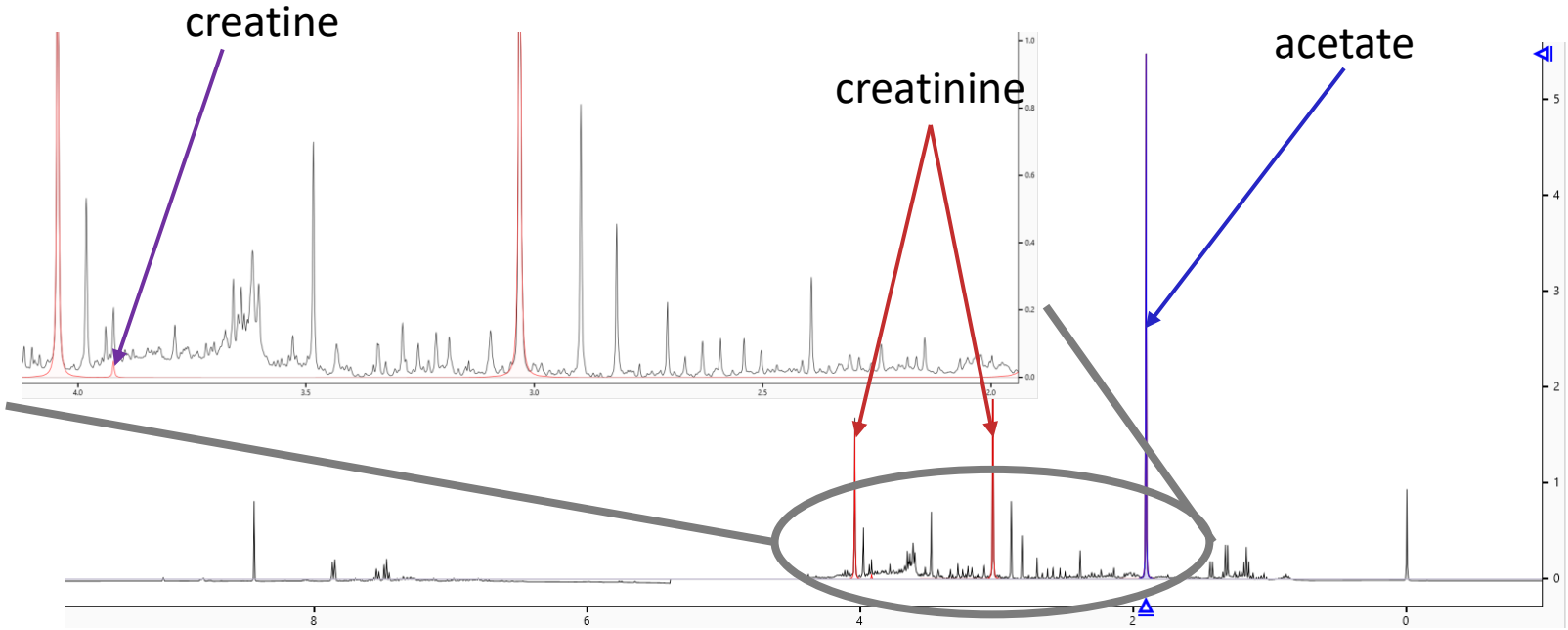
NMR can be easy to interpret

"Stored" urine sample



NMR can also be hard to interpret

"Fresh" urine sample



A more targeted approach

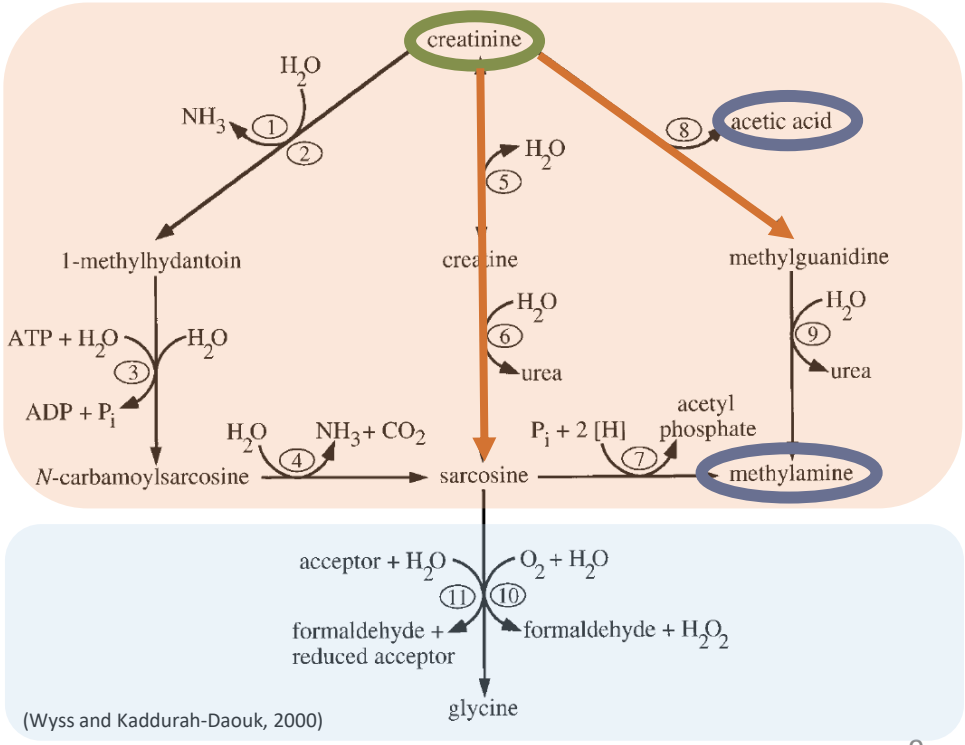
fresh urine composition to choose **single compounds**

↓

Specific compound **degradation pathways**

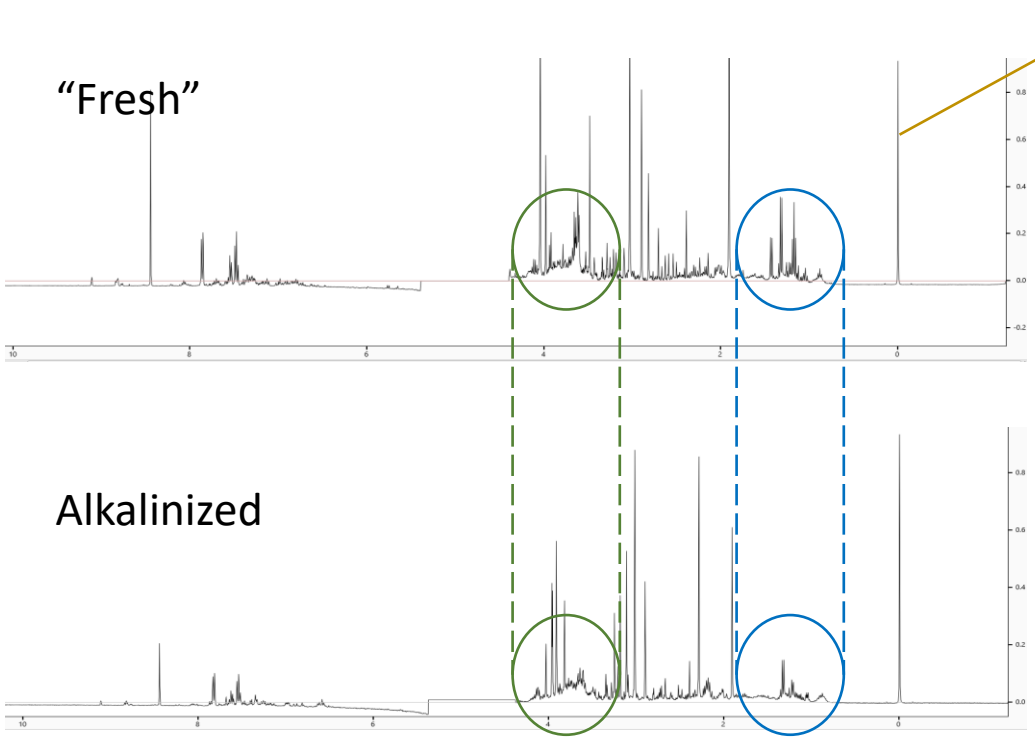
↓

targeted approach for degradation **products and by-products**

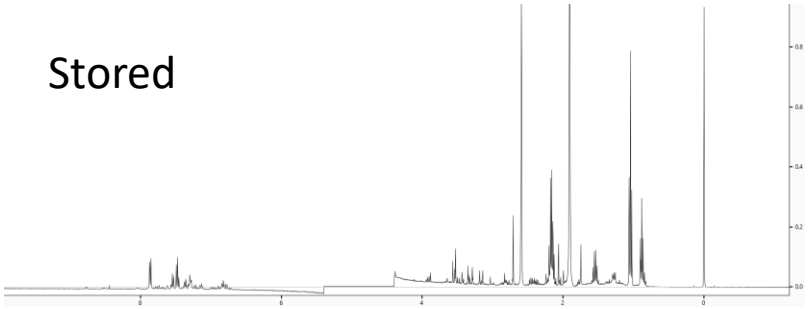


(Wyss and Kaddurah-Daouk, 2000)

Differentiation by NMR

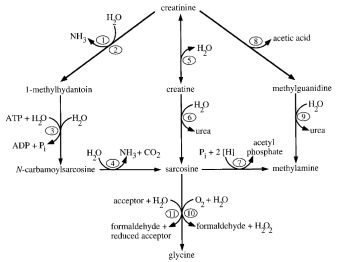


Stored

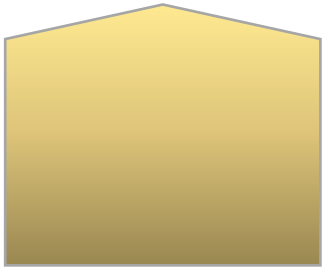


→ Less background and clearer baseline

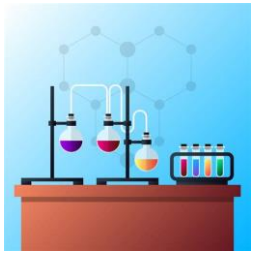
The (near) future



Complementing the targeted analysis with more compounds



Details of pathways and influence of dilution and pH



Development of a synthetic urine recipe

Acknowledgements

Prof. K.M. Udert (Eawag)

Prof. S.E. Vlaeminck (UAntwerp)

Prof. R. Ganigué (UGhent)

MELISSA

MICRO-ECOLOGICAL
LIFE SUPPORT SYSTEM
ALTERNATIVE

THANK YOU.

Nele Kirkerup
Swiss Federal Institute of Aquatic Science and Technology
nele.kirkerup@eawag.ch

www.**melissafoundation**.org

Follow us on social networks

PARTNERS

IN COOPERATION WITH

esa
European Space Agency

MELISSA
FOUNDATION

ENGINSOFT

GHENT UNIVERSITY

sck cen

SEMILLA
IPSTAR Circular Systems™

SHERPA
ENGINEERING

University of Antwerp

UNIVERSITÉ Clermont Auvergne

UAB
Universitat Autònoma de Barcelona

UNIVERSITY of GUELPH

UMONS
University of Mons

UNIL | Université de Lausanne

vito

IC and NMR results are comparable