

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

YD Choi, Amy Jung, Vaughn Tajirian, Katie Westerlund

New York University

December 6, 2015

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 Heimken/DPA, via Agence France-Presse — Getty Images

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.

What happened with 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



Recent development with CRISPR

- "In a typical experiment, scientists use Crispr to alter a single gene. But in recent work with pig cells, Dr. Church and his colleagues used Crispr to alter 62 genes at once. The researchers hope that this achievement may someday make it possible to use pig organs for transplantation into humans." (Carl Zimmer)
- "But despite the large number of genes involved, Dr. Weiss and other experts cautioned that the new work doesn't mean that we've suddenly gained the power to bypass evolution. Crispr does not allow scientists to manipulate genes on a huge scale — yet."

Complications of Xeno-plantation with Pig Organs

- 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.
- 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.