

CASE TEACHING NOTES

for

“Certified Cultured Beef: Raising Beef Without the Cow?”

by
Bryan Hains*, Dawn Hains†, and Mark Balschweid‡
Youth Development and Agricultural Education
Purdue University

INTRODUCTION / BACKGROUND

This case study introduces students to concepts and techniques in modern biotechnology as well as the possible implications of this emerging science by posing the possibility of *in vitro* cultured meat. As such, the case is intended to encourage students to think critically about biotechnology in order to further an understanding of the technology—its potential, its limitations, and its possible social, economic, and environmental impacts. While some scientists at NASA and the University of Maryland have experimented with growing *in vitro* meat in laboratories, no meat has been produced yet for public consumption.

In the case, students are introduced to Jeff Rodriguez, a graduate student with an undergraduate degree in animal science and a family that raises cattle for a living. Jeff has asked fellow graduate student Samantha out on a date. They go to a local steakhouse for dinner, where they are offered the “house specialty,” certified cultured beef. Both are incredulous at first, then wary. They decide to forgo the cultured beef. Later in the evening, driven by curiosity, Jeff telephones an old college friend now working for the U.S. Department of Agriculture who explains the techniques involved.

The case was developed for a diverse student population. Intended primarily for use in a college-level meat science, food science, or human nutrition course, the case could also be used in environmental science, agribusiness, agriculture law and policy, biomedical, animal philosophy/well-being, and high school advanced placement food science courses. Since it was designed for diverse purposes, there is no specific time frame given for completing it. The references included at the end of the notes list articles and websites for students and instructors. Instructors may assign readings at their discretion given the level of students’ knowledge of the subject matter.

Students involved in this case study should have a substantial background in the biological sciences, especially in the areas of muscle tissue and vascular tissue development. Prior to being given the case, students should receive a basic understanding of traditional livestock practices from conception to harvest and their economic, environmental, and social impacts.

The case consists of two parts that focus on two areas regarding the technologies of *in vitro* meat production. Part I focuses students’ attention on the social, environmental, and economic impacts of the culturing of meat, while assessing students’ current knowledge base and encouraging critical thinking. Part II focuses on the scientific processes of culturing meat and asks students to evaluate possible complications that might arise during the scientific process.

Objectives

In completing this case, students will:

- explore the pros and cons of *in vitro* cultured meat and its human consumption.

- learn about two different methods for culturing meat in a scientific laboratory.
- analyze these two methods in terms of which is the most beneficial to the food industry, which is most scientifically feasible, and which is most economically feasible.

CLASSROOM MANAGEMENT

Students should be divided into small groups of four or five and then given the case to read, in parts, and asked to discuss the questions, first in their groups and then as a class. In addition, as an optional follow-up assignment, students may be asked to develop a group research proposal to continue the research described in the case.

The case is intended to encourage both small group and whole class discussion. The questions are designed to spark discussion regarding the various aspects of cultured meat production. The first question opens the discussion by asking students to compare naturally raised beef with meat grown in a lab. The second question helps students to understand the global impact of cultured meat production. At this point, instructors may want to use an overhead projector or white board to write down student responses under the three categories “social,” “economic,” and “environmental” impacts.

The third and fourth questions assist the instructor to evaluate the student’s base knowledge. Many times students are unsure of their scientific knowledge and have more difficulty opening up and discussing possibilities of biotechnology. If there is a limited discussion, the instructor might ask questions regarding similar forms of biotechnology to help stimulate students’ thought processes.

The final set of questions, in Part II, requires that the instructor read the reference material before running the class discussion. It is important to understand both the benefits and limitations of the scaffolding and self-organizing meat culturing techniques, discussed in the Answer Key that accompanies this case.

It may be possible to give a quick presentation of the required lab equipment needed to culture meat at this time. Items used could include possible culture media, Petri dishes, and collagen mesh.

Finally, it is suggested that students work within their groups to identify the limitations to both forms of meat culturization. They then must choose the scientific process which they feel could be used in mass production. Using their cumulative scientific knowledge, students can participate in several activities, such as developing a research proposal, which involves identifying the scientific limitations and defining and describing their own culturing technique. If the students are asked to develop a research proposal, each group would be given the opportunity to present its proposal in class

ANSWER KEY

Answers to the questions posed in the case study are provided in a separate answer key to the case. Those answers are password-protected. To access the answers for this case, go to [the key](#). You will be prompted for a username and password. If you have not yet registered with us, you can see whether you are eligible for an account by reviewing our [password policy and then apply online](#) or write to answerkey@sciencecases.org.

REFERENCES

Anon. (1998, May). Americans and red meat: A love-hate relationship. *Harvard Health Letter* 23(7).
http://www.looksmarthowto.com/p/articles/mi_m1585/is_7_23/ai_50039388
Last accessed: April 14, 2006

Edelman, P.D, McFarland, D.C, Mironov, V.A., and Matheny, J.G. (2005) Commentary: *in vitro*-cultured meat production. *Tissue Engineering* 11: 659–662.

<http://www.hedweb.com/animimag/invitro-culturedmeat.pdf>

Last accessed: April 14, 2006

New Harvest—Advancing Meat Substitutes

<http://www.new-harvest.org/research.htm>

Last accessed: April 14, 2006

Sandhu, M.S., White, I.R., and McPherson, K. (2001, May). Systematic review of the prospective cohort studies on meat consumption and colorectal cancer risk: A meta-analytical approach. *Cancer Epidemiology Biomarkers & Prevention* 10(5): 439–446.

Ternes, E. (2005, July 6) Paper says edible meat can be grown in a lab on industrial scale.

<http://www.newsdesk.umd.edu/scitech/release.cfm?ArticleID=1098>

Last accessed: April 14, 2006

van Eelen, W.F., van Kooten, W.J., and Westerhof, W. (1999). Industrial scale production of meat from *in vitro* cell cultures. Patent w09931222.

Wolfson, W. (2002, December 21). Raising the steaks: Fancy a beefburger but want to spare the cow? Try growing meat in a lab dish. *New Scientist* 176, 60–63.

FURTHER READING

Books

Bourne, G. H. *The Structure and Function of Muscle*, 2nd ed. New York: Academic Press, 1973.

Ma, P.X., and Elisseff, J. *Scaffolding in Tissue Engineering*. Boca Raton, FL: Taylor & Francis, 2005.

Reports

Viola, J., Bhavya, L., and Oren, G. *The Emergence of Tissue Engineering as a Research Field*, Arlington, VA: National Science Foundation, 2003.

<http://www.nsf.gov/pubs/2004/nsf0450/start.htm>

Last accessed: 4/14/06

Additional Articles

Benjaminson, M.A., et al (2002). *In vitro* edible muscle protein production system (MPPS): Stage 1, fish. *Acta Astronautica* 51(12): 879–889.

Sample, I. (2002, March 20) Fish fillets grow in tank. *New Scientist*.

<http://www.newscientist.com/article/dn2066.html>

Last accessed: April 14, 2006

*Ph.D. Graduate Student, †Independent Educational Consultant, ‡Associate Professor

Acknowledgements: This case was developed with support from the National Science Foundation under CCLI Award #0341279. Any opinions, findings and conclusions or recommendations expressed in this material are those of the author(s) and do not necessarily reflect the views of the National Science Foundation.

Copyright © 2006 by the National Center for Case Study Teaching in Science.

Originally published 05/18/06 at http://www.sciencecases.org/cultured_beef/cultured_beef_notes.asp

Please see our [usage guidelines](#), which outline our policy concerning permissible reproduction of this work.