How Scientists May Save Cats from FIV

Scientists have genetically modified cats to combat an epidemic affecting feline populations worldwide: FIV

PRACTICAL SCIENCE WITH PHIL FREDA

What is FIV?

FIV, or feline immunodeficiency virus, is extremely similar to the virus that causes AIDS in humans (HIV). Both belong to a group of viruses called lentiviruses. All lentiviruses belong to a larger group of viruses called retroviruses, which can lie dormant in the genetic code itself and activate at a later time.

This is what makes viruses like HIV and FIV so dangerous because of the fact that they can lie dormant in host cells. This makes it nearly impossible to eradicate the entire viral load.

Hence, there is no proven cure for FIV or HIV currently.

FIV causes similar symptoms as HIV including long term weakening of the host's immune system until other diseases or antigens cause death.

Can I catch FIV?
Rest easy; you **cannot** be infected with FIV.

According to an article published in Science Magazine, the two viruses are too different from one another. Cats cannot be infected by HIV and humans cannot be infected by FIV.

All viruses have surface proteins on their envelopes (outer shell) that communicate with the prospective host's cells.

These surface proteins are like keys that "open up" our host cells, which then leads to viral infection and replication of new viruses.

In addition to this line of defense, previous research suggests that humans also produce a protein called "TRIMCyp".

This protein may recognize FIV virions and target them for destruction.

As a side note, it is possible for viruses to jump species.

So, don't get frantic, cats and humans are not closely related.

It is now understood that HIV is an evolved form of another primate lentivirus called SIV.

Simian immunodeficiency virus (SIV), most likely crossed into humans because of the practice of hunting chimpanzees, our closest living relative, for bushmeat in parts of Africa.

The exchange of bodily fluids is all it took for SIV to cross into a human host. Once in a human, SIV evolved into what we now call HIV.

As I said, just a side note, cats and humans are too genetically different for anyone to be worried about a possible cross-over between species.

What are scientists doing to treat FIV?
According to the article in Science Magazine, Eric Poeschla, a molecular virologist at the Mayo Clinic in Rochester, Minnesota, wanted to determine if giving cats the human *TRIMCyp* gene would make them immune to FIV.

The technique usually used to perform this kind of transfer is called somatic cell nuclear transfer (SCNT). This technique was actually used to make Dolly, the famous cloned sheep, in 1996.

The SCNT process goes like this:

- The nucleus, which contains all of the genetic information to make an organism, is first extracted from a healthy adult cat which contains the gene to make the *TRIMCyp* protein.
- Next, an egg cell from a female cat is removed of its nucleus.
- The adult nucleus with the *TRIMCyp* gene is then inserted into this egg cell.
- The egg cell is then inserted into a surrogate mother cat.
- If all goes well, a kitten with the ability to make the *TRIMCyp* protein is born and should be immune to FIV.
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So far, this SCNT has yielded positive results in which a fluorescent protein was transferred into kittens to determine if the process works.

This yielded ***glow-in-the-dark kittens!***

For this project however, Poeschla used a different method.

The researchers used a lentivirus to transfer the protein into the fetal kitten instead of a cell from another cat.

Injected into the virus were the *TRIMCyp* gene and a gene to make a fluorescent protein.
The fluorescence would serve as proof that the genetic material was successfully transferred from the virus to the kitten.

After the viruses infected the egg cells, the team fertilized them with sperm from normal male cats, and injected them into the fallopian tubes of 22 female cats with each receiving somewhere between 30 to 50 eggs.

Five of the cats became pregnant, with 11 embryos between them.

Ten of the embryos contained the new genes and five kittens were born, but only three are still alive.
One kitten was stillborn and the other died during birth.

Fortunately however, the reported 23-percent success rate is much higher than the usual 3 percent seen in SCNT.

Additionally, when the researchers infected blood cells from the kittens with FIV, the viruses did not replicate well, meaning that the experiment seems to be a success.

The researchers plan on trying other antiviral proteins from humans, apes and monkeys that also may hinder FIV.

Not only is this good news for cats, but for us.

It may be that cats will be the next model organisms for biomedical research.

Think about it!

Also something to think about:
What if another organism out there has a protein similar to *TRIMCyp* that may block the HIV virus from entering and infecting them?

If this protein can be isolated and somehow integrated into the human genome, maybe we can begin to work on a cure for AIDS.

About this column: An educational, science-minded column