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**Glow Kitties**

**Cats light up when an experiment is successful**

Just in time for Halloween, a team of scientists has introduced a new breed of kittens that glow in the dark. They’re cute, cuddly and bright, with fur that shines yellow-green when you turn off the light. But like the bag you carry around for trick-or-treating, it’s what’s inside these cats that counts. The researchers are testing a way to fight a disease that infects cats all over the world, and the kittens’ spooky glow shows that the test is working.

The disease is called Feline Immunodeficiency Virus, or FIV. Of every 100 cats in the United States, between one and three have the virus. It’s most often transmitted when one cat bites another, and over time the disease can cause a cat to get sick. Many scientists study FIV because it’s similar to a virus called HIV, short for human immunodeficiency virus, which infects people. An HIV infection can lead to a fatal syndrome called AIDS. The body of a person with AIDS is unable to fight off infections. Since AIDS was discovered 30 years ago, 30 million people have died from the disease.

Because HIV and FIV are similar, scientists suspect that if they find a way to fight FIV, they might discover a way to help people with HIV.

Eric Poeschla led the study on glowing kittens. He is a molecular virologist at the Mayo Clinic College of Medicine in Rochester, Minn. Virologists study viruses, and molecular virologists study the tiny body of a virus itself. They want to understand how such a small thing can do so much harm.

A virus (like FIV or HIV) is a tiny particle that finds and attacks cells in the body. It has a set of instructions, called genes, for how to reproduce. A virus’s only job is to make more of itself, and it can reproduce only if it attacks and invades cells. When a virus attacks a cell, it injects its genes inside, and the hijacked cell then creates new virus particles. The new particles then go attack other cells.

Poeschla and his colleagues know that FIV can be stopped — but so far, only in rhesus monkeys. Rhesus monkeys can fight off the infection because their cells contain a special protein that cats’ don’t. Proteins are the workers inside a cell, and each protein has its own to-do list. One of the jobs of the special monkey protein is to stop viral infections. The scientists reasoned that if cats had this protein, FIV wouldn’t be able to infect felines.

A cell’s genes contain the recipes for all the proteins it needs. So Poeschla and his team injected feline egg cells with the gene that contained instructions to make the monkey protein. They weren’t sure the gene would be adopted by the egg cells, so they injected a second gene along with the first. This second gene contained instructions for making a cat’s fur glow in the dark. If the cats glowed, the scientists would know the experiment was working.

Poeschla’s team then implanted the gene-modified eggs in a cat; the cat later gave birth to three kittens. When Poeschla and his team saw that the kittens glowed in the dark, they knew the genes were at work in the cells. Other scientists have engineered cats that glow in the dark before, but this experiment is the first time scientists have added two new genes to a cat’s DNA.

Even though they were able to add the monkey protein–forming gene to the cats’ cells, Poeschla and his colleagues still don’t know if the animals can now fight off FIV. They’ll need to breed more cats with the gene, and test these animals to see if they’re immune to FIV.

And if the new cats are immune to FIV, the scientists hope they might learn something new about how proteins can be used to prevent HIV infection.

**FILL IN THE BLANKS**

Chromosomes: A sequence of DNA that determines a particular characteristic in an organism. They are Genes are passed from parents to children, and genes contain the instructions for building proteins.

DNA: A long, spiral-shaped molecule inside nearly every cell of an organism that carries genetic information. Chromosomes are made of this.

Protein**:** Compounds that are an essential part of all living organisms. These organic molecules do the work inside a cell. They may be parts of body tissues such as muscle, hair and collagen. These molecules are made of amino acid and can be enzymes and antibodies.

Virus**:** A tiny particle that can cause infection and is typically made of DNA inside a protein coat. These particles are too small to be seen by microscopes, and it is able to multiply only within the living cells of a host.

**ANALYSIS QUESTIONS:**

1. **Can a virus reproduce on its own? Why or why not?**

No, the virus cannot reproduce on its own. It needs a host or a living organism to infect first. Then, once it is in the organism, it can inject its genes in the cells of the living organism.

1. **How is the Glow in the Dark Gene helpful to virologists studying FIV and HIV?**

The glow in the dark gene is helpful to virologists studying FIV and HIV since it can learn about how the proteins can be used to prevent HIV infections. Experimenting with injecting new genes into the cats can help with discovering a cure for HIV infections or a prevention for them.

1. **What further studies need to be completed on the Glow Kitties?**

Some further studies that need to be completed on the Glow Kitties would be conducting more experiments with other genes and seeing if the cats are immune to the FIV virus.

**REGENTS QUESTIONS**

**Base your answers to questions 1 through 4 on the passage below and on your knowledge of biology.**

**Avian (Bird) Flu**

Avian flu virus H5N1 has been a major concern recently. Most humans have not been exposed to this strain of the virus, so they have not produced the necessary protective substances. A vaccine has been developed and is being made in large quantities. However, much more time is needed to manufacture enough vaccine to protect most of the human population of the world. Most flu virus strains affect the upper respiratory tract, resulting in a runny nose and sore throat. However, the H5N1 virus seems to go deeper into the lungs and causes severe pneumonia, which may be fatal for people infected by this virus. So far, this virus has not been known to spread directly from one human to another. As long as H5N1 does not change to another strain that can be transferred from one human to another, a worldwide epidemic of the virus probably will not occur.

1. **State one difference between the effect on the human body of the usual forms of flu virus and the effect of H5N1. [1]**

The H5N1 virus goes deeper in the lungs and causes severe pneumonia, which can be fatal. Meanwhile, the usual forms of the flu virus affect the upper respiratory tract, which just results in a runny nose and sore throat.

1. **Identify the type of substance produced by the human body that protects against antigens, such as the flu virus. [1]**

The type of substance produced by the human body that protects against antigens are known as antibodies.

3. **State what is in a vaccine that makes the vaccine effective. [1]**

Dead or weak bacteria in the vaccine makes it effective. To be more specific, the dead or weakened pathogens.

1. **Identify one event that could result in the virus changing to a form able to spread from human to human. [1]**

An event that could result in the virus changing to a form able to spread from human to human are mutations.

1. AIDS is an infectious disease that has reached epidemic proportions. Describe the nature of this disease and identify two ways to prevent or control the spread of infectious diseases, such as AIDS. In your response be sure to include:

• the type of pathogen that causes AIDS [1]   
 • the system of the body that is attacked by that pathogen [1]   
 • the effect on the body when this system is weakened by AIDS [1]   
 • two ways to prevent or control the spread of infectious diseases, such as AIDS [2]

AIDS is an infectious disease that can be prevented through absence of sex or using protection during sex. The pathogen that causes AIDS is HIV. When the immune system is weakened by AIDS, it would give the victim an increased risk of inflammation of the brain and spinal cord.