AFTERLIFE

Advanced Filtration TEchnologies for the Recovery and Later conversIon of relevant Fractions from wastEwater

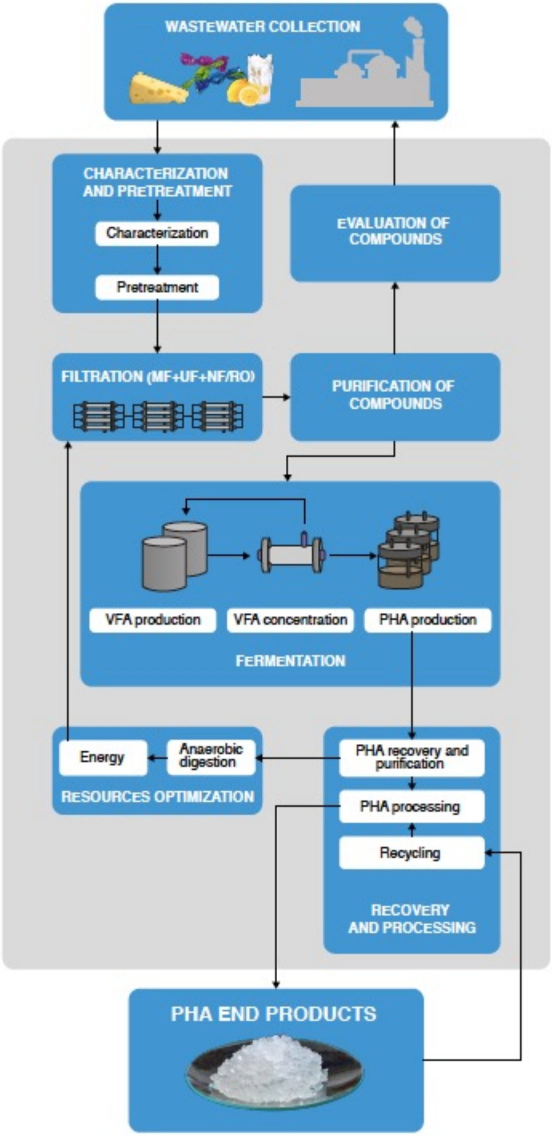
Bio-based Industries Consortium

Horizon 2020
European Union Funding
for Research & Innovation

AFTERLIFE has received funding from the Bio-Based Industries Joint Undertaking under the European Union's Horizon 2020 research and innovation program under grant agreement No. 745737 .

Project summary

- The AFTERLIFE project proposes a flexible, cost- and resource-efficient process for recovering and valorizing the relevant fractions from wastewater
- It will represent an advance on existing approaches to wastewater treatment, which rely on physic-chemical and biological methods
- The AFTERLIFE process will separate out the different components of value using a series of membrane filtration units that will separate all the solids in the wastewater
- These will then treated to obtain high-pure extracts and metabolites or, alternatively, to be converted into value-added biopolymers; polyhydroxyalkanoates (PHAs)
- In addition to the value extracted from the solids, the remaining outflow of the water will be ultrapure and ready for re-use



Project Details

4
Duration (Years)

3.890.000
Max. grant amount

15
Partners

7
Countries

CONSORTIUM

visit us at:
www.afterlife-project.eu

Process

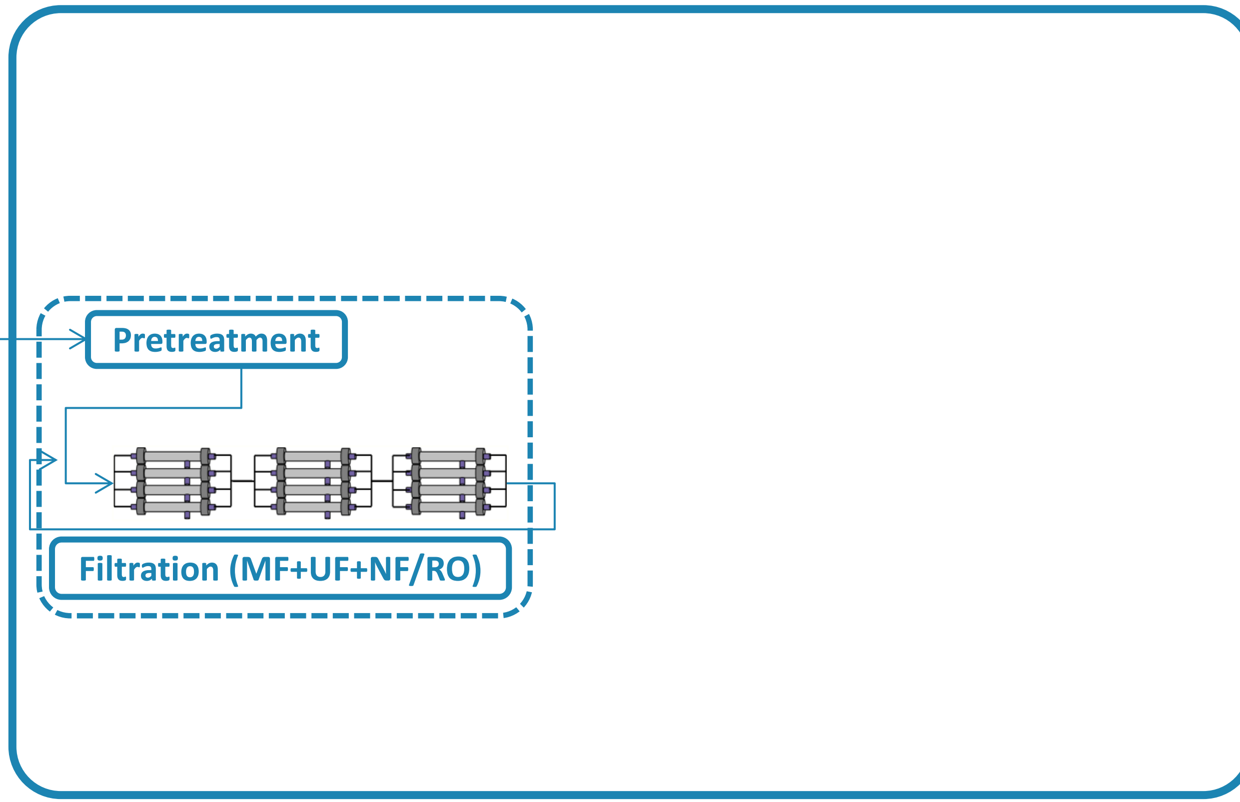
AFTERLIFE process

Wastewater Collection

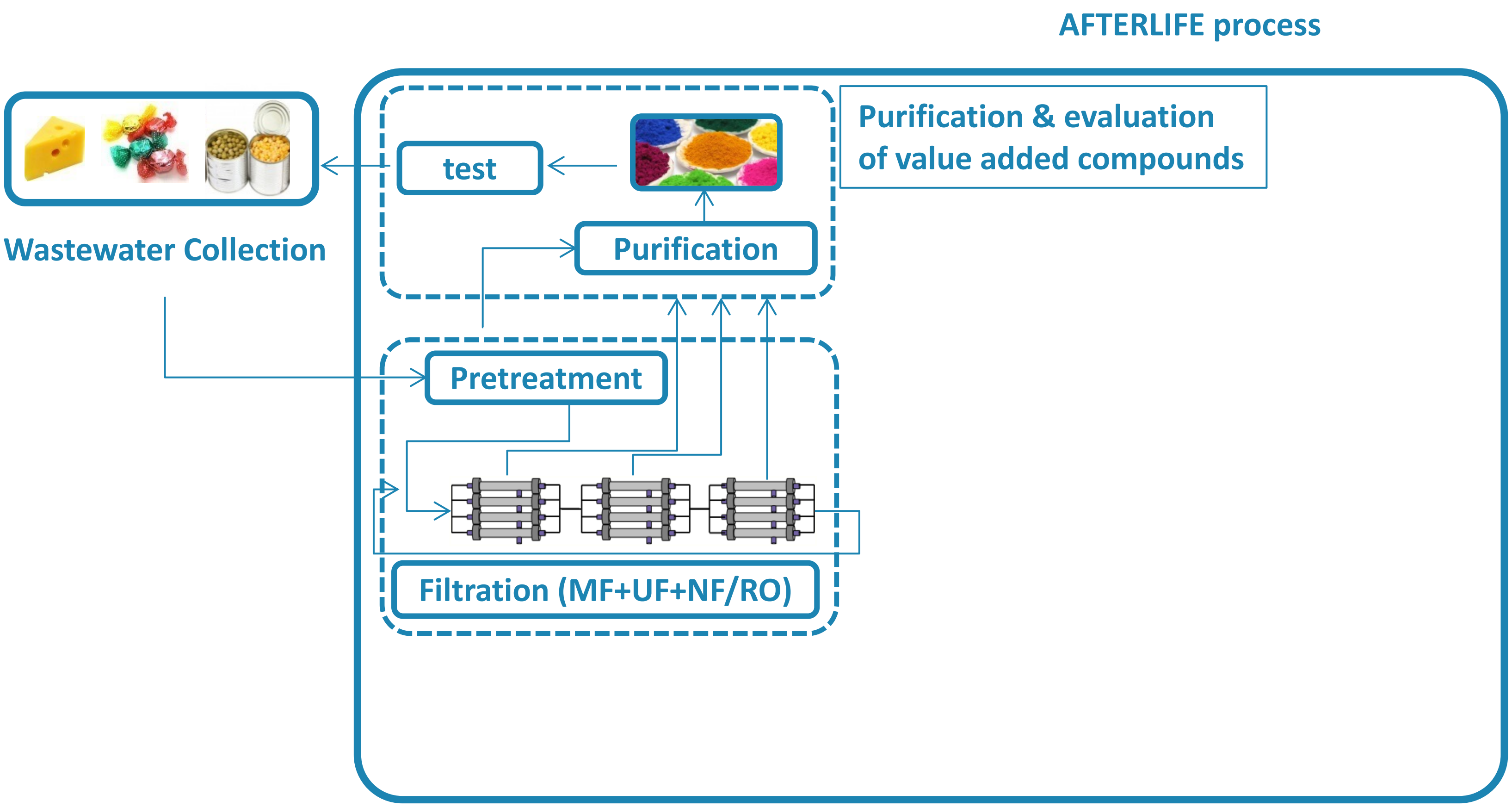
Process

Wastewater Collection

AFTERLIFE process

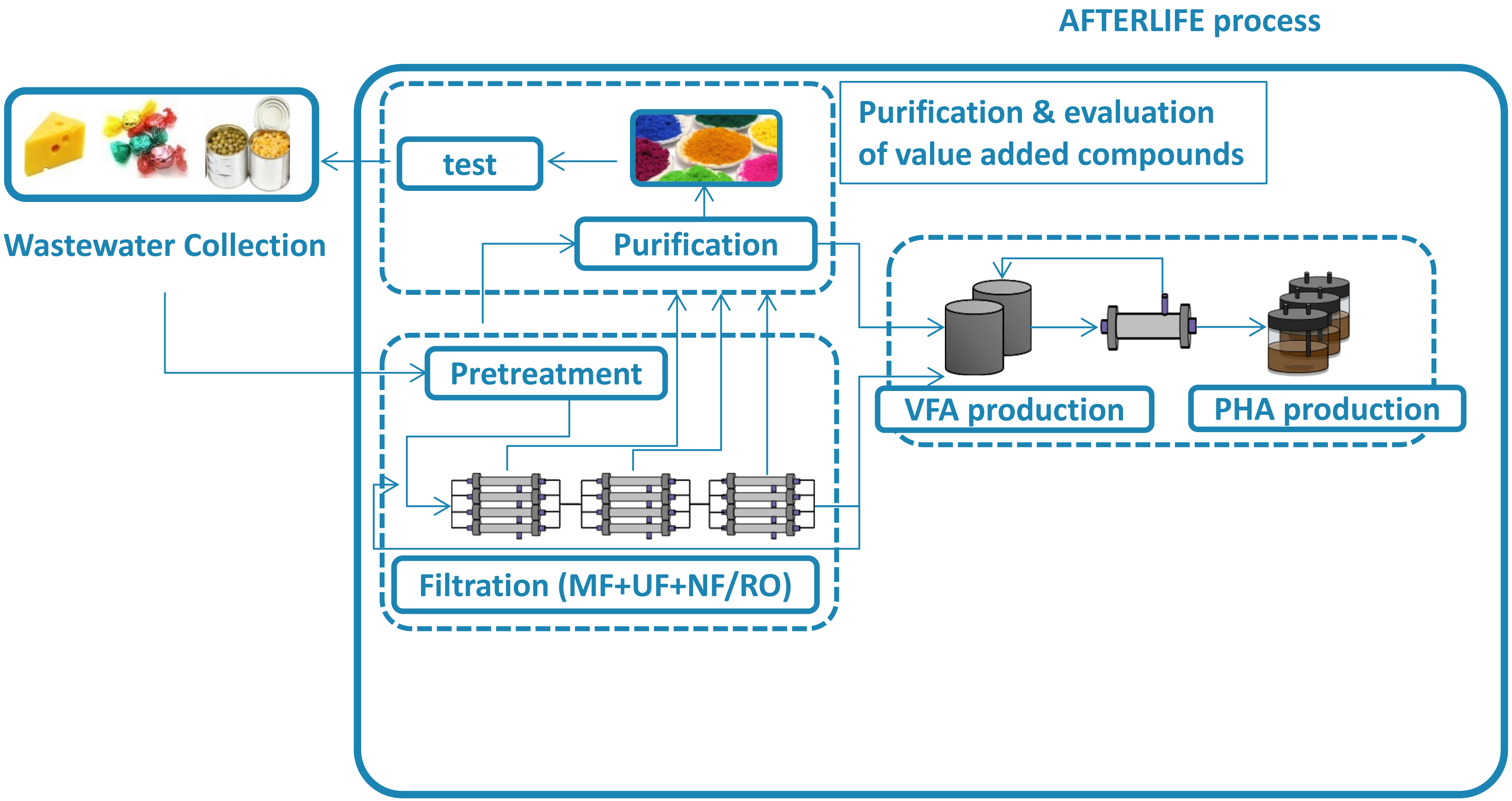


Process



AFTERLIFE process
Purification & evaluation of value added compounds
test
Purification
Wastewater Collection
Pretreatment
Filtration (MF+UF+NF/RO)

Process


AFTERLIFE process
Purification & evaluation of value added compounds
test
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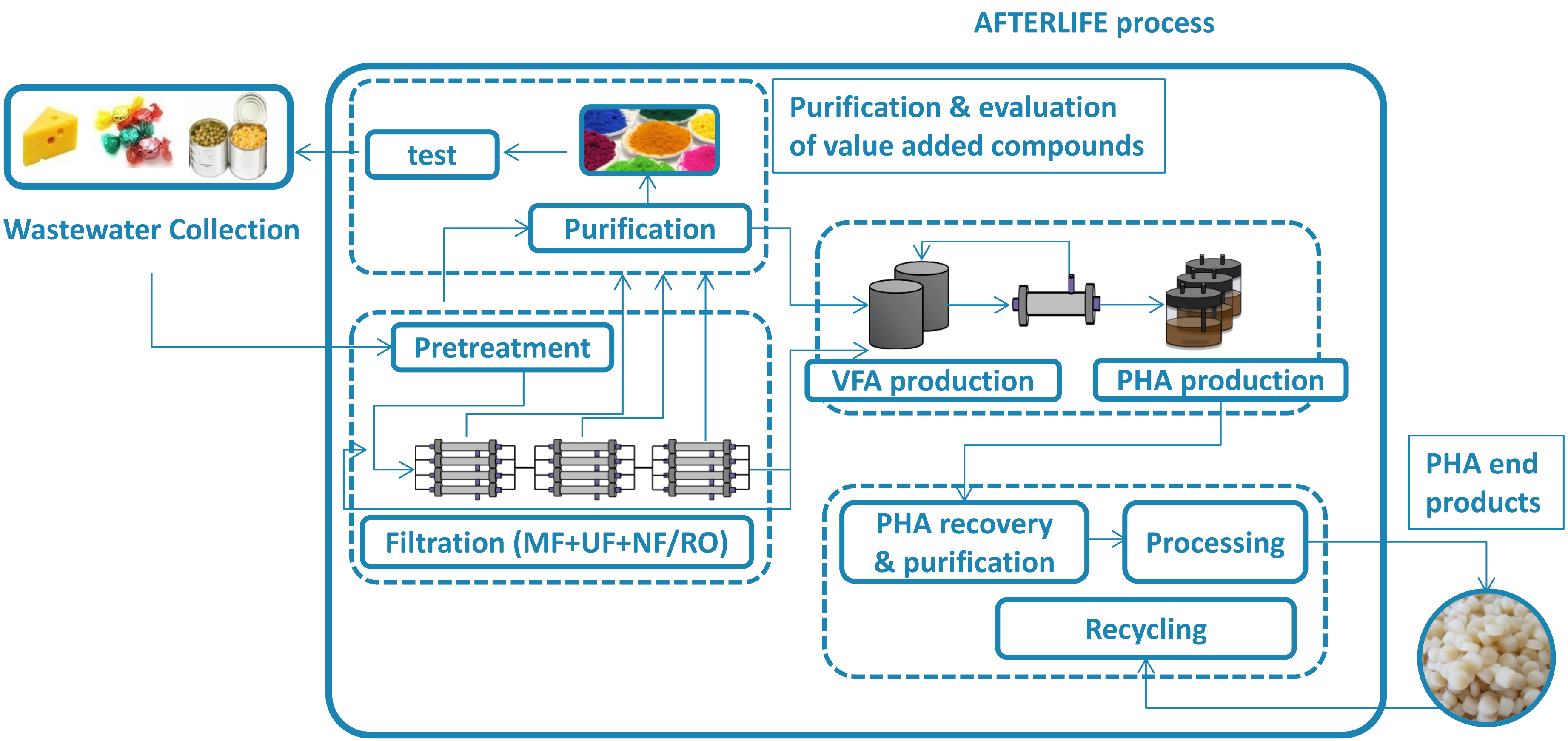
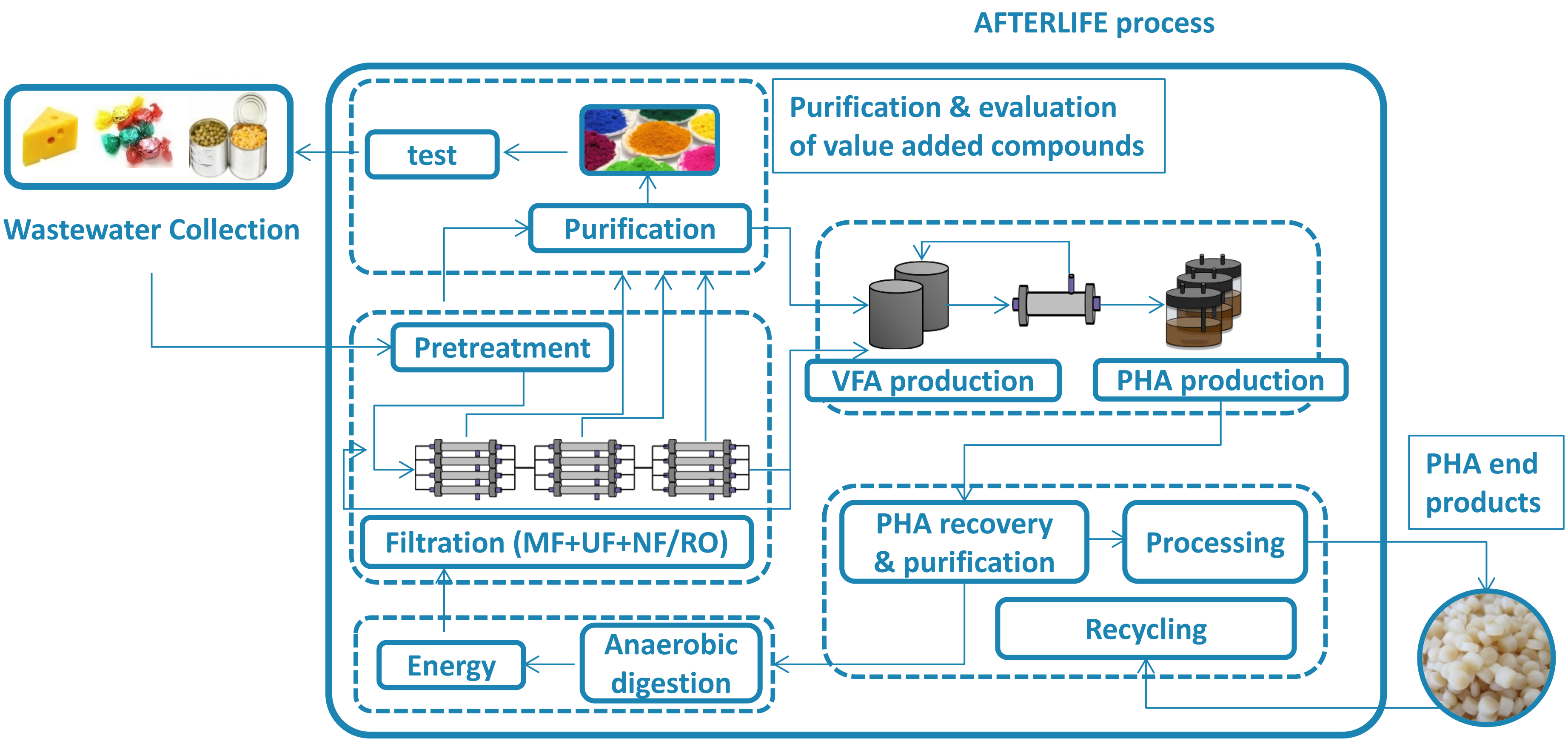
Filtration (MF+UF+NF/RO)
VFA production
PHA production

Process



AFTERLIFE process
Purification & evaluation of value added compounds
test
Purification
Wastewater Collection
Pretreatment
Filtration (MF+UF+NF/RO)
VFA production
PHA production
PHA end products
PHA recovery & purification
Processing
Recycling

Process



AFTERLIFE process
Wastewater Collection
test
Purification & evaluation
of value added compounds
Purification
Pretreatment
VFA production
PHA production
Filtration (MF+UF+NF/RO)
PHA end
products
PHA recovery
& purification
Processing
Recycling
Energy
Anaerobic
digestion

Expected impacts

- Validate that AFTERLIFE provides recovery rates that are comparable to, or better than, those of competing technologies
- Successfully recycle or reuse 100 percent, in dry weight, of the suspended solid fractions
- Create a new cross-sectorial interconnection in bio-based economy clusters
- Create cooperation projects through cross-industry clusters
- Set the foundations for at least one new bio-based value chain and one new bio-based material
- Lead to 30 new consumer products by 2020
- Attract broad participation from SMEs

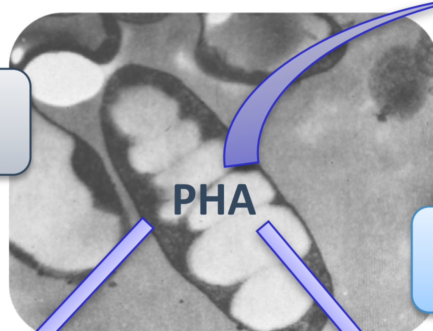
PHA as basis for bioplastics

Polyhydroxyalkanoates (PHA)

Biopolymers formed by hydroxyacids as monomeric units.
Some bacteria are able to store these polymers inside.

Biodegradable

Thermoplastic



UV resistance

Biocompatible

Short-Chain- Len (SCL)PHA (3-5 carbons)

m-Chain- Length (MCL)PHA (6-14 carbons)

PHB PHBV

Packaging

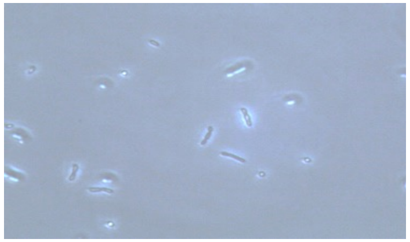
Medical applications

Energy accumulation

PHA from AFTERLIFE

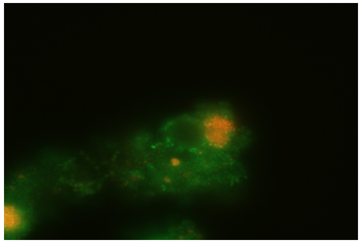
- Evaluation of the VFAs production yields through batch test under controlled conditions (conversion 0.3 g VFA/g COD)
- Continuous production of VFAs enriched liquid through a Sequencing Batch Fermentation
- PHA production from VFA using (1) pure and (2) mixed cultures
- Development and application of fed-batch and feast-famine strategies
- PHA type: P3HB or PHBV
- PHA accumulation > 60% and yields > 0.6 g PHA/ g substrate

Pure cultures



Margarita Salas

Mixed cultures



NOVA id FCT
Associação para a Inovação e Desenvolvimento da FCT

PHA as basis for bioplastics

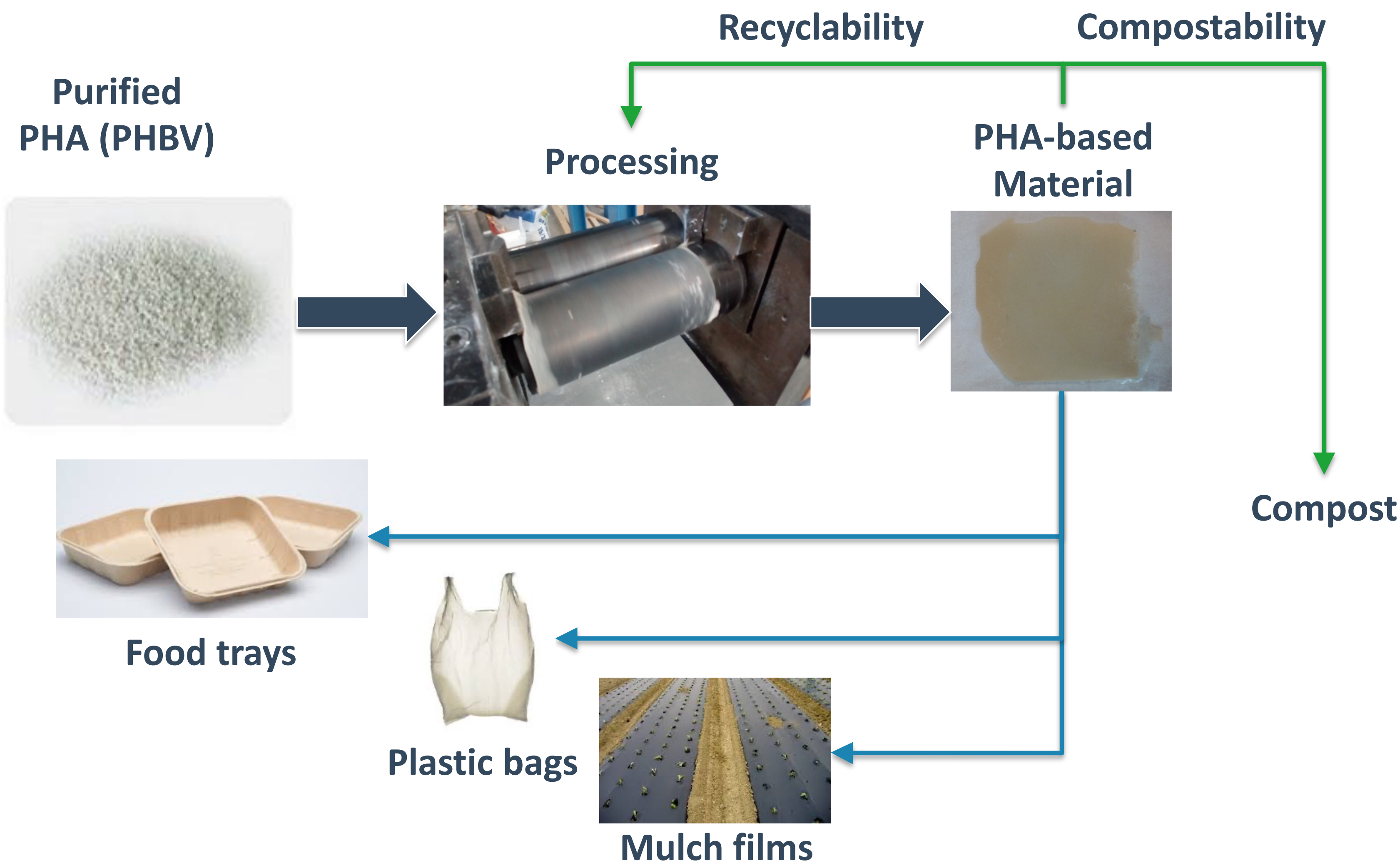
Main advantages:

- GHG emissions
- No competition with food chain
- Very versatile biodegradability characteristics
- Excellent physico-chemical properties (printing, sealing, dyeing, barrier)
- High versatility: Injection moulding, sheet and film extrusion, thermoforming

Main challenges:

- Low thermal stability in melt: Biopolymers have low thermal stability (molecular chain scission above 160 °C), which compromises their transformation under industrial conditions.
- Low ductility: PHA presents a deformation at break of less than 5%, which limits its application in the packaging sector.
- Limitations in processing: the high crystallinity of PHA, which gives it excellent barrier properties, makes its thermoforming challenging without additives

Bioplastics from AFTERLIFE

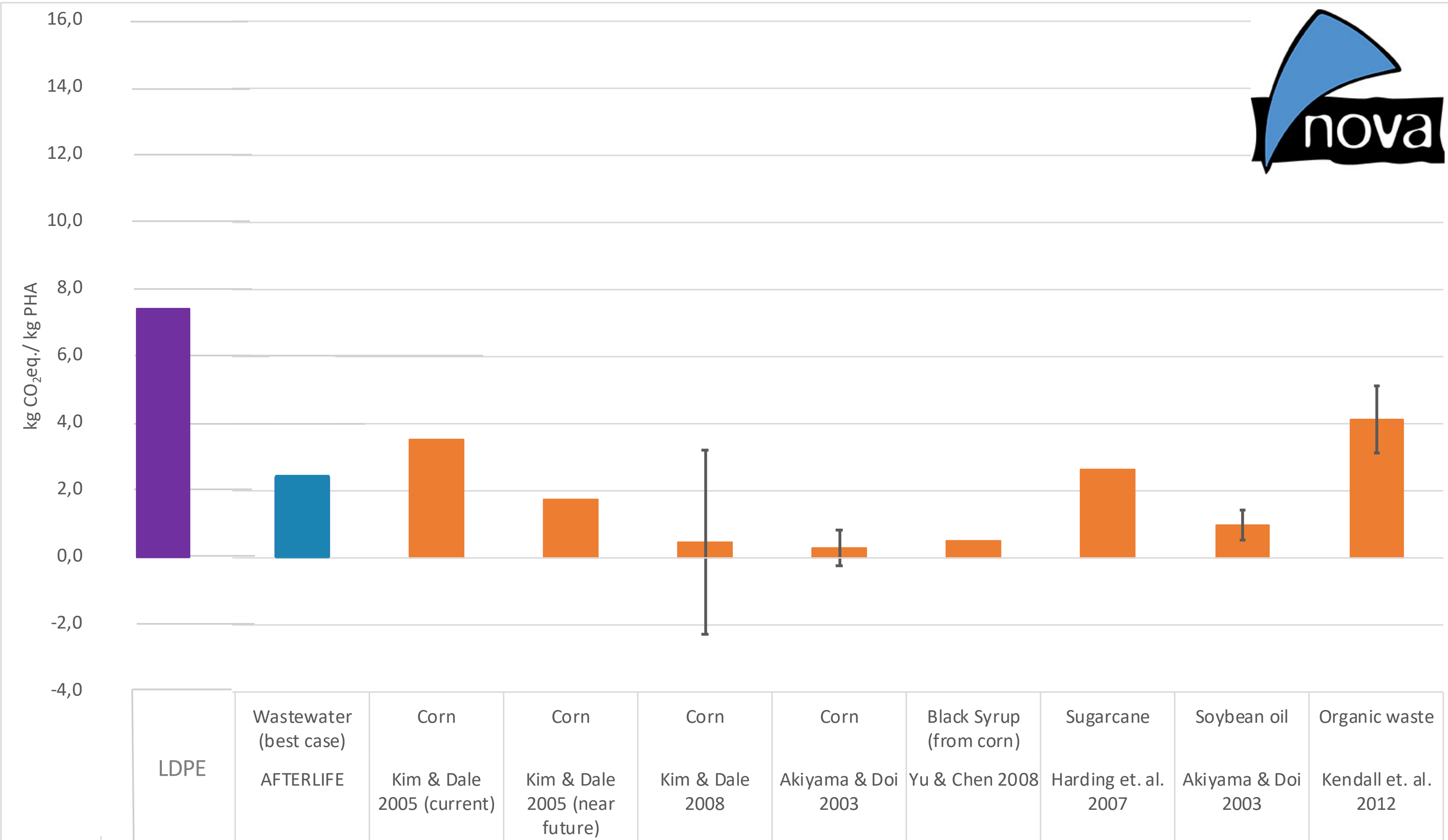


Technical aspects

IMPROVING LIMITATIONS OF PHA (PHBV)

- **Thermal stability**
  - Clays
- **Ductility**
  - Thermoplastic polyurethane (TPU)
- **Processability by thermoforming**
  - Poly(lactic acid) (PLA)
  - Poly(lactic acid) (PLA) + additives

Environmental impact



Outcomes

- Technical barriers seem salvable
- Wastes as carbon source will increase availability of PHA
- Techno-economic, environmental and social benefits that lead to a circular economy
- Regulation might need to be pushed to facilitate Market Entry ??
  - Upcoming legislation to encourage this innovation

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