Examining Growth Hormones in Beef*

Skill Level:
- Advanced

Life Skills:
- Communication, critical thinking and decision-making

Setting:
- A space with enough light for reading and a hard surface to set four jars on; no seating or tables required.

Time:
- 15–20 minutes

Materials:
- ❑ "Feedstuffs FoodLink: The Facts About Growth Promotants" article (one per participant)
- ❑ 42 oz. bag of hard-shelled chocolate candy (such as M&Ms or Reese's Pieces)
- ❑ Four 1 quart-sized canning jars with lids and rings
- ❑ Thin-tip permanent marker
- ❑ Four self-adhesive labels or four index cards (optional)
- ❑ Pens or pencils (one per participant)
- ❑ Notebook or scrap paper (one sheet per participant)

*This lesson was inspired by an activity idea from Joan Ruskamp of Dodge, Nebraska.

Overview:
The *Examining Growth Hormones in Beef* lesson is designed to add a visual component to written words. Participants will learn about consumers' concern about growth hormones used in beef production and then read an article about the issue. After reading the article, participants will share facts from it and interpret their understanding of the information by answering a series of questions. Canning jars filled with varying numbers of candies will help provide a visual component to aid in reading comprehension.

Objective:
After completing this activity, participants will be able to interpret data and prepare appropriate responses to common food production misconceptions.

PROCEDURE:

Before the meeting:

1. Review the activity, gather the supplies you will need and make one copy of the "Feedstuffs FoodLink: The Facts About Growth Promotants" article for each participant.
2. Clean and dry the canning jars, lids and rings.
3. Fill the jars with the candy in the following amounts:
   - **Jar 1:** Fill the jar to the top (about 1,010 candy pieces) to represent the amount of estrogen that's present in raw cabbage. Label this jar with "#1: Full jar = the 2,700 nanograms of estrogen in 4 ounces of raw cabbage."
   - **Jar 2:** Put 170 pieces of candy in the jar to represent the amount of estrogen that's present in raw peas. Label this jar with "#2: 170 pieces of candy = the 454 nanograms of estrogen in 4 ounces of raw peas."
   - **Jar 3:** Put 113 pieces of candy in the jar to represent the amount of estrogen that's present in potatoes. Label this jar with "#3: 113 pieces of candy = the 300 nanograms of estrogen in a 4-ounce potato."
   - **Jar 4:** Cut one piece of candy in half (or as close to equal pieces as you can) and place in jar. Label this jar with "#4: 0.5 pieces of candy = the 1.6 nanograms of estrogen in 4 ounces of beef."

TALKING IT OVER:

Ask the group the following questions.

- What is a nanogram?
- Is estrogen naturally found in the human body?
- What is the difference between natural and synthetic hormones?
- Why are people concerned about the amount of estrogen in their food?
- Is there a large difference in the amount of estrogen in beef that comes from a steer given hormones and beef that comes from an untreated steer? What about from a steer given hormones and from a heifer that isn't pregnant?
- Is there a difference in the efficiency with which implanted and nonimplanted cattle convert the feed they eat to meat? Which group is more efficient?
- Why do some beef producers choose to use growth promotants?
- What would you tell a friend who is concerned about what they've heard about the amount of estrogen found in beef?
- How could you explain to someone with no agricultural background that beef is a wholesome, safe product?
- Does this article show any biases? Please explain your answer.
- Why is knowing the author or publisher of an article important when you're reviewing and collecting information?

During the meeting:

1. Introduce the activity by reading aloud or paraphrasing the following information:

   In the news, on social media and in the grocery store, consumers are constantly bombarded with information about foods that are healthy and unhealthy. As a livestock producer, it's important for you to recognize that consumers have many misconceptions about livestock production practices and the benefits and dangers of meat consumption. Today we're going to read an article about the impact of the growth promotants that are used on cattle. Then we'll work together to visualize the data from the article using canning jars and candy, and answer some questions related to the article. At the end of the lesson, you'll know enough about growth promotants that you'll be able to help correct some consumer misconceptions about animal agriculture.

2. Set the four jars that you filled earlier in front of the group so that the labels don't show. Don't say anything as you do so. Then ask the group "What do you think these four jars could represent?"

3. After the guesses have slowed or stopped, explain to the group that they'll find out what the jars represent after they read an article called "Feedstuffs FoodLink: The Facts About Growth Promotants." Pass out the article, the paper, and the pens or pencils. Depending on the ages and reading skills of the audience, you may want to have the group (a) take turns reading aloud from the article, (b) read it individually or (c) read it in small groups. (**Note:** You could also choose to have the group read other articles. If you do, remember to adjust the "Talking It Over" (processing) questions accordingly.)

4. Once participants are done reading the article, have them write down four things they think are important from the article.

5. Have each participant share one of those facts with two other people.

6. Next point out the jars you filled before the meeting. If you labeled the jars, turn them around so the labels are facing the group, or simply explain to the group what each jar represents and how it ties into the content of the article.

7. If you don't plan to use the jars of candy to repeat the activity in the future, the candy could be the group snack for the meeting.

ALIGNMENT TO SCIENCE & ENGINEERING PRACTICES

How 4-H Increases Science Literacy

Nationally and in Michigan, 4-H has long enjoyed a reputation for engaging young people in positive, experiential (hands-on), and nonformal activities that are inquiry based. The activities in the *4-H Animal Science Anywhere* series can be used to enhance classroom science education. The activities are aligned with the eight Scientific and Engineering Practices from *A Framework for K–12 Science Education* (National Research Council, 2012, p. 42).

The activities in *4-H Animal Science Anywhere: Examining Growth Hormones in Beef* were evaluated for their alignment with the Science and Engineering practices by Michigan State University (MSU) Extension Educator Tracy D'Augustino in 2016.

Table 1. How This Lesson Aligns With the Science and Engineering Practices (National Research Council, 2012, p. 42)

Science & Engineering Practice	Action	Activity Step
▸ Asking questions and defining problems	Participants brainstorm what the jars might represent.	2
▸ Developing and using models	Participants view the jars used to model the amount of estrogen found in four common foods.	6
▸ Planning and carrying out investigations		
▸ Analyzing and interpreting data	Participants record four important items in the article provided.	4
▸ Using mathematics and computational thinking		
▸ Constructing explanations and designing solutions	Participants use the information provided to construct explanations and answers to questions during the "Talking It Over" discussion.	Talking It Over
▸ Engaging in argument from evidence	Participants discuss how to talk to peers concerned about what they have heard about growth hormones in beef.	Talking It Over
▸ Obtaining, evaluating, and communicating information	▸ Participants analyze and evaluate written information when they record four important items in the article provided. ▸ Participants communicate information as they discuss important ideas. ▸ Participants discuss the potential bias of article author.	4 5 Talking It Over

ADAPTATIONS & EXTENSIONS:

- Search for other articles that are relevant to current consumer concerns related to animal science and adapt the lesson to match the news story.
- Have participants read and compare two articles, looking specifically at the biases and the research backing the information presented in them.
- Have each participant bring an animal science news article to the meeting and work in small groups to read, analyze and then share what they've learned with the larger group. This allows the group to learn about a variety of topics in a short time.
- Use this lesson outline with other articles. Select an article of interest and find a way to help your group visualize its content using small, manageable items such as candy. Ask follow-up questions and reinforce the information presented in a whole-group discussion.

REFERENCES & RESOURCES:

Information about the article used in the lesson follows.

Feedstuffs FoodLink (2012). *The facts about growth promotants.* Retrieved from feedstuffsfoodlink.com/story-growth-promotants-75-71789 (Article reprinted with permission.)

The resources that follow can help you and your group increase your content knowledge.

Beef Cattle Research Council. (2013). *Explaining growth promotants used in feedlot cattle.* Calgary, Alberta, Canada: Author. Retrieved from www.beefresearch.ca/blog/growth-promotants/

Cattlemen's Beef Board and National Cattlemen's Beef Association. (2007). *Growth promotant use in cattle production*. Retrieved from www.explorebeef.org/CMDocs/ExploreBeef/FactSheet_GrowthPromotantUse.pdf

LaMacchia, E. (2013). *Update: Cattle growth promotants – New development unfolds* [blog post]. Austin, TX: Whole Foods Market. Retrieved from www.wholefoodsmarket.com/blog/update-cattle-growth-promotants---new-development-unfolds

National Research Council. (2012). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas*. Washington, DC: National Academies Press.

Parr, S. L. (2013, March 27). *Use of implants and carcass quality: National beef quality audit webinar* [video, 20:06]. Calgary, Alberta, Canada: Beef Cattle Research Council. Retrieved from http://www.youtube.com/watch?v=zQ6K1lI3Ci4&feature=share&list=UU-LxQaqJkk8CfRwBDsPxLiQ

Webster, H. W. (1989). *Growth promotants in cattle* [LL45]. Clemson, SC: Clemson University Cooperative Extension Service. Retrieved from http://virtual.clemson.edu/groups/psapublishing/Pages/ADVS/LL45.pdf

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Feedstuffs FoodLink

The Facts About Growth Promotants

U.S. farmers and ranchers are dedicated to supplying the safest, highest quality and most affordable sources of protein in the world. That is meat, milk and eggs produced in the most efficient way while taking care to ensure animal well-being and environmental sustainability.

America's cattle producers use growth promotants to safely produce more of the lean beef that consumers demand while using fewer resources such as land and feed.

Sometimes referred to as cattle growth hormones, these production technologies have been used for nearly 60 years to help cattle efficiently convert their feed into more lean muscle. Most growth promotants are used to supplement existing hormones or compensate for missing hormones in an animal's body.

The hormones in growth promotants are metabolized (broken down) by the animal's body before it goes to slaughter. Although these products vary in active ingredients and dose, they generally work by discouraging protein depletion and encouraging protein synthesis in cattle so they can gain more lean muscle from less feed. Improvements in cattle production technologies, including the use of growth promotants, have helped provide a growing population with the lean beef they demand while using fewer resources.

A University of Minnesota Extension Service study found that growth promotants improve cattle growth rates and feed conversion efficiency, increasing annual U.S. beef production by more than 700 million pounds while saving more than 6 billion pounds of feed. In addition, if the beef production practices from 1955 were used today, 165 million more acres of land – an area almost the size of Texas – still could not equal today's beef production according to an expert analysis. Growth promotant use in beef cattle typically improves lean tissue development by 8% to 20% compared to cattle that haven't been treated. The use of recombinant bovine growth hormone in dairy cattle can increase milk production by as much as 10% in a cow.

Growth promotants typically are administered through a small pellet (called an implant) that is placed under the skin on the back of an animal's ear, but some can be administered through the animal's feed. The hormones in growth-promoting implants include estrogens (estradiol and zeranol), androgens (testosterone and trenbolone acetate or TBA) and progestins (progesterone and melengestrol acetate or MGA).

It is important to recognize that many common foods naturally contain estrogen (or phytoestrogen in plants) at levels hundreds or thousands of times higher than the levels in dairy or beef products that come from animals given estrogen hormones.

Feedstuffs FoodLink, "The Facts About Growth Promotants." Continued

In addition, estrogen levels in dairy and beef products from treated animals are essentially the same as products from untreated animals.

- 4 oz. beef from a steer given hormones contains 1.6 nanograms of estrogen
- 4 oz. beef from an untreated steer contains 1.2 nanograms of estrogen
- 4 oz. of beef from a heifer that isn't pregnant contains 1.5 nanograms of estrogen
- 4 oz. of raw cabbage contains 2,700 nanograms of estrogen
- 4 oz. of raw peas contains 454 nanograms of estrogen
- 3 oz. of soy oil contains 168,000 nanograms of estrogen
- 3.5 oz. of soy protein concentrate contains 102,000 nanograms of estrogen
- 3 oz. of milk from a cow given rBST contains 11 nanograms of estrogen
- 3 oz. of milk from an untreated (non-BST) cow contains 11 nanograms of estrogen

Average level in a woman of childbearing age: 480,000 nanograms per day of estrogen

Average level in a pre-pubertal girl: 54,000 nanograms per day of estrogen

Average soy latte (one cup of soymilk): 30,000 nanograms of estrogen

The U.S. Food and Drug Administration (FDA) requires extensive toxicological testing to determine safe levels of hormone use in livestock. The agency also requires manufacturers to demonstrate that the amount of hormone left in each edible tissue after treatment is well below that known to be safe. Visit *www.fda.gov/animalveterinary/safetyhealth/productsafetyinformation/ucm055436.htm* for more information.

In addition to the FDA, other prestigious bodies – such as the World Health Organization (WHO), the U.N. Food and Agriculture Organization, Health Canada and the international Codex Alimentarius Commission – agree that hormones can be safely used in agricultural animals.

Affordability of U.S.-Produced Food

The efficiency of modern agriculture means that American consumers spend only 10% of their income on food. This compares to elsewhere in the world where 18%–25% of consumers' income goes toward the purchase of food.

A Family Affair

One common misperception is that large corporations control the majority of American farms and ranches today, but the fact is that 99% of U.S. farms and ranches are still owned by individuals and family corporations or partnerships. According to the U.S. Department of Agriculture, there are only 7,000 non-family-controlled corporate farms in the United States. This compares with more than 2 million family-owned operations.

For more facts on your food and the food production system, visit these websites:

- FeedStuffs FoodLink (*feedstuffsfoodlink.com*)
- Feed Stuffs (*feedstuffs.com*)
- Faces of Agriculture (*facesofag.com*)