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A proteomic approach to optimizing gas fermentation in industrially relevant acetogens

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Fossil fuel supplies are running out and in order to maintain our current energy usage, including our transport systems, we must find alternatives. The use of fossil fuels also raises many environmental concerns such as pollution and increasing greenhouse gas emissions leading to climate change. One solution to these problems is the development of sustainable and renewable biofuels to take over from fossil fuels and power our cities and transport networks. Much research is currently taking place in an effort to develop biofuels that are cheap and effective, however much of the focus has been on growing plant crops for energy generation. In a world where many are starving, this strategy has the disadvantage of competing with farmland currently used for growing food crops and diverting food, such as sugars, away from feeding the population and towards energy production. Another approach is to use bacteria, certain strains of which are able to naturally produce fuels such as ethanol, although many of these also rely on feedstocks such as sugar to grow. Alternatively there is a small group of bacteria that are able to grow on waste gases, including the greenhouse gas carbon dioxide and the poisonous gas carbon monoxide instead of sugars. These bacteria can take up the gases and convert them into many useful biofuels, effectively removing these harmful gases from the environment whilst making highly beneficial products for us.

Our project aims to investigate the potential of two of these types of bacteria to make very important biofuels. We want to test different growth conditions for the bacteria, by changing the types and amount of gas we feed them, to understand which mixes will improve the amount of biofuels that the bacteria make. We will also test whether one of these types of bacteria is naturally better at making a particular biofuel than the other to make sure that we are working with the best bacterial species to produce the largest amount of biofuel.