Bioconversion

with Professor Esteban Marcellin, Professor Chris Greening and Dr Leonie van 't Hag

Talking *points*

Knowledge

1. What is bioconversion?
2. What is gas fermentation?

Comprehension

3. What societal challenges are addressed by the work of the RECARB Hub?
4. How are Esteban, Chris and Leonie using synthetic biology to meet their aims?

Application

5. To what extent do you think gas fermentation technology has the potential to significantly reduce the amount of greenhouse gas in the atmosphere, and why?
6. What does Leonie mean when she describes the team's work as taking an 'integrative approach'?

Analysis

7. What do you think are the advantages and disadvantages of gas fermentation, tree planting and direct air capture as ways to remove greenhouse gases from the atmosphere?
8. "Most people think of microbes only as pathogens, but the vast majority are beneficial and essential to life on Earth," says Chris. Why do you think microbes are less-recognised than other organisms for their important role in sustaining healthy ecosystems?

Evaluation

9. Some people are concerned that synthetic biology research could lead to 'super microbes' that might cause harm to the environment or to humans. How might institutions mitigate these concerns?
10. Can you imagine a future where we receive all our food from microbial bioconversion products? Do you think such a future is probable or possible – why or why not?

Activity

Imagine you are part of Esteban, Chris and Leonie's team at the RECARB Hub. You have been tasked with pitching your work to a group of stakeholders from one of the following industries:

- Food
- Feedstock (food for livestock)
- Aviation
- Energy
- Chemicals
- Plastics

Design a pitch that showcases the team's bioconversion techniques. Within your presentation, make sure to:

- Explain the underlying science in an appropriate level of detail, using information from the article and your own research.
- Explain how the team's bioconversion techniques can:
  - Mitigate climate change
  - Alleviate resource scarcity
  - Benefit the industry that you are pitching to
- Anticipate and address any concerns about safety or viability
- Explain why you seek the participation/investment of your chosen industry.

Present your pitch to your class or a smaller group within your class. Answer any questions they may have and listen to their feedback. Watch the other pitches and reflect on the activity. How effectively did you communicate the benefits of bioconversion? How well did you respond to questions and feedback? How could you have explained the science more clearly?

More *resources*

- The RECARB Hub website introduces the diverse projects and teams within the group, and shares the latest news and developments: **recarbhub.org**

- This video from the ARC Centre of Excellence in Synthetic Biology gives a quick animated introduction to gas fermentation: **youtube.com/watch?v=xMd6jNkCN4k**

- This article from *Science* explores the establishment of a new group for the conservation of microbes, and also touches on the role of biotechnological principles such as synthetic biology within conservation: **science.org/content/article/publicity-problem-new-group-pushes-microbes-be-conserved-other-endangered-species**