The NDC-Chatfield project is entitled “The Effect of Microgravity on Two Strains of Biofuel Producing Algae with Implications for the Production of Renewable Fuels in Space Based Applications.”  The investigators hope to establish the viability of using these algae for the production of biofuels in space.

The first algae being studied is *Chlamydomonas reinhardtii*, a strain which produces hydrogen when deprived of sulfur. The investigators hope to establish the viability of algal hydrogen production in space, and specifically, to determine if algae removed from the gravitational influence of the Earth will still produce hydrogen in a sulfur deprived environment. In addition they hope to demonstrate that the lack of gravitational influences will reduce or remove the necessity of agitation for the solution.  The experiment is based on work done by scientists at NREL who are studying a special strain of algae for their ability to produce hydrogen. The proposed method would utilize the sulfate-limited system reported by Alexander S. Fedorov, Sergey Kosourov, Maria L. Ghirardi and Michael Seibert. Using this system, they demonstrated that continuous hydrogen production was possible for 4000 hours in a closed system.

The second algae being studied is *Chlorella vulgaris*, a strain that accumulates intracellular lipids when deprived of nitrate. With this strain, the investigators hope to show that lipid production and storage within the algal cells still occurs in a microgravity environment. The lack of agitation will be especially significant for the chlorella, as they are non-motile; giving a picture of cellular distribution for a species that is completely at the mercy of gravitational and fluid forces. This part of the experiment is also based on work done by scientists at NREL, who are working to characterize the ability of this strain of algae to produce lipids that can be used for the production of biofuels.

The NDC-Chatfield project will adapt each system to demonstrate the survivability of the algae on the long trip to orbit, and demonstrate that small-scale production in space is possible using each biochemical pathway.

*Current Progress*

*Chlamydomonas reinhardtii*: We are working to get the algae to produce hydrogen consistently and to understand the variables that affect this production. We have currently produced hydrogen on a small scale and are working on a procedure that will delay the onset of hydrogen production until we get to the ISS. If successful, the delay will ensure that any hydrogen produced, will be generated in space. We are planning to use hydrogen tape, developed by HySense in Florida to give us visual verification of the presence of hydrogen. This tape changes color in the presence of hydrogen.

*Chlorella vulgaris*: We are working to understand the timeframe for the storage of lipids within the cells, so that we can confirm that the algae also store lipids while in space. We are experimenting with different concentrations of nitrate within our bioreactor to determine the ideal concentration for the trip to the station. At this time we plan to monitor the process using pictures taken during our time on station. We are also working to develop a method that would allow us to more closely monitor the state of lipid production within the cells. To do this we hope to use a color sensor within our bioreactor to give us real time data of the state of the algae. This is a new and novel approach that will require extensive investigation before it can be employed.