

DAIRY GENOMICS & CLIMATE CHANGE

3 X 75 MINUTE CLASSES
+ TAKE HOME
ASSIGNMENTS
SBI3U, SBI3C

A high school lesson plan provided by the University of Guelph

This lesson plan gives students the opportunity learn about how increased feed efficiency in the dairy industry can facilitate reduced greenhouse gas emissions. Students will explore contemporary research while learning about the economic and environmental implications of selecting and breeding dairy cattle for new traits.

This lesson plan surrounds Episode 9 of The Why and How Podcast [“How can dairy genomics fight climate change?”](#) The podcast looks to answer big questions in agriculture, food, and the environment through casual conversations rooted in research. It is hosted by undergraduate students and published by the Ontario Agricultural College of the University of Guelph.

Curriculum Alignments and Expectations

- Evaluate the importance of some recent contributions to our knowledge of genetic processes, and analyse social and ethical implications of genetic and genomic research
- Demonstrate an understanding of concepts, processes, and technologies related to the transmission of hereditary characteristics.

Learning Objectives

- Understand the connection between the dairy industry and climate change
- Explore the topic of dairy cattle genomics and its implications for methane emissions
- Learn the Canadian dairy industry and sustainable practices employed

Assessment Strategies and Success Criteria

- Take-home activities
- Group and class discussions
- Debate

Cross Curricular Links

- Career Studies – Identifying Possible Destinations and Pathways
- Presentation and speaking skills
- Scientific investigation skills

Materials

- Access to Internet
- A/V classroom capabilities or suitable alternative for watching an online video
- Small pieces of paper
- Writing utensils



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TEACHER NOTES

Pre-Lesson Discussion

1. Before playing the podcast, have a discussion with students to discover their current level of understanding of the dairy cattle industry's and its relation to climate change. See Glossary for any terms you are unfamiliar with.

Note: Ensuring no students are alienated for thoughts, opinions or background (i.e. farming family) is very important. It may be beneficial to lay ground rules before your discussion.

- *What are some big contributors to climate change? If agriculture, and specifically the cattle industry, are not mentioned, introduce the concept to the class.*
- *Does anyone live on or near a dairy or beef farm?*
- *How do you think cattle contribute to climate change?*
- *Do you know what genomics is?*
- *Would you be willing to spend more on a product that contributes less to greenhouse gas emissions?*
- *Briefly explain the intent of selective breeding of dairy cows with respect to feed efficiency. Do you think selective breeding can reduce greenhouse gas emissions in the cattle industry?*

Take-Home Work

2. Assign students the task of listening to the podcast as take-home work (38 minutes) and to define the following terms discussed in the episode. Some terms may require

additional online research to provide a definition.

- Genomics vs genetics
- Feed intake vs efficiency
- Lifetime performance index
- Heritable traits vs Generational interval
- Methane
- Grazing system
- Animal welfare
- Selective breeding vs genetic modification

In-Class Lesson

In a class discussion, review the difference between similar terms they researched as part of their pre-discussion homework.

Break class into smaller groups of approximately four students per group. Ask students to discuss the following questions amongst themselves,

- *If and how your perception of cattle and climate change has changed from listening to the podcast?*
- *Has the discussion on this podcast made you aware of beliefs you previously held? Did your ideas or beliefs change?*

3. **Activity 1: Concepts Re-Explained (this can be alternatively included in the take-home work)**

Required Materials: A/V classroom capabilities or suitable alternative for watching an online video (3:45)



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Watch this [video about breeding cows to burp less](#) to further understand the basics of the research covered in the podcast interview.

Supplemental information on the research can be found in this [article about genetics](#).

4. Activity 2: Role-Play Debate

Split your class into small working groups (maximum of 5 students/group) and assign them each a debate topic and position from the options below.

Topic 1

Affirmative

- Selective breeding is ethical and a valuable breeding method of dairy cattle to produce desirable traits, including reducing GHG emissions.

Opposition

- Selective breeding of dairy cattle is unethical and is not effective enough to result in any real impact to climate change or otherwise.

Topic 2

Affirmative

- Reducing GHG emissions from dairy cattle is an important part of reducing overall GHG emissions from the agricultural industry in Canada.

Opposition

- Dairy cattle are not the largest contributor to GHG emissions in Canada, there are several other things that are a much larger factor. It is a waste of time to try to reduce GHG

emissions from Dairy cattle.

Topic 3

Affirmative

- Dairy consumption is going up, finding a more efficient and environmentally friendly way to produce dairy products is an important part of people's diet and the Canadian economy.

Opposition

- We should simply stop producing dairy products, we don't need it in our diet, and that would provide the greatest impact on GHG emissions.

Decide whether you would like students to work on their debate notes in-class within their groups or assign it as a take-home assignment.

Conducting the Debate (each debate will take approximately 40 min)

1. The first speaker from the affirmative team presents their opening argument (3 min)
2. The first speaker from the opposition team presents their opening argument (3 min)
3. The second speaker from the affirmative presents a further argument and addresses conflict and questions raised from the first speaker of the opposition (5 min)
4. The second speaker on the opposing team presents further arguments and addresses conflict and questions raised from the previous affirmative speakers (5 min)



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5. Allow a short break for rebuttal preparation (5 min)
6. The opposing team presents their rebuttal, attempting to defend the opposing arguments and to defeat the supporting arguments without adding any new information (5 min)
7. The affirmative team presents their rebuttal, attempting to defend the opposing arguments and to defeat the supporting arguments without adding any new information (5 min)
8. Second rebuttal and closing statement from opposition team (3 min)
9. Second rebuttal and closing statement from affirmative team (3 min)

Determining a winner of the debate is optional. If you wish to determine a winner for each debate topic, ask the remainder of the class (not involved in the current debate) before the debate begins to vote for which position, they are supporting. At the conclusion of the debate ask the class to vote again and record if there were any “swing” in the votes.

5. Activity 3: Debrief and Reflection

Required Materials: Small pieces of paper and writing utensils

Hand out small pieces of paper and ask students to anonymously write one thing they are taking away from the podcast or accompanying activities. Collect the responses and read a few of them aloud. Continue with a larger group debrief if needed.

Additional Resources

- [Podcast Episode Transcript](#)
- The [Efficient Dairy Genome Project](#)
- Visit us by registering for an [on-campus experience](#)

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