

Glowing Cells

Materials:

- blue/green flashlight turning on green light with red goggles
- blue flashlight with yellow goggles
- set up scope with DAT-GFP worms or Jaw-GFP worms
- set up video keynote on BSB3 computer in BrainLab (computer on right)
- green highlighter (must have!), other color highlighter, and control colored regular markers, glass microscope slides
- turn disco light on in BrainLab
- Wavelength diagram



Activity:

Today we are going to play with animals that glow. Can you think of any animals that glow?
answers: lightning bugs, glow worms, critters in the ocean

Slideshow:

1st slide: about dinoflagellate that glow when touched (surfer touches them, wave touch them)

(if we put GFP into an adult animal, it is the same thing as introducing a virus or bacteria and your body's immune system will kill the cell with the GFP thinking it is foreign but if you introduce it into a developing embryo then the GFP is not considered foreign and is considered self.)

2nd slide: about Jellyfish. only the ring around the jellyfish actually glows. Scientists can take the DNA or recipe that makes the green glowing color or GFP and put that recipe into any type of cell or body part that we want to glow. So, if we put the DNA into an egg of an animal, we can make an animal's whole body glow or maybe just its eyes or brains even!

3rd slide: What animals do you see here?

do you notice anything that all the pics have in common? (they are all dark) hmmm, I wonder if you can't see the glowing light unless its dark

Often, the fluorescent molecules are not very bright and the visible white light makes it hard to see so scientists are often in the dark looking at fluorescing cells. We have some pretty bright fluorescent molecules here at spectrUM to share with you so we don't have to go in a dark room to see them fluoresce or glow.

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4th slide: Here are the cells or the small parts of a mouse brain with 4 different colors and a mix of those colors to make up all the colors you see. (just like your TV using 3 colors to make a mix of colors). This is the hippocampus-the part of your brain that you need to form new memories.

5th slide: so here is a picture of a zebra fish...show 6th slide. so what scientists have done is they put 1 of the “glowing” or fluorescing proteins to turn on every time a neuron is turned on (when Calcium is used). So this fish is sitting here so lets see what the fish thinks.

Have you heard that you only use 10% of your brain? what do you think now after watching the zebrafish brain, was he only using 10% at any given time or did it look like he could use a lot more than 10%? (using only 10% of our brain is a neuromyth).

Hands-on Part

We're going to make things glow or fluoresce

Older kids: Fluorescence is the property of absorbing light of short wavelength and emitting light of longer wavelength (absorbs higher energy light and emits lower energy light) Look at Wavelength diagram and talk about lights with stronger energy, shorter wavelength vs lower energy, longer wavelength

Highlighter challenge: Use the highlighters to draw on your glass slide (be creative with a picture but use all these colors:

(use green, blue and another color)

Also try non-highlighters on another slide for a control.

Have kid try on Yellow Goggles. Then you turn on the blue flashlight and ask them what color the light is? (answer they'll say is “green” but it's not green, it's blue!)

Have then look at their slide:

Talk about green writing, does it glow?

Talk about blue writing, can you see it?

The yellow goggles are blocking out the blue light but letting the green light through!

Try the red goggles and green light now

DIY your blood and urine fluoresce?



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Why do you think scientists use fluorescence?

- label different parts of cells
- label molecules to see where they travel in cell
(where does Na go when a neuron is turned on)
- can label cancer cells to see where it travels in the body
- label parts that only get turned on at certain times (Ca gets turned on and you see fluorescence when neuron gets turned on)

Lets look at some glowing worms!

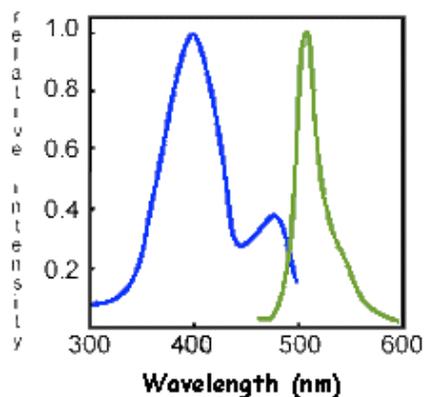
Dat-GFP: you are looking at part of the worm's brain! 5 dopamine neurons out of 302

Why do we have to wear the goggles?

to separate the excitation (blue light) and emission (green light) wavelengths

(remember, smaller wavelength=higher energy) Energy is lost between excitation and emission

GFP Excitation/Emission Spectrum



RFP Excitation/Emission Spectrum