'Milking' algal cells proves efficient alternative

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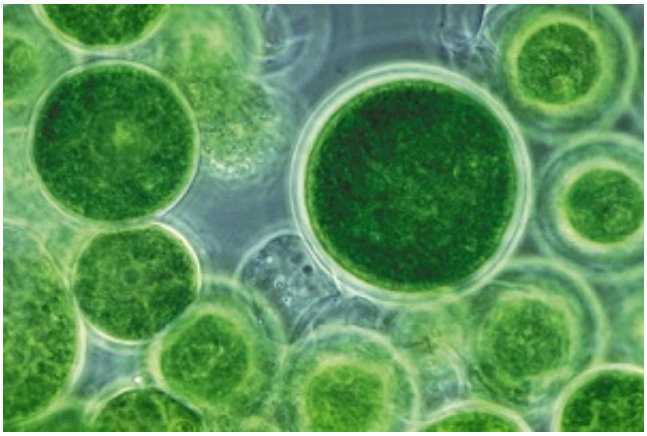

No extra fertilisers were added while cells were being repeatedly milked during that period of time. Credit: Learn 2 Teach, Teach 2 Learn

Biofuel researchers have dramatically improved microalgae hydrocarbon productivity by using non-destructive extraction, akin to 'milking' algal cells as opposed to the conventional harvest and destruction.

The algae species *Bortyococcus braunii* is known for its oil production however its slow growth rate for a conventional growth/harvest has made it unattractive for commercial production.

Murdoch University School of Veterinary and Life Sciences Algae R&D Centre researcher Dr Navid Moheimani and his team, in collaboration with the University of Tsukuba (Japan) have been investigating a non-

destructive approach rendering the algae to be 'milked' and 'remilked' every five days.

By using a compatible solvent (n-heptane) they were able to extract oil from non-growing state algae repeatedly—producing significantly more hydrocarbon (oil) and requiring significantly less expensive nutrients (as opposed to rapid growth phase).

Dr Moheimani says B. braunii could replace its external hydrocarbon after five days [after milking] in cultures with one per cent CO_2 addition.

"The overall external hydrocarbon productivity using non-destructive extraction was at least 20 per cent higher compared with B. braunii grown in conventional semi-continuous culture," he says.

The efficiency comes from having not to regrow the algae after each extraction saving on fertiliser usage and waste biomass disposal costs.

"So far we have shown that at least two species of Botryococcus braunii can be milked," he says.

"We have also found that at least of one of these species can repeatedly be milked for over 70 days."

No extra fertilisers were added while cells were being repeatedly milked during that period of time.

"It should be noted that, when B. braunii was grown semicontinuously [conventional method], the total lipid was over 52 per cent higher than the external hydrocarbon extracted by milking," Dr Moheimani says.

However, no nutrient addition is required during repeated hydrocarbon

extraction by milking whereas, in order to maintain the semicontinuous culture, it is.

This new method is compared to conventional biofuel production which requires large quantities of fertilisers followed by harvesting, dewatering, and conversion of wet biomass to the required biofuel at a 30 per cent dry biomass to oil.

"It is possible that the cells eventually do become critically nutrient limited and require addition of a limited amount of specific nutrients to stabilise the culture, and this is the topic of ongoing work," he says.

Dr Moheimani and the research team are currently working with Prof Bahri and Dr de Boer from School of engineering at Murdoch University on a potential continuous milking bioreactor reactor.

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