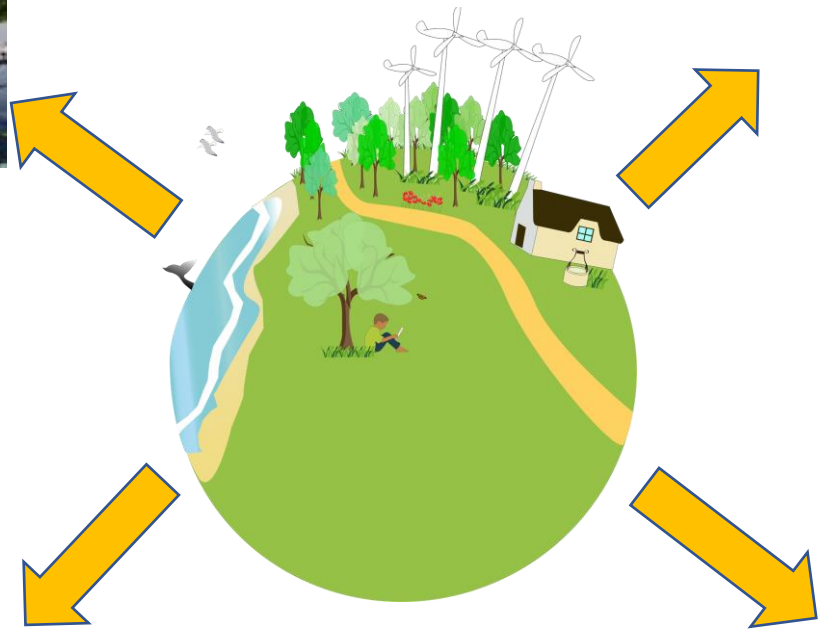
Microorganisms for sustainable food production, environmental conservation and food security

School of Chemical Engineering
University of Birmingham

Current Environmental Issues

Environmental Pollution

Food waste



Biodiversity loss

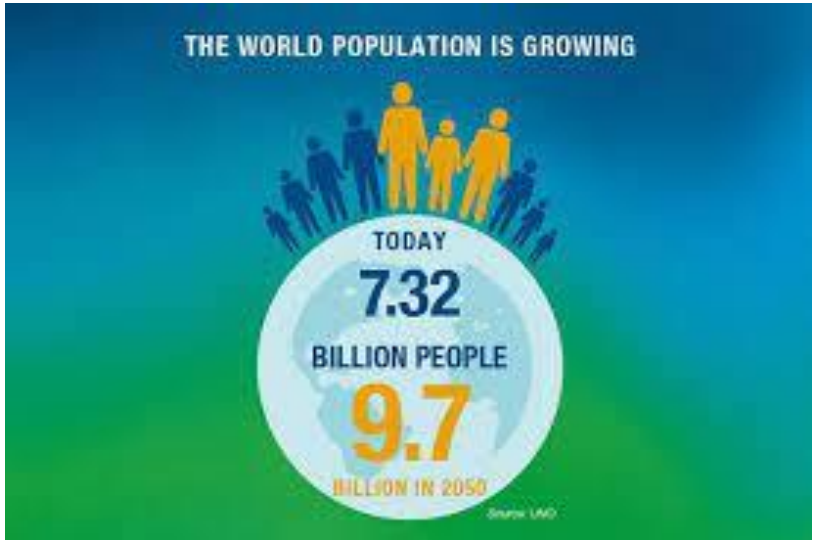
Climate change

Challenges of the current global food supply system

Food scarcity

Malnutrition

Environmental cost of food production



Green house gas emission (14.5%)

HeTa

FOOD RESEARCH CENTER OF EXCELLENCE

What we are doing at HeTa to address these issues

Microbial based food production

- Single cell proteins
- Algae based flour formulation for the baking industry

Bioremediation of heavy metals in Water/Wastewater

- Bio-recovery using *E.coli*

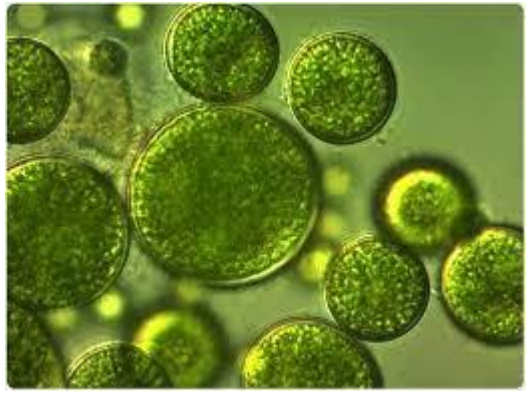
Food Safety

- Antimicrobial peptides for food shelf-life extension
- Industry collaboration for safer foods (biofilm detection and novel technologies for decontamination)

Food waste valourisation

- Extraction of useful industrial materials from food wastes (coffee, egg shell)

Algae based flour formulation for the baking industry



Rich source of Single –cell protein

Large scale fermentation for biomass and desirable metabolites

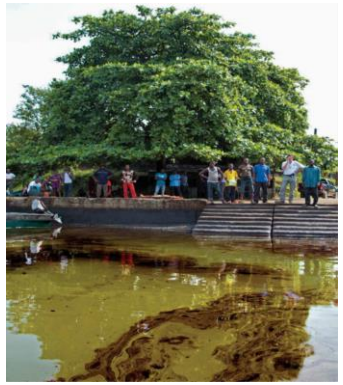
Algae flour

Research focus

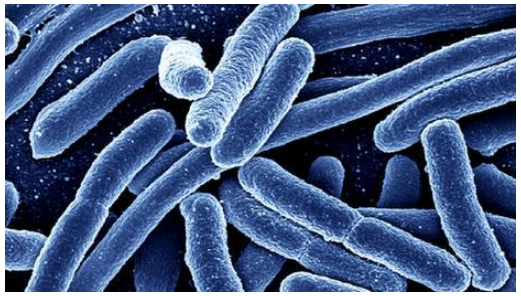
- *Algae strain selection and improvement*
- *Optimization of algae methods for improved yield and productivity.*
- *Fortification for higher nutritional value.*
- *New product formulation.*

Bioremediation & Bio-recovery of heavy metals in Water/Wastewater

6 CLEAN WATER AND SANITATION



Chronic oil/metal pollution of rivers and water bodies



E. coli for heavy metal accumulation

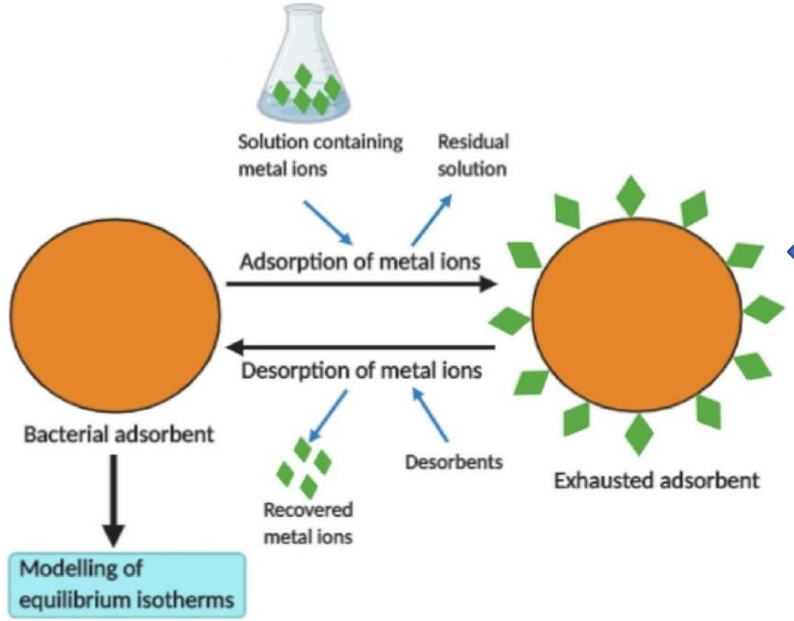
Shake flask cultivation of *E. coli* with contaminated water

Portable water free of heavy metal

Biomass/Heavy metal recovery

Parameters influencing heavy metal biosorption

- pH
- Temperature
- Biosorbent dosage
- Competing ions
- Agitation
- Nature of biosorbent
- Contact time



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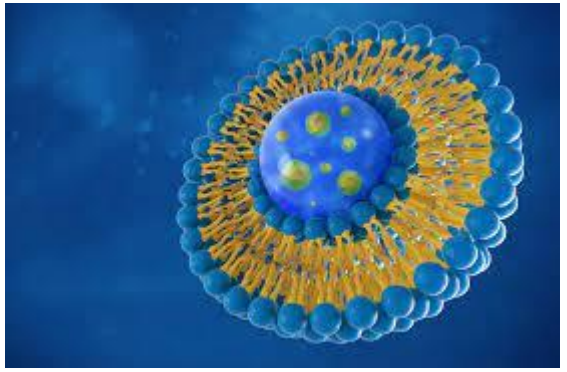
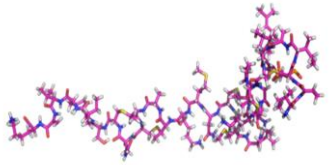
Antimicrobial peptides for food preservation



microencapsulation



Bacteriocins are antimicrobial peptides produced by bacteria that kill/inhibit other microorganisms

Active packaging

Lactic acid bacteria

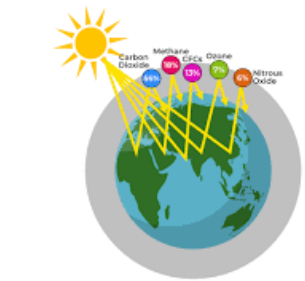
Large scale fermentation

Extended shelf-life

Reducing/Valorizing food waste

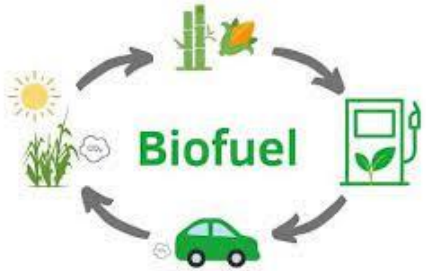
Over a third of all food produced globally (~2.5 billion tons) is lost or wasted each year.

Land fills



Waste Valorisation

Useful bioproducts



Food Waste Valourisation

Beer

Coffee Products

Chocolate

Food industry

By product/ Food waste

- Damage environment
- Huge waste of money/Energy

Phenolic compounds
Catechin
Amino acid
Carotenoids
Flavonoids
Vitamin B6, B12, E and C
Alpha acid

+ Fibre/protein

- Environmentally friendly methods
- Shorter operating times
- High yield and quality of extracts

Reduces cost

Food recycling

Sustainability

Natural food additives

Functional food

Wheat

Cocoa beans

Coffee beans

Food production

Conclusion

- In conclusion, HeTa is actively addressing critical environmental issues by implementing innovative solutions to food and agricultural processes.
- Our efforts directly target key concerns such as food waste, water pollution, climate change, and resource conservation.
- Through the production of bacteriocins from lactic acid bacteria, algae-based flour formulations, bioremediation of heavy metals and reducing/valorising food waste, we are taking tangible steps towards mitigating these environmental challenges.
- By prioritizing sustainable practices and optimizing resource usage, we aim to contribute to a more environmentally friendly and sustainable future, safeguarding ecosystems, reducing pollution, and promoting a healthier planet for generations to come.

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THANK YOU

Additional Information:
https://www.birmingham.ac.uk/postgraduate/courses/taught/chemical-engineering/food-safety-hygiene.aspx

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