



Utilization of glycerol for mixotrophic growth and lipid (oil) accumulation in microalgae

Presentation By

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- Prof. Peter Scales
- Prof. Paul Webley

Post-Doc Researchers

- Dr. David Hill
- Dr. Ronald Halim

Research Students

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- Qi Zheng
- Sam Law

Group's Research Interests

- Algal Cell Physiology and Rupture
- Extraction and Biomass Processing
 - Algal Lipidomics

Presentation Overview

- **Background**
- **Project Context**
- **Objectives**
- **Preliminary Results**

Microalgae as feedstock

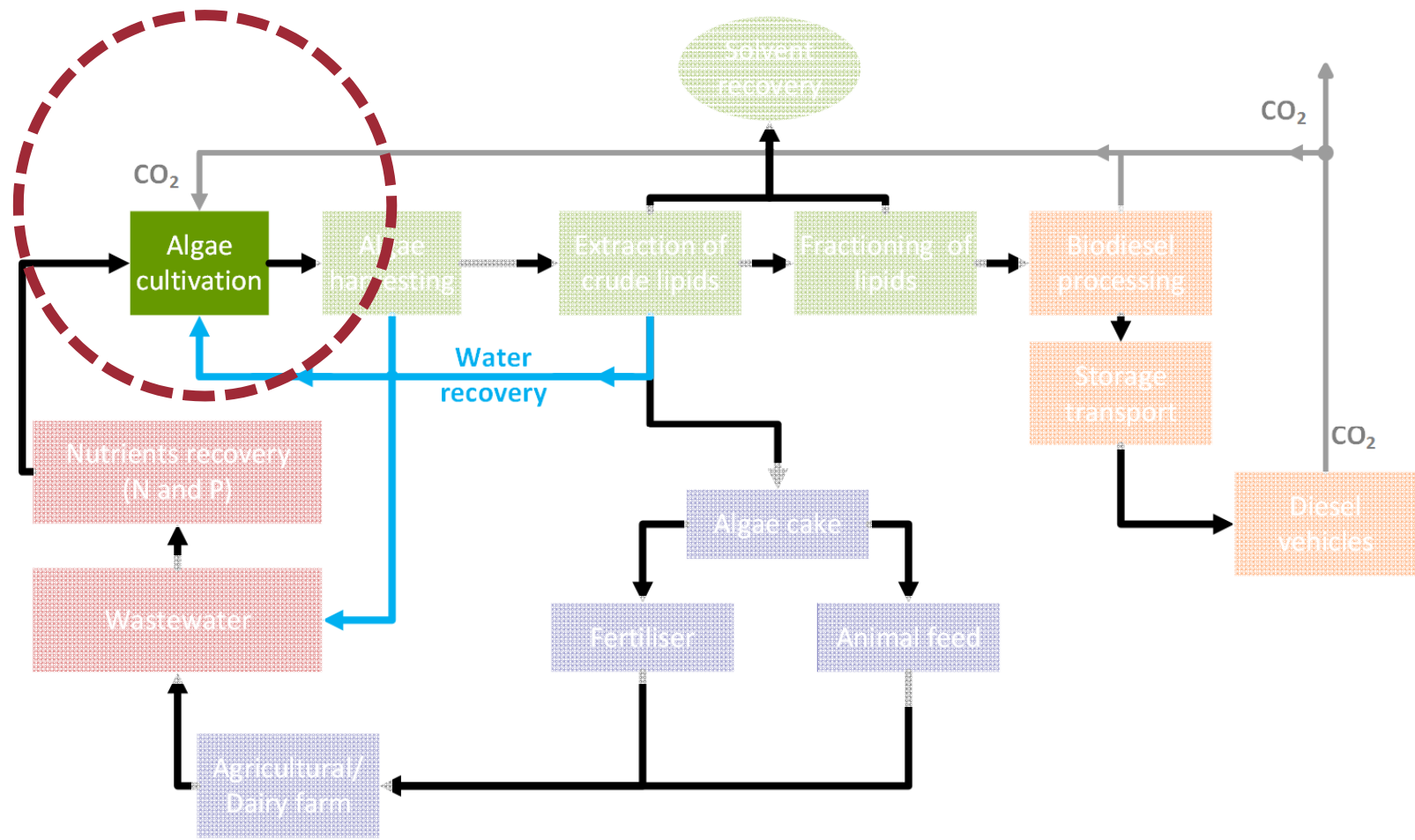
- Non-food based feedstock
- Can grow in brackish/saline/wastewater
- Diverse metabolic capabilities
- Mitigates excessive CO₂ emissions
- Accumulates metabolites (carotenoids, lipids)



Hurdles in scaling up

- High energy requirements
 - Low lipid yield
 - Contamination

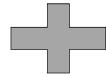
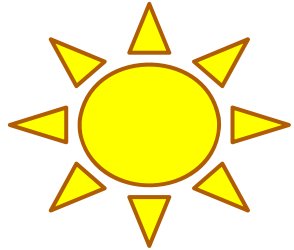
Algal Industrial Processing



Algae Cultivation

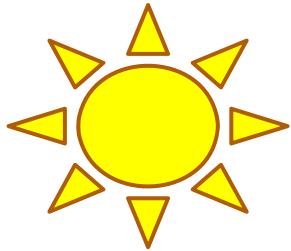
Approach

1. Autotrophic



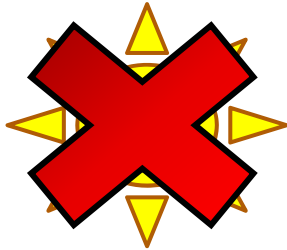
Inorganic Carbon (Atm.CO₂)

2. Mixotrophic



Inorganic and Organic (Glycerol)
Carbon

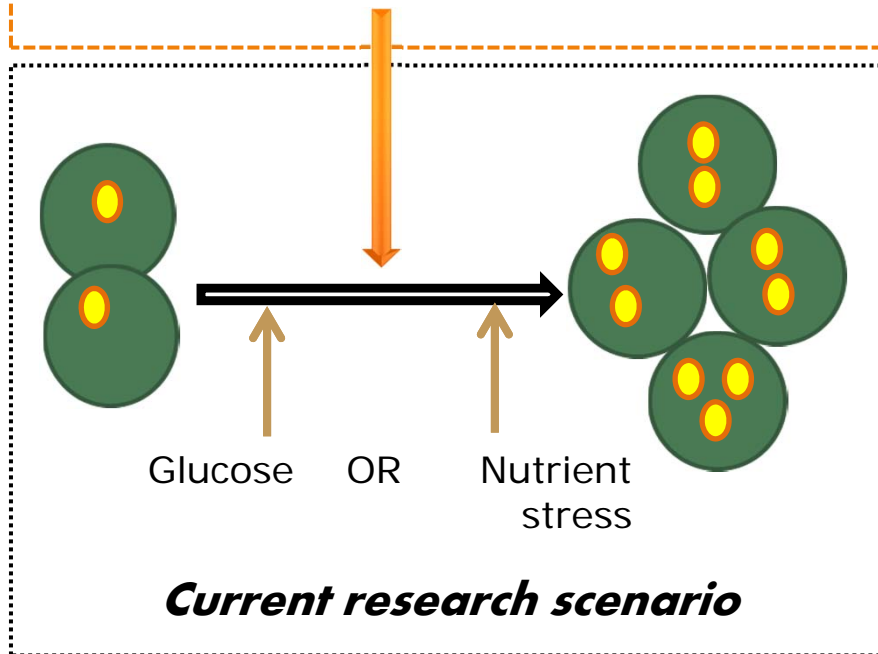
3. Heterotrophic



Organic (Glycerol) Carbon

Project Concern

Glycerol AND Nutrient stress



Utilization Of Glycerol Under Nitrogen Stress

(R.Q-1) Will glycerol help enhancing microalgal lipid yield?

(R.Q-2) Will it increase lipid yield even better under stress?

Three selected microalgae strains

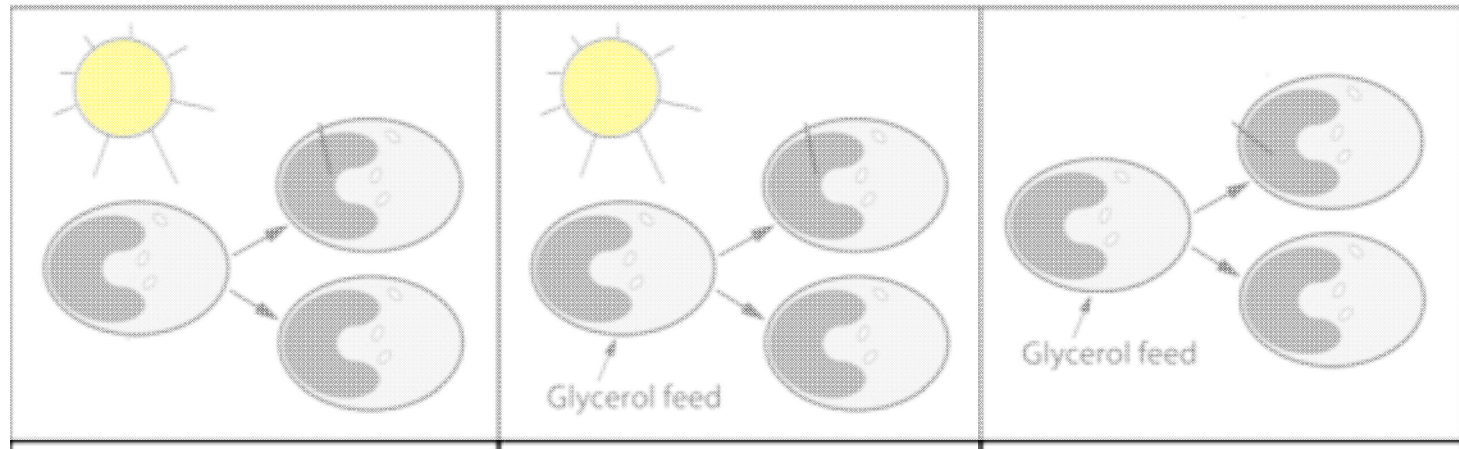
- ✓ *Haematococcus* sp.
- ✓ *Chlorella* sp.
- ✓ *Nannochloropsis* sp.

Autotrophic

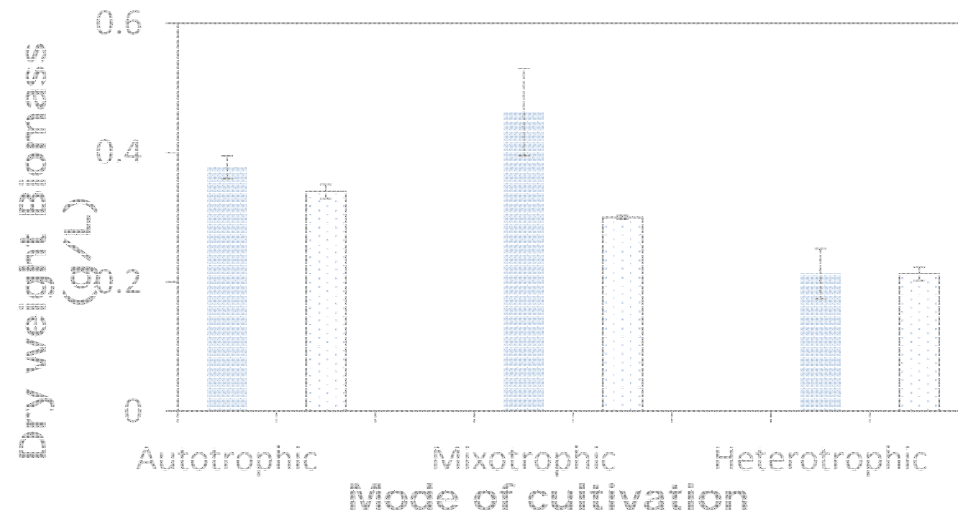
Mixotrophic

Heterotrophic

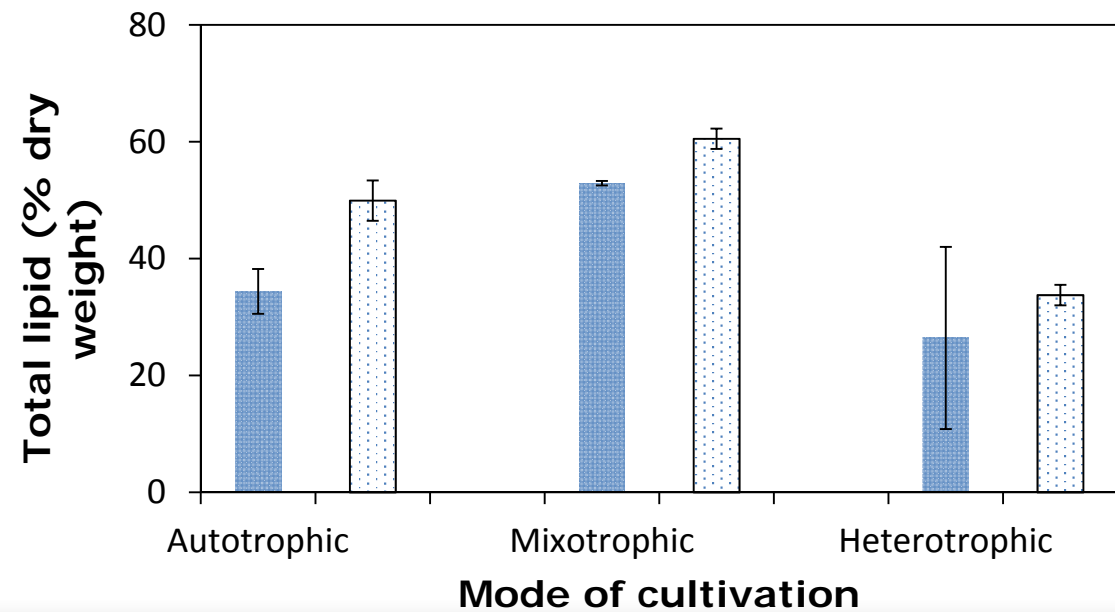
Nitrogen
replete



1. *Nannochloropsis* sp.*



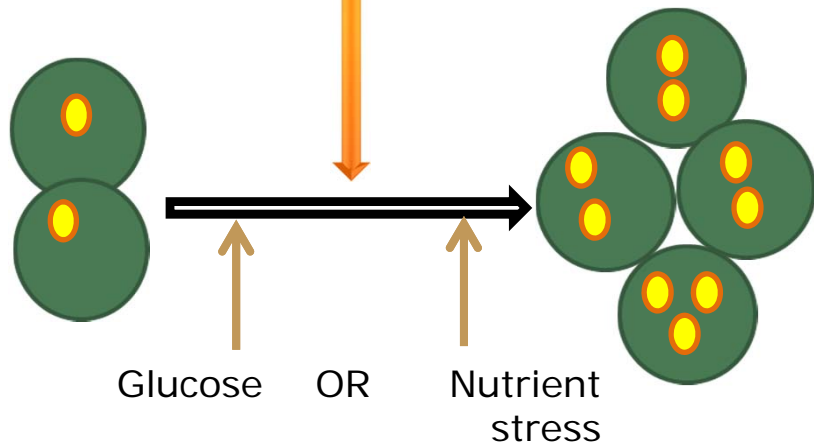
■ N-replete
▨ N-deplete



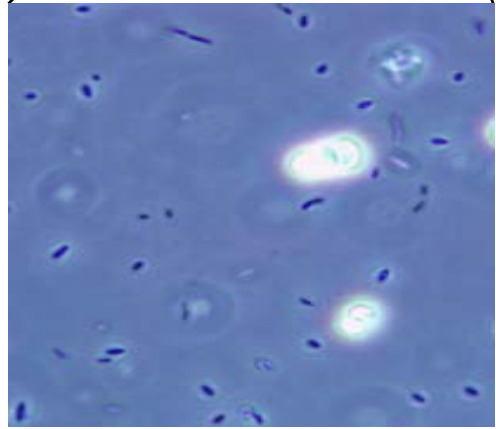
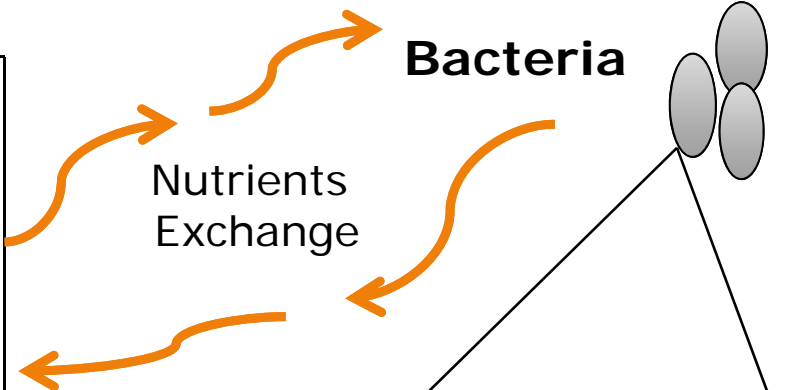
Project Context

Project Concern

Glycerol AND Nutrient stress



Current research scenario



Analysis Of Algal Growth In A Co-culture

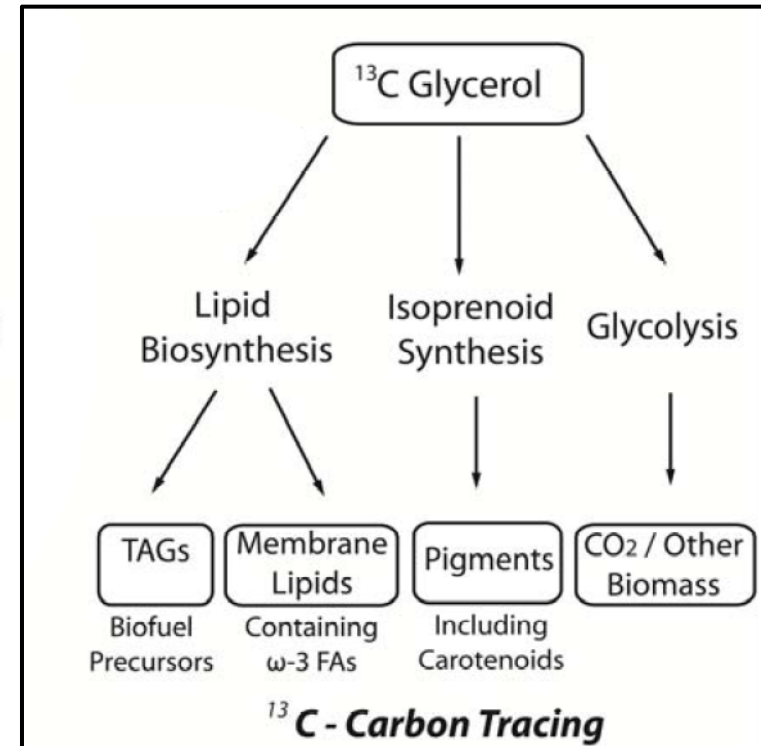
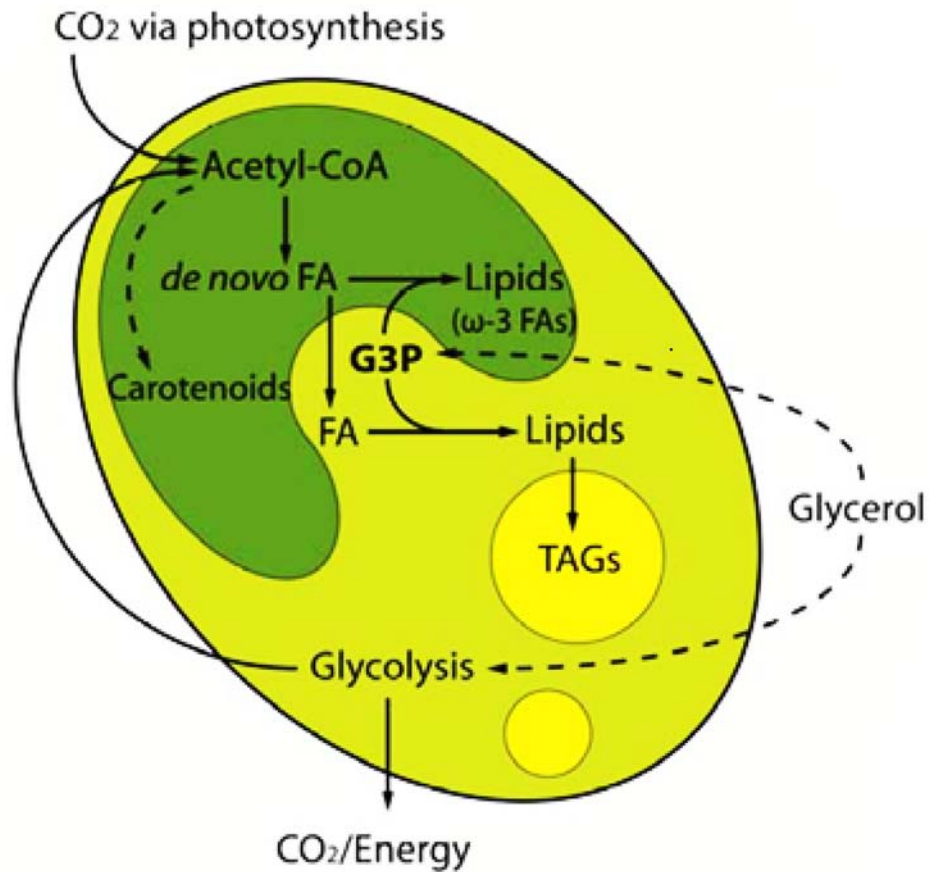
(R.Q-3) What are the effects of bacteria on selected microalgae?

(R.Q-4) Will microalgae perform better in a co-culture?

Possible Outcomes

- ✓ **Increased growth and lipids** (Algae and growth associated bacteria)
- ✓ **Low-cost cultivation media** (Reduces cost of external nutrients)

Metabolic Analysis Of Glycerol Utilization



(O.1) Utilization Of Glycerol Under Nitrogen Stress

(O.2) Analysis Of Algal Growth In A Co-culture

(O.3) Metabolic Analysis Of Glycerol Utilization

Acknowledgement

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- Lab colleagues

THANK YOU