**Activity: Ethics of modifying cows with human genes**

In this activity, students explore different stakeholders’ perspectives on using transgenic cows to make medicines and weigh up the consequences, both benefits (pluses) and harms (minuses).

By the end of this activity, students will be able to:

* examine an ethical issue from different stakeholders’ perspectives
* weigh up the consequences – benefits (pluses) and harms (minuses) ­– to guide their decision-making on an ethical issue
* understand that ethical issues are often complex with no ‘right’ answer, but ethical deliberation can help us to make informed, justified decisions.

**What you need**

* Copies of [plus-minus-interesting (PMI) worksheet](#PMI)

**What to do**

1. Ask students to identify who/what may be affected by modifying cows with human genes tp make medicines. (Stakeholders may include, but not limited to: **cows, research scientists, environment representatives, government regulators, animal welfare advocates, farmers, biotech business representatives, people who need medicines, iwi, religious groups.)**
2. Divide the class into small groups (3–6 students/group) seated at separate tables, each with a large plus-minus-interesting (PMI) worksheet and a different stakeholder group. Ask the students to consider the benefits and harms for the stakeholder group on their worksheet. Give the students 2–3 minutes to discuss and write an idea or 2 on the worksheet. After a few minutes, ask the groups to move to the next stakeholder PMI (the paper stays at each table). Ideas from previous groups should not be repeated. (See [example of completed PMI](#complete).)
3. After the groups have completed each stakeholder PMI, they should then come together as a class to share and discuss their ideas. Ensure that students defend their reasoning by using questions like: Why do you say that? What do you mean? How do you know?
4. Value could be added by each group taking their final PMI and placing the consequences in order of most important to least important. The teacher can record the top 2–4 of each group’s list on the whiteboard or another list. Encourage the students to discuss the following questions:

* Which option(s) do you think will produce the most good and the least harm?
* If one stakeholder is harmed and another benefits, how do you decide who or what matters most?

1. Students could be asked to produce a written report or presentation that represents a particular stakeholder.

**Extension idea**

The [Ethics thinking toolkit](https://www.sciencelearn.org.nz/resources/2363-ethics-thinking-toolkit) help you explore ethical decision-making and judgements with your students. You may use ‘Consequentialism’ or other frameworks, such as ‘Rights and responsibilities’, ’Autonomy’, ‘Virtue ethics’ or ‘Multiple perspectives’ to explore the issue of genetically modifying cows with human genes.

**Plus-minus-interesting (PMI) worksheet**

|  |  |  |
| --- | --- | --- |
| I am a\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_. Modifying cows with human genes to treat disease will have the following benefits and harms for me… | | |
|  |  |  |
| **Benefits (PLUS):** |  | **Harms (MINUS):** |
|  |  |  |
| **An INTERESTING thought or idea (possible outcomes of taking the action):** | | |

**Example of completed plus-minus-interesting (PMI) worksheet**

|  |  |  |
| --- | --- | --- |
| I am a RESEARCH SCIENTIST. Modifying cows with human genes to treat disease will have the following benefits and harms for me… | | |
|  |  |  |
| **Benefits (PLUS):**  I can make new treatments for diseases that are difficult to treat.  I can make cheaper treatments than those currently available.  I can use transgenic cows to produce large amounts of protein, and it is easy to scale up production to meet demand.  I can make higher quality proteins because they are made using a natural system.  I will minimise harm to the animals used for this research.  I gain knowledge and skills and get to be part of groundbreaking developments in this field.  Our economy will benefit by having herds of high-value cattle. |  | **Harms (MINUS):**  I will have to use large animals in this research to produce new treatments for disease. |
|  |  |  |
| **An INTERESTING thought or idea (possible outcomes of taking the action):**  If the treatments we can make using transgenic cows can ease human suffering, save lives and the risks are low, it is worth us proceeding with this research. | | |