

PROJECT DESCRIPTION

Exploiting cellulosic sewage and bacterial metabolism to produce novel bio-based compounds

Every year, up to 10 kg per capita of toilet paper is wasted in the sewage and then metabolised in the activated sludge process, contributing to the increase of energy consumption and sludge disposal in municipal wastewater treatment plants (WWTP). Despite their added value, cellulose fibers contained in toilet paper are an untapped resource, which might be efficiently recovered from the sieving of municipal wastewater and biologically converted into platform chemicals (volatile fatty acids), biopolymers (polyhydroxyalkanoates) and ingredients for animal feed (single cell proteins).



CONTACTS:

Coordinator
Università di Verona

Researcher
Federico Micolucci, PhD
federico.micolucci@univr.it

Supervisor
prof. Nicola Frison
nicola.frison@univr.it



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REFRAME

RESOURCE RECOVERY FROM
NOVEL ASSISTED METABOLISM



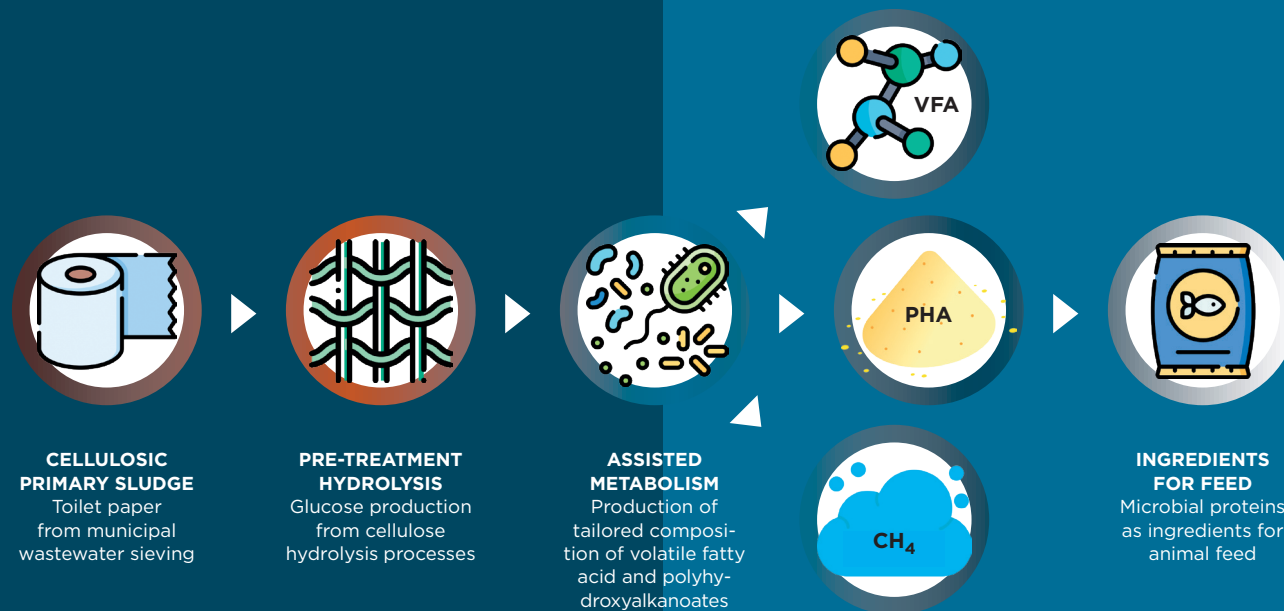
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OBJECTIVE

The REFRAME project aims to transform WasteWater Treatment Plants (WWTPs) into Water Resource Recovery Facilities (WRRFs), utilising wastewater and sewage sludge as raw materials for producing bio-based compounds. It focuses on recovering valuable biomolecules found in wastewater, including cellulose, which is the primary component of toilet paper. With the support of the Marie Skłodowska-Curie Actions program, the project will develop an innovative method that uses bacterial metabolism to extract cellulose from primary sludge and convert it into bio-based volatile fatty acids and polyhydroxyalkanoates, suitable for energy and animal feed applications.

Specific objectives of the REFRAME project:

1. to understand the bioprocess mechanisms to achieve optimal production of targeted VFAs and PHAs from cellulosic fibers through a fine control of the oxidation reduction potential;
2. to study the link and interactions between the extracellular ORP and the microbial communities through metagenomic analyses;
3. to optimize the recovery and purification processes of bio-based VFAs and PHAs as platform chemicals, precursors for bioplastics and ingredients for feed.



REFRAME is a cutting-edge scientific initiative with the ambitious goal of transforming wastewater treatment plants into Water Resource Recovery Facilities in line with European Commission objectives.

Product category <small>*considering 0.3% as current EU bio-based share</small>	Average Price (€/ton)	EU production (kton/y)	Current EU bio-based production (kton/y)	Total bio-based production with REFRAME (kton/y)
platform chemicals (EC-JRC, 2018)	1480	60791	181	315
Acetic acid	600	18500	55*	189
Propionic acid	2250	470	1.4*	70
Butyric acid	1575	105	0.3*	14
Polymer for plastics	2680	60000	268	372
PHA	5430	2.3	2.3	104

IMPACTS

- to increase the bio-based shares of platform chemicals up to 1.7 times by the valorisation of cellulosic fibers from toilet paper;
- to increase the bio-based share of polymer for plastics up to 1.4 times by the production of polyhydroxyalkanoates;
- to raise awareness among prospective stakeholders about innovative environmental technologies and bio-based products.