

Day 6 - Fuel

Project: iGEM 2018

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Right now, solar power is the source of fuel for the Mars rover, and will likely be utilized as we colonize the red planet, however, we will need a renewable energy source to utilize for travel and potentially sending ships back to Earth.

Brocadia anammoxidans (Anammox bacteria) survive with no oxygen and use nitrogen and ammonia (found naturally in human waste) to produce energy. These bacteria are the only known producers of hydrazine, or rocket fuel. It is used in sewage treatment effectively, however isn't used to produce large quantities of rocket fuel because the fuel is kept in organelles and is used by the cell. To harvest it we have to lyse the cells and purify the results. We could use bioengineering to increase the production rate of these fuel but we would have to always lyse the cells

(note there is an organelle in this prokaryote despite the typical rule against it).

<http://engr.utexas.edu/features/7749-alper-yeast-cells-biofuel>

https://news.nationalgeographic.com/news/2005/11/1109_051109_rocketfuel.html

Activities

K-5

This could be a good chance to talk about the structure of cells and the functions of each structure. I like the Dessert Cells activities but it often hinders actual understanding because students are distracted by the sweets. Using felts to let students add and remove organelles (in Eukaryotes) and then talking about what that would mean for the cell can be fun (best for older students) With bacteria cels, giving student flagella to attach, 1, 2 or many flagella for movement. Not super related to the lesson at hand.

6-12

Design a space ship with a "self-refilling" fuel tank. How many compartments would be needed? How frequently would liquid shift from one tank to another. What fuel sources could be stable? How does fuel stability shift on Earth vs. In space vs. on Mars

An opportunity to talk about the limitations of SynBio, we can't get the bacteria to excrete something that it has contained in a organelle (yes, organelle - this bacteria does in fact have an organelle equivalent).