

## The Organic Food Controversy

**Do organic foods have more or less bacterial contamination than traditionally grown foods?**

### **PROJECT DESIGN:**

**Project overview:** Students will take a survey regarding their perceived benefits and risks associated with consuming organically grown food. They will research the controversy of organic food safety vs. traditionally grown food safety. They will be able to pose questions they have on this issue to real scientists. Based on their research, they will develop a hypothesis about this controversy, then design and conduct an experiment to compare the presence of *e. coli* bacteria in organic and traditionally-grown produce. They will take the survey again to ascertain whether their opinions have changed as a result of their research and experiment.

**Age and course appropriateness:** Primarily for grades 9-10 (Biology, Environmental Science) but can be adapted for application in grades 7-12.

**Student prior knowledge:** Students will most likely have an opinion about whether organically-grown or traditionally-grown produce is “safer” to eat. This project will require that they examine both sides of the issue, ask professional scientists questions they are unable to answer in their research, formulate an informed hypothesis based on their research, design and conduct an experiment to test their hypothesis, then analyze their results and draw conclusions. Students will address assumptions and questions they have about this issue several times during the course of the project in order to determine if their research and experimentation change those assumptions or change their position on the issue of organic food safety.

### **LEARNING GOALS:**

**NOTE:** This unit involves four activities: a pre-survey, a guided-inquiry Internet-based research activity, a guided-inquiry experiment, a post-survey and analysis of results. Either the research or the experiment could be eliminated if time or equipment or supplies are issues.

**Content Objectives:** The student will be able to:

- Define the terms bacteria, prokaryote, pathogen and *E. coli*
- Differentiate between organic farming and traditional farming
- Collaboratively test their predictions regarding the presence or absence of *E. coli* in organically and traditionally grown foods
- Describe the effect of human activity on food safety
- Evaluate the validity of claims regarding benefits/risks of organic foods
- Become familiar with several careers in food safety, plant production and pathology

**Process skills objectives:** The student will be able to:

- Develop or improve Internet research skills
- Using the larger scientific community as a resource
- Developing and reflecting on opinions
- Becoming well-informed on both sides of a controversial issue
- Hypothesis development and justification
- Plan and implement appropriate experimental design
- Data collection and graphing
- Identify possible sources of experimental error or uncontrolled results
- Organize, analyze, make inferences and evaluate data
- State valid conclusions using logic and evidence
- Communicate conclusions
- Evaluate promotional claims
- Use safe practices during laboratory investigations
- Compare perceptions identified by survey to observations made by experimentation
- Develop abstract writing skills
- Develop persuasive letter writing skills

**National Science Education Standards addressed:**

- Teaching Standard A: Plan an inquiry-based program, including selecting content and adapting/designing curricula to meet student interests, knowledge, understanding, abilities and experiences
- Teaching Standard B: Guide and facilitate learning, including focusing and supporting inquiries while interacting with students and challenging students to accept and share responsibility for their own

- learning; encourage and model the skills of scientific inquiry (including curiosity, openness to new ideas and skepticism)
- Teaching Standard D: Provide students with time, space and resources for learning science so that students are able to engage in extended investigations, create a setting that is flexible and supportive of science inquiry, ensure a safe working environment, make available tools, materials, media and technological resources to students, and identify and use resources outside the school
  - Teaching Standard E: Develop communities of science learners by nurturing collaboration, facilitating ongoing discussion and modeling the skills, attitudes and values of scientific inquiry

Content Standards for Grades 9-12:

- A: Students should develop abilities necessary to do scientific inquiry and understandings about scientific inquiry
- C: All students should develop understanding of the interdependence of organisms
- F: All students should develop understanding of personal and community health, of science and technology in local, national and global challenges
- G: All students should develop understanding of science as a human endeavor, nature of scientific knowledge