Lesson Plan 1: You’ll be Wishin’ for some Neurotransmission and Background Story

Background on Zombie Apocalypse

1. Pass out “The Zombie Autopsies“: Mission and Background and read it aloud to students:

Welcome to Harvard Medical School. We have recruited you because you are the best and the brightest young minds boasting skills in technology, working well in groups (socialization) and most important of all, your creativity. We will assume that you have at least some background in biology, but nothing more yet. We will especially be focusing on neuroscience as we have at least deduced that the brain plays a very important role in explaining zombie behavior. Your ultimate goal, should you pass your tests, will be to become a medications development specialist doctor and create a cure for the zombie plague that is destroying the entire world. Will you decide to save the world, or will you let it fall into eternal ruin?

Background:

“One-third of humanity has perished from the plague. Two point three billion people have died, and countless more are quickly moving towards the final stages of the disease. There is reason to believe that in a short time nearly everyone on Earth will be infected. The virus continues to spread exponentially, and all attempts at a vaccine or cure have failed. Scientific and industrial infrastructure is rapidly faltering. Early attempts at controlling the spread of the disease via nuclear and non-nuclear incineration have left the planet in an ecologically fragile state. Current computer models suggest that civilization can only survive for approximately another decade before we face total destruction. These are indeed dire times. “

Over the course of this unit you must successfully learn about the following in order to save civilization:

- Neurons
- Neurotransmission
- Neurotransmitters

www.pbs.org/newshour/extra
• Neuroanatomy
• Medications development
• How to write an academic journal article

2. Play the trailer of “Night of the Living Dead” (http://bit.ly/vup1b) for students - WARNING: The following clip contains material that may not be suitable for younger students. Please screen this short clip ahead of time to decide if it is appropriate for your students.

The original film, Night of the Living Dead directed by George Romero, was produced in 1968 on a very tight budget. Although films were being made in color at that time, Romero chose black and white for creative and budget considerations. The film is often hailed as one of the most successful independent films ever made. To learn more about the film, click here (http://imdb.to/GYmgVu). To watch it in its entirety and you can click here (http://bit.ly/16nEco9).

Lesson Plan: You'll be Wishin’ for some Neurotransmission

Warm up Activity

1. Explain to students the following:

Welcome Harvard medical students! To understand the brain of a human or zombie we must first understand the specialized cell that make up the tissue of the brain. These specialized cells are called neurons, and we will spend today discussing what they are and how they work. There is a pattern in your body that you may remember from biology class that goes like this:

Cells make up tissue, and tissue makes up organs. Easy enough?

Your brain is an organ and follows the same pattern of “cells, tissue, and organ” and we are going to start with the specialized cells of the brain which are called neurons. Before we get to the brain and its parts we need to learn a little about these neurons

2. Show them the first seven slides of the “Neurons and Neurotransmission” PowerPoint while going over each slide verbally.

Main Activities

Create a giant neuron in groups

1. Put students into small groups and give them their giant neuron puzzle. Have students put the puzzle together (tape or staples work) and then label their neuron with the words on slide six and using the image to help them. Once you have checked to make sure all the parts are labeled correctly, have students come up with a spooky name, a Halloween related personality and decorations for their neuron. The class will be sharing their neurons with the other students and using them in a game.
2. Return to the PowerPoint and go over slides 8-13, which explain the process of neurotransmission. On slide 13, there are two very good short video clips on the full process.

**Play telephone with the giant neurons**

1. Have students stand up in their groups with their GIANT neurons and have the entire class form a circle with their neurons almost touching. They must line their neurons up in the same direction from dendrites (right) to terminal buttons (left) throughout the entire circle. Check to make sure students are lined up correctly and that there is SPACE between each neuron (synaptic gap). Have each group introduce their neuron to the class. Explain to the class that you are now going to attempt neurotransmission and you will do this by playing the game of telephone. Here are the rules:

   1. The teacher picks the phrase - make it Zombie-oriented for fun!
   2. You may only say the phrase to the person next to you once - no repeating!
   3. The last person to go will whisper the answer to the teacher and the teacher will announce the phrase to the class.

A few suggestions on this exercise - you want to have neurotransmission take place as quickly as possible so encourage the kids to speed up. If any bad words are used the game ends immediately. The kids will most likely botch up the phrase, but try to explain that if their neurons in their brain did that they would have a pretty terrible life. Play several rounds and have fun. If students continue to fail you might want to point out that the signal (i.e. the message) might be botched because of the failure of the mylenation on the axon.