

Resources for Exploring Cellular Agriculture with Middle and High School Students (Resource Exchange)

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FREE RESOURCES!




CELLULAR AGRICULTURE

Discussion
Guide 1

Consequences
& Impacts

V1.0
5/2023

Funded by
USDA NIFA project (#2021-69012-35978)

 **USDA** National Institute for Cellular
Agriculture at Tufts University

EXPLORING CELLULAR AGRICULTURE WITH MIDDLE AND HIGH SCHOOL STUDENTS

The growing global demand for protein and the environmental impact of traditional farming are fueling interest in cellular agriculture—growing food from cells using bioreactors. This innovative field blends engineering, nutrition, animal science, and ethics, offering a rich platform for pre-college STEM exploration.

Tufts University is advancing research in growth methods, media, scaffolding, and consumer acceptance, while also leading educational outreach. The project has created three free activity guides for middle and high school students that promote hands-on learning and discussion around the science, ethics, and sensory aspects of cellular agriculture.

**80–100
MINUTE
LESSONS**

**GRADES
7–12**

Tufts
UNIVERSITY

School of Engineering
Center for Engineering
Education and Outreach


ACTIVITY GUIDES

HELP VS HARM

Research and
consequence mapping

10 MINUTES

IMPACTS

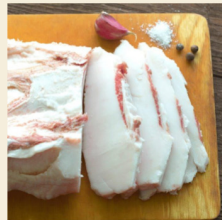


Students will deliberate and create a list of the impacts that their "characters" may face due to cellular agriculture and then participate in another class share-out led by the instructor.

Using Google Jamboard, students will answer the following question:
How are stakeholders being/going to be impacted by cellular agriculture?

In this part of the impact analysis, the instructor will have each group of students brainstorm the ways in which the characters they listed earlier may be affected by this new technology. Students can either focus on a single character or they can brainstorm impacts for numerous characters. When thinking of impacts for multiple characters, some students have organized impacts based on the character as seen in the example below.

How to Engineer Texture



- Native fat has ECM
- Solid structure



- Cultured fat missing binder
- Mushy and sad

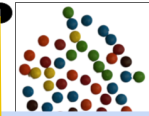
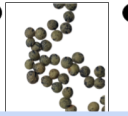
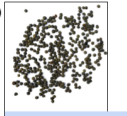
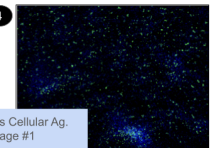
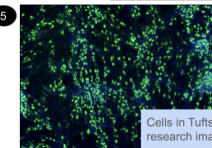
SENSORY ANALYSIS

Taste Engineering

WHICH LINE IS IT?

Image processing
and analysis

Skill progression

- 
MMs in a multi color mix
- 
Beans clumped small number
- 
Beans clumped large number
- 
Cells in Tufts Cellular Ag. research image #1
- 
Cells in Tufts Cellular Ag. research image #2

LEARNING GOALS

- Engineering and technology ethical considerations
- Sociotechnical impacts of cellular agriculture innovations
- Create claims and context from various media sources
- Consider multiple solutions (NGSS K-2-ETS 1-2)
- Frame the problem (NGSS K-2-ETS 1-1)
- Weigh and choose criteria and constraints for their design (NGSS K-2-ETS1-2)
- Understand their client to meet their needs (NGSS K-2-ETS1-2)
- Communicate ideas and thinking to partners, groups, and outside audiences (SL 1.1D, 2.1D, 1.4, 2.4, 1.6, 2.6; NGSS K-2-ETS1-2)

FREE DOWNLOAD!



sites.tufts.edu/CellAgOutreach