Manchester joins the Carbon Trust in global race to commercialise algae biofuels

The Carbon Trust has announced plans to take on the world in the global race to develop a sustainable, cost-effective biofuel from algae. *See website for full details*

The "dream team", comprising eleven leading UK institutions, was unveiled by the Carbon Trust and is tasked with finding a winning formula for cultivating 70 billion litres of algae biofuel a year by 2030. This will be the equivalent to 6% of global road transport diesel and a saving of over 160 million tonnes of CO_2 every year. The twelve research teams were selected from over 80 initial proposals following an extensive competition and detailed assessment process. The Carbon Trust is investing £8 million over 3 years into the projects using funding from the Department for Transport (DfT) and the Department for Energy and Climate Change (DECC).

Starting from first principles of agriculture, thousands of strains of algae will be screened to find the winning few that can produce large quantities of a substance similar to vegetable oil. Additional research will develop methods for enabling large-scale production in algae ponds and next year the Carbon Trust plans to start construction of a pilot demonstration plant in an equatorial region where algae are most productive. Algae has the potential to deliver 5 to 10 times more oil per hectare than conventional cropland biofuels and new Carbon Trust lifecycle analysis indicates that, over time, it could provide carbon savings of up to 80% compared to fossil fuel petrol and jet fuel

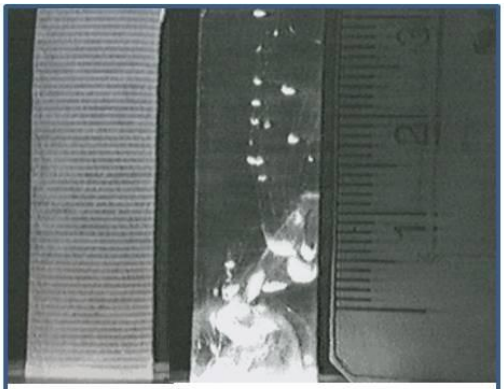
The two Manchester projects are:

Project 1 - **Nutrient optimisation for high lipid yield and productivity - Jon Pittman, Andrew Dean** and **Roy Goodacre**

This project will assess algal culture conditions that give maximal cellular lipid content whilst maintaining a high cell density. Metabolic and gene expression profiling of the algae will be performed to help us understand the molecular mechanisms of lipid induction. The project will also examine the use of these profiles as biomarkers for the screening of algal strains for high lipid productivity traits and for determining the optimal growth stage for lipid extraction. The cell growth and triacylglycerol (TAG) production will be optimised by Andrew Dean in Jon Pittman's lab (Michael Smith Building), and they will perform gene expression analysis. Metabolite analysis will be performed in Roy Goodacre's lab (MIB).

Project 2 - **Ultrasonic extraction of biofuel precursors from single cell algae - Jeremy Hawkes, Peter Fielden, Bernard Treves Brown** and **Jeff Prest,** MIB with Steve Wilkinson, Chemical Engineering, Sheffield

The second project aims to reduce the cost of biomass separation from dilute algal cell suspensions. Standard cell separation techniques such as continuous centrifugation consume more energy than the energy value of the biodiesel product. This project proposes ultrasound filtration as a technology with much smaller power requirements since energy is focussed selectively, moving cells and not the surrounding medium. In addition, ultrasound technology provides a low power, tuneable means of disrupting cells and extracting oil. Integration of this technology into the overall algal biodiesel process will also be addressed by an experimental investigation of key growth parameters and computational modelling.



Cells forced into bands by an ultrasonic standing wave sediment rapidly when the sound is switched off