

Nat-Sci II Presentation:
Editing of Pig DNA May Lead to More Organs
for People

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The Article under Investigation

- “Editing of Pig DNA May Lead to More Organs for People,” appeared in New York times Science section (10/15/15). Written by Carl Zimmer.



In recent work with pig cells, scientists used the gene editing technique known as Crispr to alter 62 genes at once.

Axel Helmken/DPA, via
Agence France-Presse —
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Genetics meets Surgical Technologies: CRISPR and Xeno-transplantation

- CRISPR : A recently developed method for “editing genes.”
- Xeno-transplantation : The transplantation of living cells, tissues or organs from one species to another.
- It has been recently shown that a particular complication that arises in xeno-transplantation, using pig organs, can be solved through gene-editing via CRISPR.

Development from Genetics: CRISPR

- In October of 2015, scientists gathered at the National Academy of Sciences in Washington to talk about Crispr, a new method for editing genes.
- Carl Zimmer claims that "In the past couple of years, the technique has become so powerful and accessible that many experts are calling for limits on its potential uses — especially altering human embryos with changes that could be inherited by future generations."

CRISPR: a new method for editing genes I

- In the CRISPR, the new spacer sequences match part of the infecting phage genome's sequence.
- In CRISPRs protecting the body, they interfere with a phage infection
- Recent discoveries tell us that CRISPR defense does not block phage absorption
- Does not involve a restriction-modification system (bacteria's way to protect themselves from foreign DNA)

CRISPR: a new method for editing genes II

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Complications of Xeno-plantation with Pig Organs I

- In the 1990s, xenotransplantation, a technique that uses pig organs in humans, has been topic much discussed by scientists. They have hoped that the organs from the pigs could be cleaned from the harmful viruses and pathogens that would enter the human host and ultimately harm them.

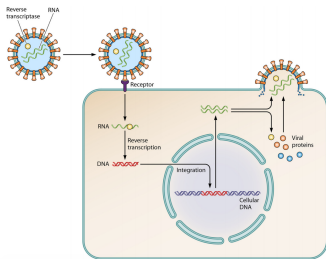


FIG 3 Schematic presentation of the life cycle of PERVs. For further details, see the text and Table 4.

Complications of Xeno-plantation with Pig Organs II

- However, the issues with this is that in the pig's DNA there are viral genes. These genes are called endogenous retroviruses; which humans also have.
- The one found in pigs (PERVs) can produce viruses that infect other pig cells. Unfortunately, when mixed with human cells, they are also infected.

Gene-editing Solution to the Complications

- This road block seemed impossible to get rid off to scientists because they were part of the pig's genome.
- However, Dr. Church was able to figure out a method to disable the PERVs. They started off by finding out there are 62 PERVs found in each cell, and that the PERVs had almost identical DNA.
- What Dr. Church did was design a new set of genes and place them into the pig cells. These new genes created enzymes would find the PERVs and cut them out from the DNA. Within two weeks, the pig cells had changed all the viral DNA.
- Dr. Church was able to accomplish this by creating only one molecule, not 62, to alter the 62 genes.