NAME	DATE
NAIVIL	



Evaluating Arguments

Insulin

Background

A scientific argument should have a clear claim, supporting evidence, and reasoning that connects the evidence to the claim. It should be based on facts, not feelings.

Instructions

Read the information on page 2. For both argument A and argument B:

- 1. Draw a box around the claim. A claim is a statement or conclusion that answers the original question.
- 2. Underline the evidence. Evidence is observations or data that support the claim.
- 3. Squiggly-underline the reasoning. Reasoning is the justification for why the evidence supports the claim. It contains logic and relevant science ideas.
- **4.** Use the Argumentation Checklist to evaluate the parts of each argument.

Questions

1. Which argument do you agree with more, A or B? Why do you agree more with this argument?

2. What are the problems with the other argument?

NAME	DATE

Insulin for Diabetic People

Insulin is a small signaling protein that helps to keep blood sugar levels steady. The insulin gene contains the instructions for making insulin protein.

In people with Type 1 diabetes, the specialized cells in the body that make insulin are damaged; they cannot make insulin. Without insulin, a diabetic person's blood sugar levels can become dangerously high or low. To keep their blood sugar steady, they need to take insulin as a medication.

Insulin protein molecules from pig and human. Image from David Goodsell, doi:10.2210/rcsb_pdb/mom_2001_2 The first insulin medication was made from insu-

lin that was isolated from the pancreas glands of pigs or cattle that had been butchered for their meat. Newer insulin medication is made by putting the human insulin gene into bacteria or yeast cells. The cells make insulin protein, which is then purified and given to diabetic people.

alanine

threonine

human insulin

Observations

- 1. In humans, insulin is produced only by specialized cells in the pancreas gland.
- 2. The only organisms that have pancreas glands that naturally make insulin are vertebrates.
- 3. Though pork chops and steak are much more popular foods, some people enjoy eating the pancreas glands from animals—a delicacy that some cultures call "sweetbreads."
- 4. Some diabetic people had allergic reactions to insulin medication that had been isolated from pigs or cows. Their immune systems recognized the insulin as foreign and attacked it.
- 5. The amino acid sequence of insulin varies among species. The human insulin protein is made up of 51 amino acids. Insulin from pigs is 98% identical to human, and insulin from cows is 94% identical.
- **6.** All living things read information in genes the same way.

Question

Which is a better medication for diabetic people: insulin isolated from pigs or cows, or insulin made by inserting the human insulin gene into bacteria or yeast cells?

NAME	 DATE

Argument A

Insulin that is made by inserting the human insulin gene into bacteria or yeast cells is a better medication for diabetic people than insulin isolated from pigs or cows. The insulin from both pigs and cows has a different amino acid sequence than human insulin, and it triggered an allergic reaction in some patients. Since all living things read information in genes the same way, the bacteria or yeast should make insulin from the human gene the same way cells in the pancreas do. Because this insulin will have the same amino acid sequence as natural human insulin, the diabetic person's immune system will be less likely to recognize it as foreign. Insulin that is less likely to trigger an allergic reaction is a better medication.

Argumentation Checklist

Yes	No	CLAIM	NOTES
		Is there a clearly stated claim?	
		Is it consistent with all of the available evidence?	
		Is it the simplest conclusion based on all of the available evidence?	
		EVIDENCE	
		Is there enough evidence to support the claim?	
		Is all of the evidence relevant to the claim (there are no extra facts)?	
		Do the data collection, analysis, and interpretation seem reasonable?	
		REASONING	
		Is there enough reasoning to justify why the evidence supports the claim?	
		Is the reasoning related to the claim?	
		Is it related to the evidence?	
		Is it consistent with accepted science ideas?	
		Does it use facts, not feelings (system 2 thinking, not system 1)?	

Argument B

Insulin isolated from pigs or cows is a better medication for diabetic people than insulin made in bacteria or yeast cells. Single-celled bacteria and yeast do not have pancreas glands, and they do not normally make insulin. Pigs and cows are vertebrates, and their pancreas glands naturally make insulin. Insulin from pigs or cows is more natural than insulin made from yeast or bacteria. Since natural products are better than synthetic ones, insulin from pigs or cows would be a better medication for diabetic people. We also already eat cows and pigs, and it would be better to not waste the natural products that could be made from the parts people don't usually eat and would otherwise throw away.

Argumentation Checklist

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