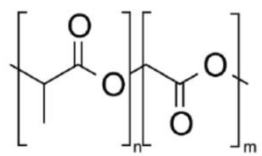
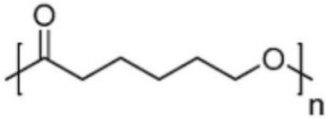
Advancing Sustainability and Health: The role of microbial-derived copolymers in circular economy and biomedical applications

Raffaele Conte, PhD
CNR IRET –Naples

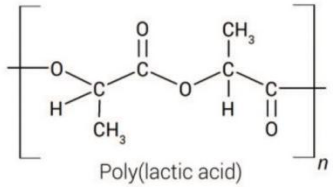
PLGA



poly (lactic-co-glycolic acid)



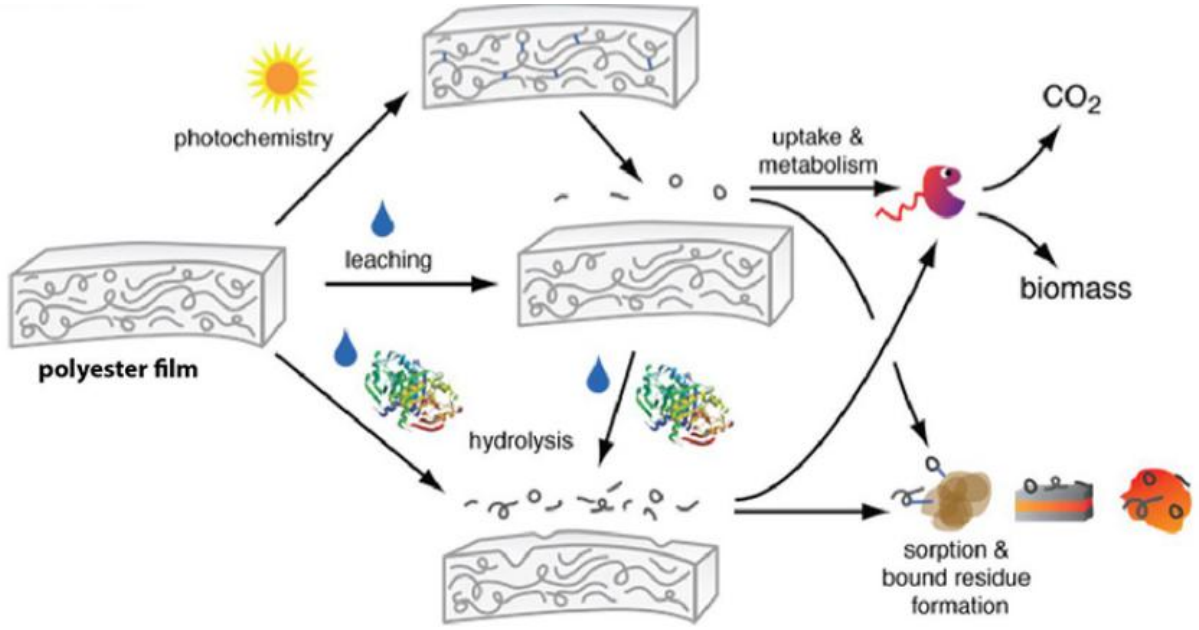
Polycaprolactone



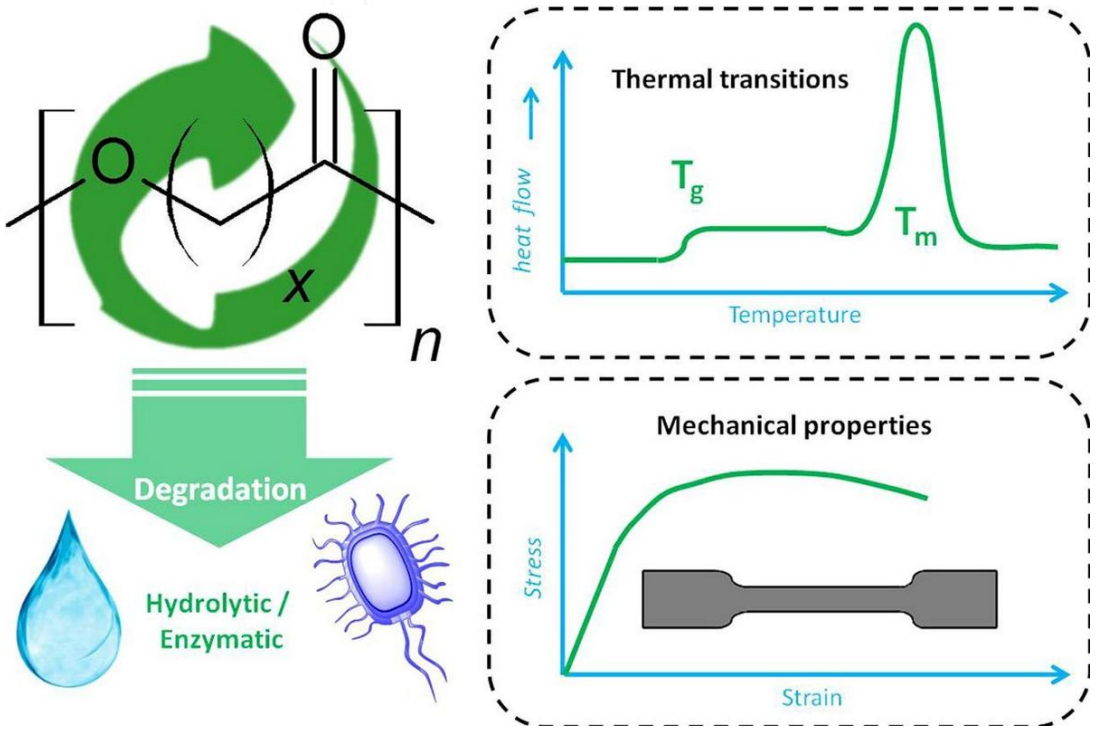
Poly(lactic acid)

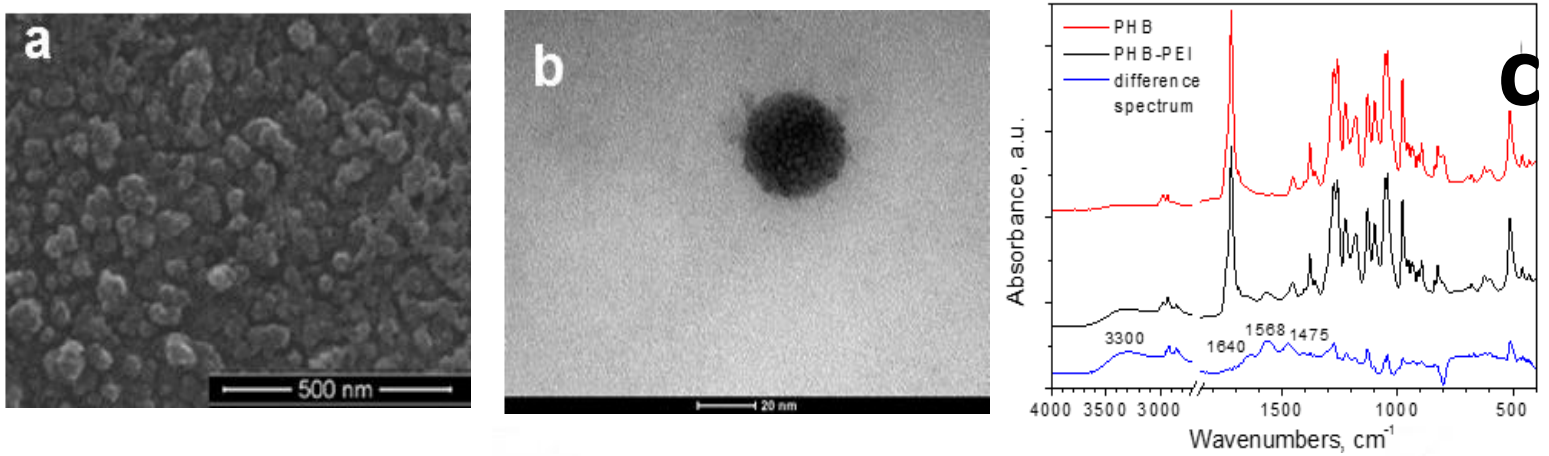
Plastic materials - Ecosystem damage

Biodegradable Polymers - Circular Economy

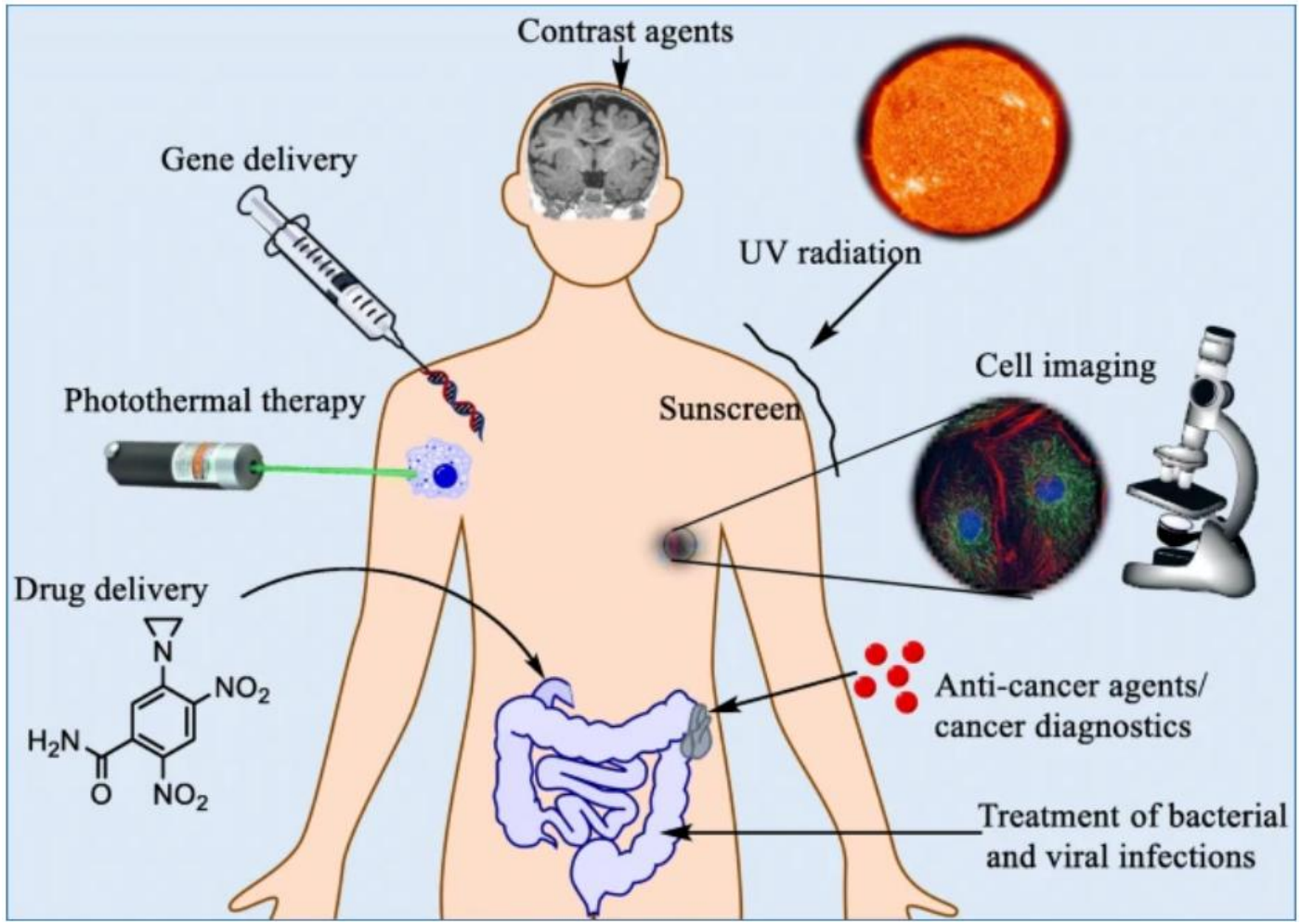


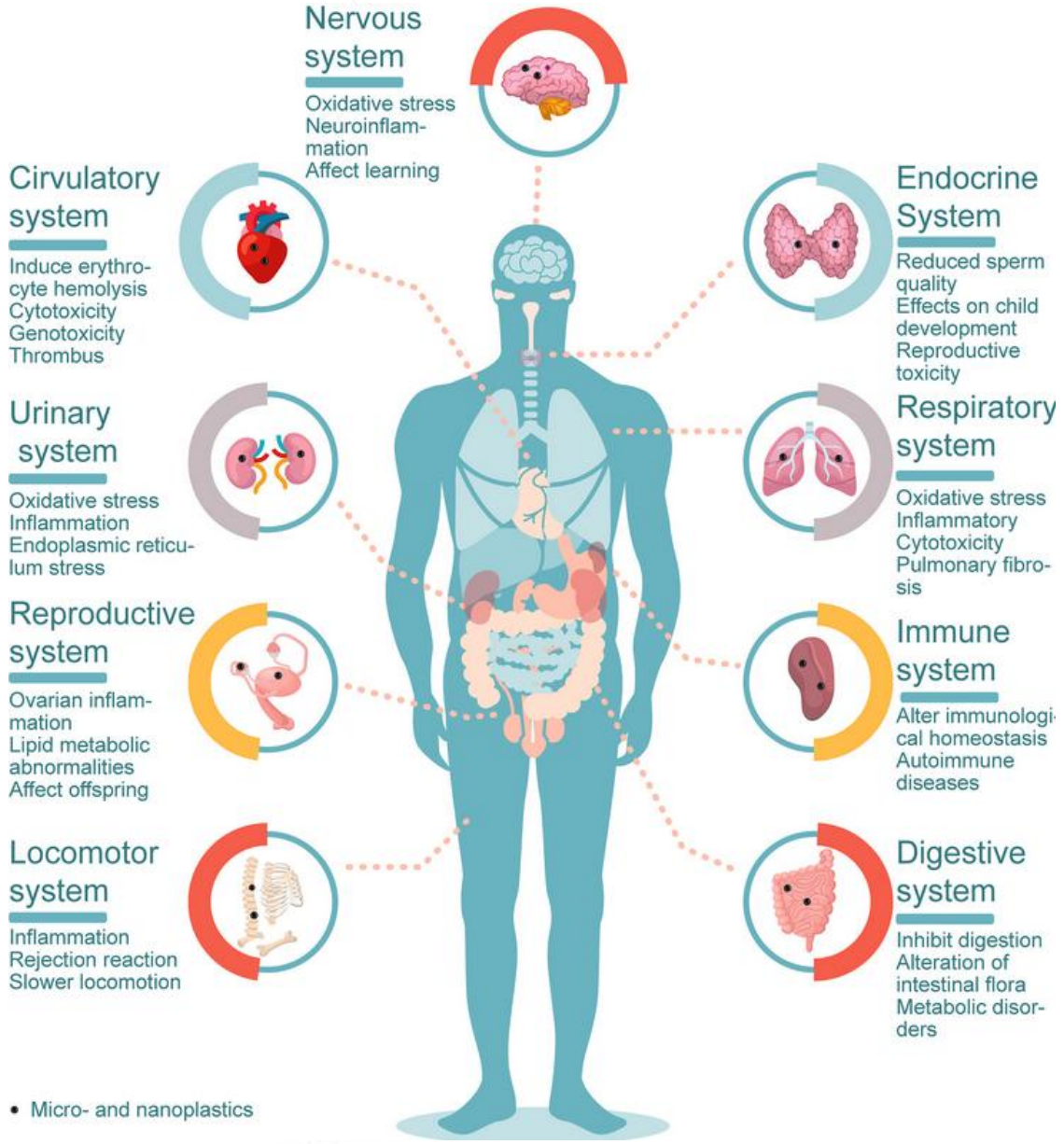
Biodegradable

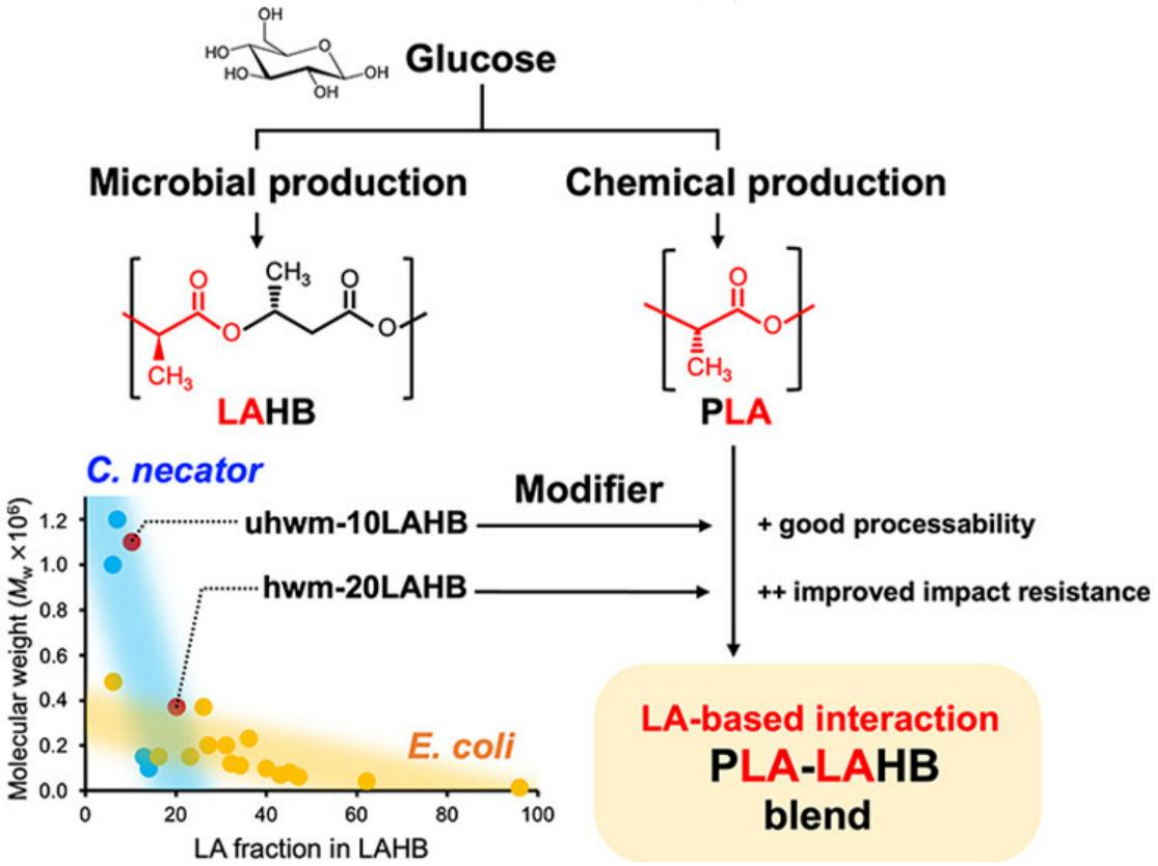




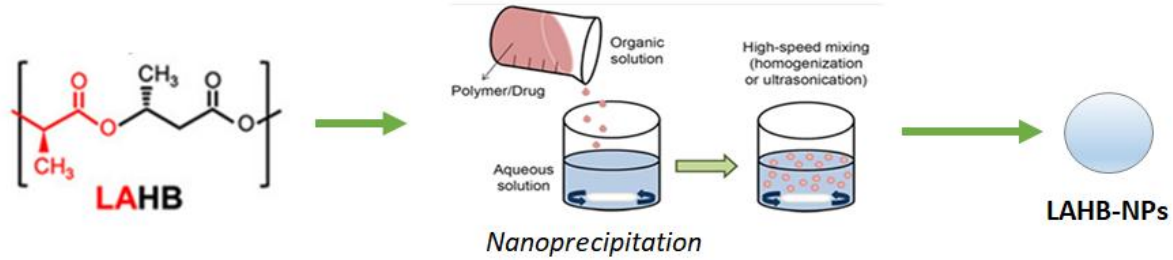
Nanoparticles physico-chemical characterization. (a) SEM and (b) TEM images of PHB-PEI-NPs. (c) ATR-FTIR


Contrast agents
Gene delivery
UV radiation
Photothermal therapy
Sunscreen
Cell imaging
Drug delivery
NO_2
H_2N
O
NO_2
Anti-cancer agents/
cancer diagnostics
Treatment of bacterial
and viral infections

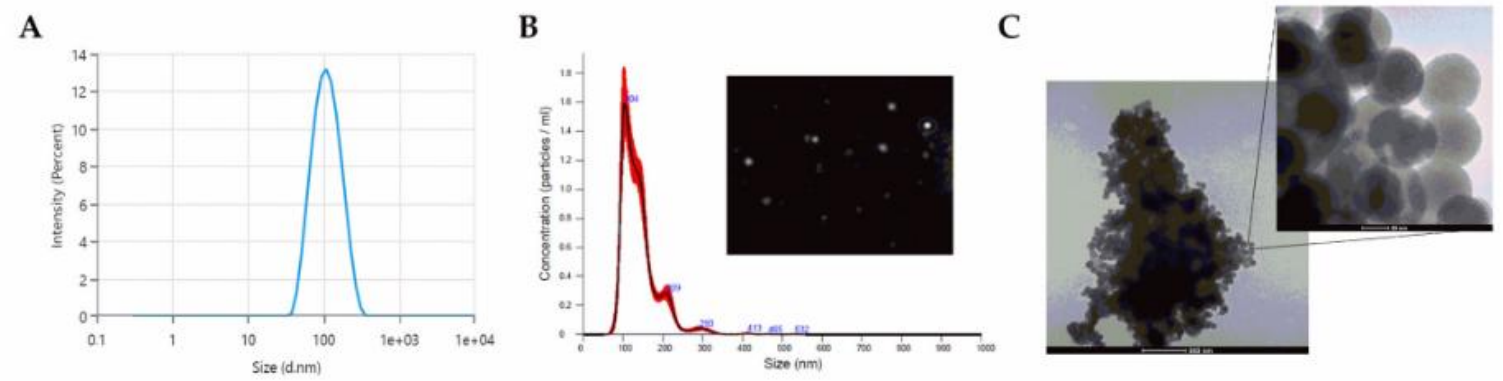

Nervous system
Oxidative stress
Neuroinflam-mation
Affect learning
Cirvulatory system
Induce erythro-cyte hemolysis
Cytotoxicity
Genotoxicity
Thrombus
Endocrine System
Reduced sperm quality
Effects on child development
Reproductive toxicity
Urinary system
Oxidative stress
Inflammation
Endoplasmic reticu-lum stress
Respiratory system
Oxidative stress
Inflammatory
Cytotoxicity
Pulmonary fibro-sis
Reproductive system
Ovarian inflam-mation
Lipid metabolic abnormalities
Affect offspring
Immune system
Alter immunologi-cal homeostasis
Autoimmune diseases
Locomotor system
Inflammation
Rejection reaction
Slower locomotion
Digestive system
Inhibit digestion
Alteration of intestinal flora
Metabolic disor-ders
• Micro- and nanoplastics



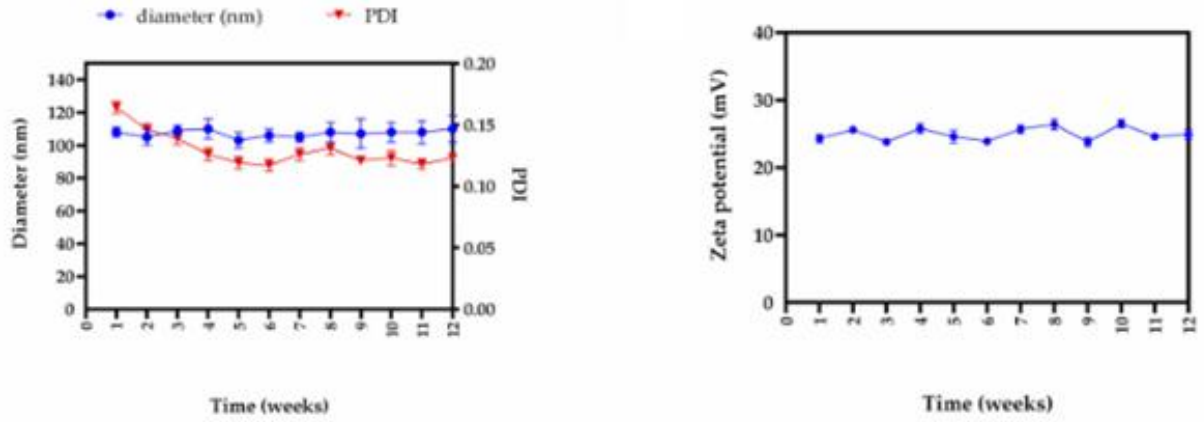
PLA is modified using ammonolysis agents to enhance hydrophilicity and susceptibility to bacterial digestion



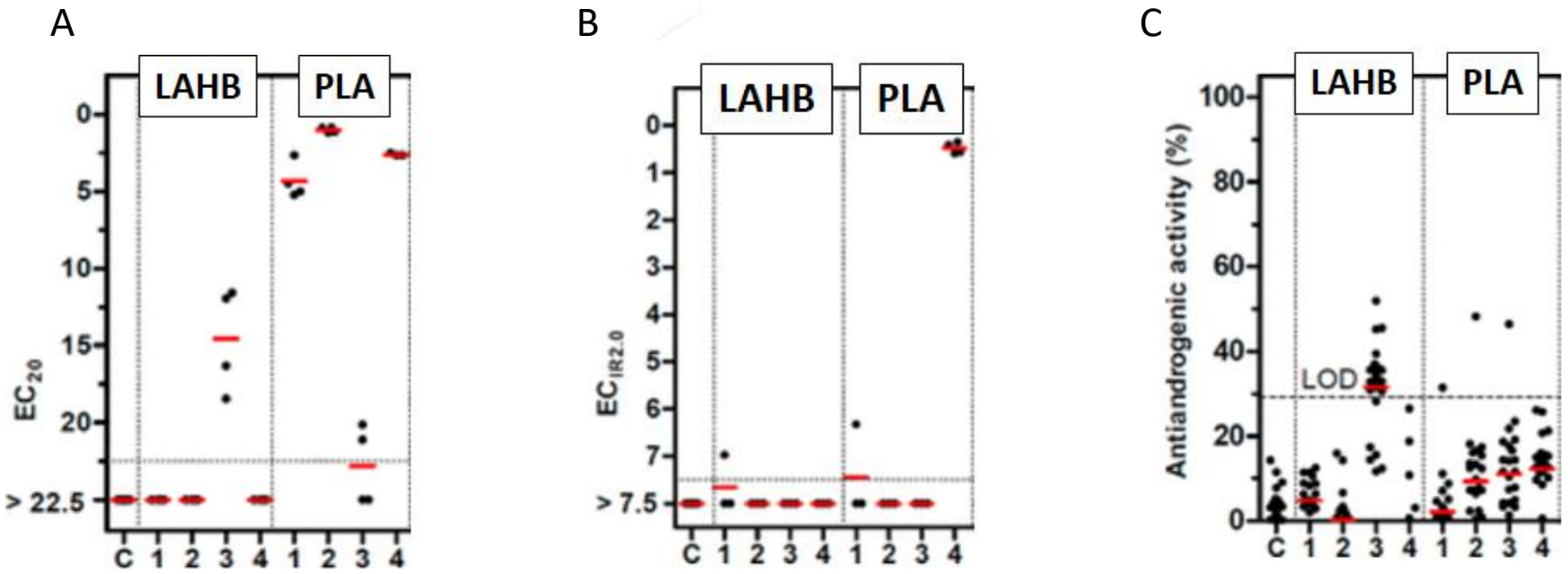
Nanoparticles synthesis scheme



Physicochemical characterization of LAHB nanoparticles. (A) Average particle size, and (B) NTA measurement of LAHB NPs in suspension. The frame is a representative screenshot of the NTA video. (C) Morphology of of LAHB NPs using TEM microscopy



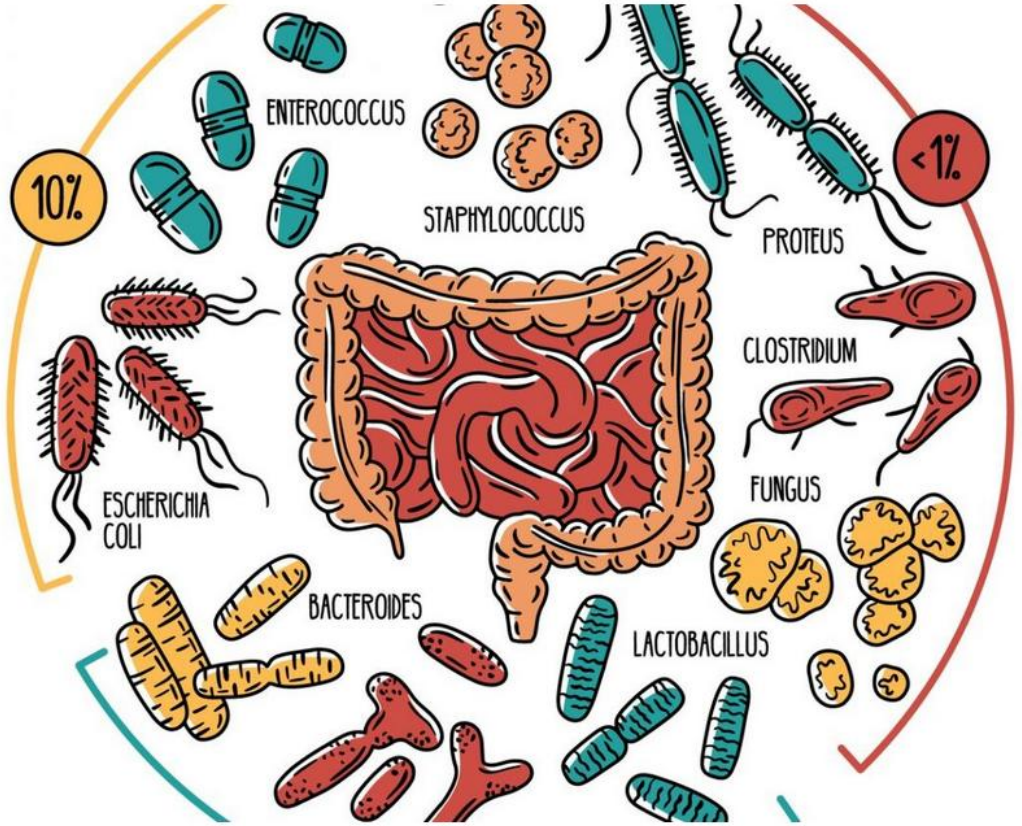
Size, PDI, and ζ-potential of LAHB-NPs during three months of storage at 25 °C



A. Baseline toxicity in the Microtox assay. Data is presented as mean EC_{20} for bioluminescence inhibition (lines) from three to five independent experiments (dots) performed with duplicates. The >22.5 indicates that LAHB NPs of 22.5 mg (highest analyzed concentration) did not inhibit the bioluminescence by >20%.

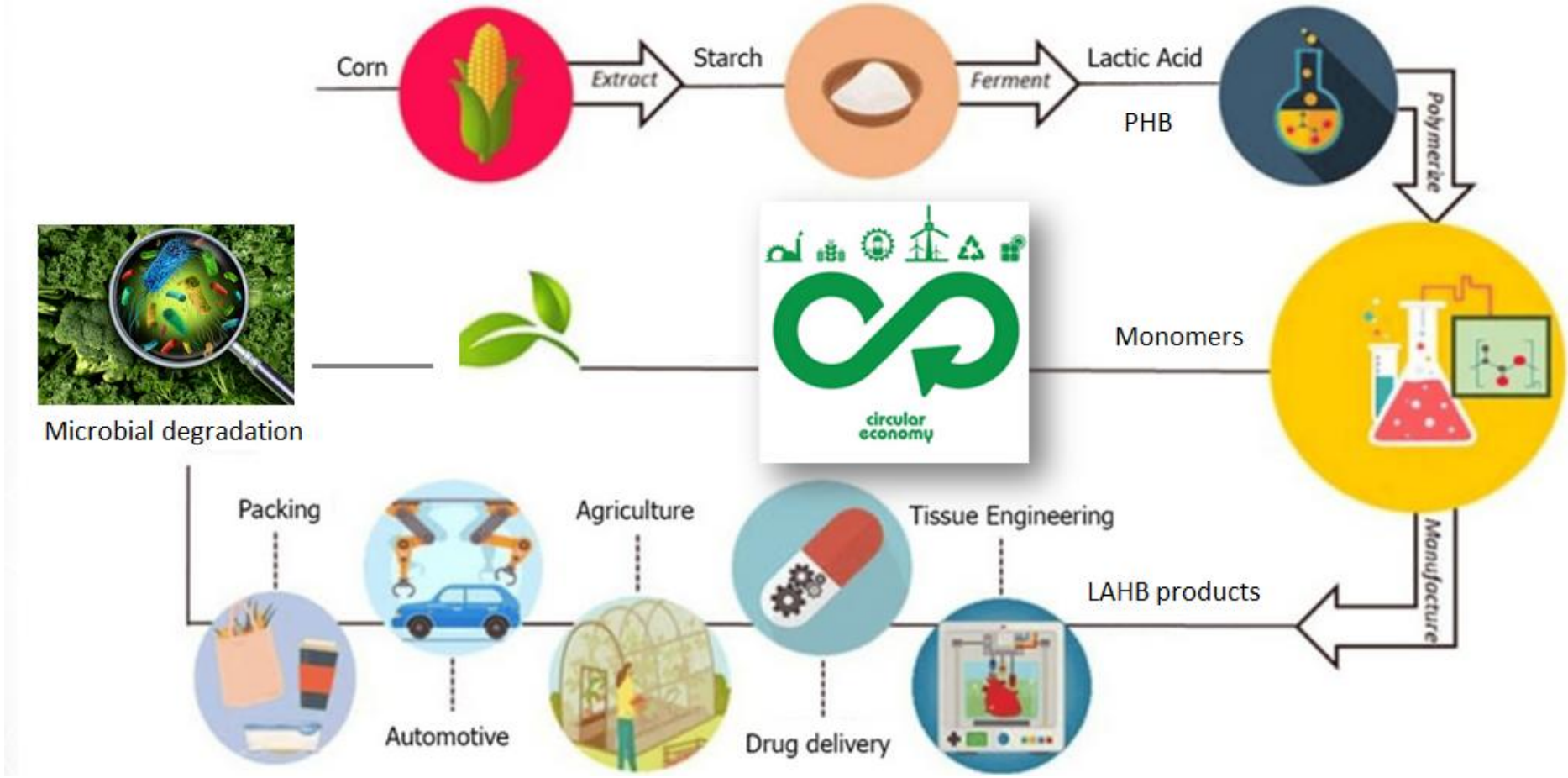
B. Oxidative stress response induced in the Nrf2-ARE assay. Data is presented as mean ECIR2 (lines) from three to four independent experiments (dots) performed with duplicates. The >7.5 indicates that LAHB NPs of 7.5 mg (highest analyzed concentration) did not produce an induction ratio of 2 (IR2).

C. Relative antiandrogenic activity given as relative human androgen receptor inhibition of LAHB NPs of 3.75 mg plastic



RESULTS

These findings highlight the potential of LAHB as a promising alternative to conventional bioplastics for pharmaceutical and biomedical applications, offering a significant advantage in mitigating concerns related to the endocrine-disrupting effects of existing bioplastics. Moreover, this bio-based aliphatic polyester is degraded by the human microbiota without generating toxic byproducts, laying the foundation for the development of innovative materials used in bioresorbable medical devices, controlled drug release systems, and tissue engineering applications.


Corn
Extract
Starch
Ferment
Lactic Acid
PHB
Polymerize
Monomers
Manufacture
LAHB products
Tissue Engineering
Drug delivery
Agriculture
Automotive
Packing
Microbial degradation
circular economy

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Volume 58, June 2024, 103100

Antidiabetic and aldose reductase inhibitory activity and LC-MS/MS compositional polyphenol determination of aqueous extract of *Ammodaucus leucotrichus* fruits

Saliha Bouknana [a,b], Fatima Zahra Lafdil [a], Fahd Kandsi [a], Mounia Driouech [a], Raffaele Conte [c], Driss Bouknana [d], Abderrahim Ziyyat [a], Hassane Mekhfi [a], Abdelkhaleq Legssyer [a], Mohamed Bnouham [a]

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Exploring Phytochemical Composition, Antioxidant, Antibacterial Properties, and in Silico Study of Aqueous Leaf Extract of Pistacia lentiscus L. from the Eastern Region of Morocco

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Published: May 1, 2024

DOI: https://doi.org/10.26538/tjnpr/v8i4.20

Keywords:
Pistacia lentiscus L., Phytochemical composition,

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