



## The Story

A zombie apocalypse has infected nearly all of humanity. A group of scientists, engineers, programmers, military strategists and other experts have come together to attempt to find a cure for the infection.

One of the problem solvers, a biochemist named Stephanie Mann figures out that the contagion is a prion, which is an infectious protein agent that can structurally fold in ways that can be harmful to other proteins in the body. She reasons that the prion is affecting the brain, since the symptoms of the zombies match those of a person suffering degenerative nerve and brain disorders.

*Side note: Prions can behave much like viruses, transmitting to other proteins in the body, spreading like an infection that can wreak havoc on the body. Some prions, like the one that causes mad cow disease, can have deadly effects on the brain and the neuromuscular system.*

Stephanie reasons that if they can change the pH of the body carefully, they may be able to denature (unfold) the infectious protein in the zombie. She finds that common baking soda (sodium bicarbonate) seems to work.

In order to test her hypothesis, she must use sample tissue from an actual zombie...in this case a brain (since that is where the prion causes infection).

In this activity, you are going to make you own zombie brain to help Stephanie save mankind from total annihilation.

## The Brain

You will need:

- a gelatin brain mold available from multiple online retailers
- a pH probe or homemade pH indicator (search, "red cabbage pH indicator")

Ingredients –

- 2 (6 ounce) boxes of gelatin *- any flavors or combinations*
- 1  $\frac{3}{4}$  cups boiling water
- $\frac{3}{4}$  cup cold water
- 9 ounces fat-free evaporated milk *- can't have fat or it will curdle*
- 15 drops each of red, green, and blue food coloring *- to make it gray*
- 2 teaspoons of citric acid *- to make it acidic*

# **Zombie Brain Game**

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## **Directions to create the brain:**

- Wash the mold with warm soapy water
- Coat the inside with a small amount of vegetable oil and wipe out any excess
- Put the gelatin mix in a bowl and add the boiling water
- Stir in citric acid to create an acidic brain for the chemistry portion of the activity
- Stir for two minutes or until dissolved
- Stir in cold water
- Stir in evaporated milk and food coloring
- Pour the mixture in the mold, leaving about a quarter inch from the top
- Place the brain mold in a shallow bowl to keep it level while being refrigerated overnight.
- To remove the brain, shake the mold gently until the gelatin loosens
- Place a flat plate upside down on the open part of the mold and then flip the plate and mold together
- Lift off the mold slowly, leaving the brain on the plate

## **Directions to titrate brain mixture:**

- Remove a spoonful of brain and place in a bowl
- Add water and stir until the mixture is fairly liquid
- Using a pH probe or homemade pH indicator, take a baseline reading of the brain pH
- Using a quarter teaspoon at a time, mix baking soda into the mix and take a pH reading after each.

## **Questions**

1. When a zombie apocalypse begins, where will you be?
  - a. Running like crazy to a “safe” zone, but grabbing the cat first
  - b. Joining the zombies, because what’s more fun than being a zombie?
  - c. Turning zombies back to humans by creating a scientific cure
  - d. Building a zombie village where they can live, while you live far far away
2. Zombies are real
  - a. True
  - b. False
3. Baking soda is a common household item. It’s called Sodium Bicarbonate in chemistry-speak. If baking soda can cause the pH of a zombie brain to RISE, would it be considered...
  - a. Acidic
  - b. Basic
  - c. Not sure but it does a good job of keeping the fridge smelling fresh
4. Acids and bases are used in most homes for multiple purposes. For example, vinegar is acidic and is used in cooking. Bleach and ammonia are bases and are used in cleaning. Did you know that most bases feel slippery?
  - a. Yes
  - b. No
  - c. My little brother is slippery but that’s because he never takes a bath
5. When zombies infect other people, eventually there will be more zombies than people. What will happen to the rate of infection in this case?
  - a. The rate of infection will increase
  - b. The rate of infection will decrease
  - c. Don’t ask me...I’m a zombie