

# MINDQUEST-ANTHEM



MindQuest is a forum for inquisitive people of all ages. We present and discuss, on an occasional basis, subjects that increase our understanding of and awareness about the world around us - be it scientific, cultural, economic, humaniora  
website: [BigIdeasForum.info](http://BigIdeasForum.info); email: [BigIdeasForum@gmail.com](mailto:BigIdeasForum@gmail.com)

# BIF - 2/3/22

Eleven countries are identified as being at the top in a particular respect  
Only one gets mentioned twice.

11. Most overweight population. **Nauru**
10. Most sheep per person! **Falkland Island**
9. Most freshwater lakes. **Canada**
8. No rivers at all. **Saudi Arabia**
7. Most diverse in culture, languages, religions, etc. **India**
6. More than half of its citizens live abroad! **Malta**
5. Most covered by tropical forests. **Suriname**
4. Largest nation without a single farm. **Singapore**
3. Most literate and best educated **Lichtenstein/Finland**
2. Least peaceful. **Somalia/Eritrea/Yemen**
1. Largest number imprisoned **USA**.

3 medical breakthroughs  
in 2021/2022

## **NERVE REPAIR**

### **PROBLEM:**

Peripheral nerves have some capacity for regeneration after an injury, but they often need help. For major damage, sections can be surgically replaced with nerves taken from other parts of the patient's body, but that obviously creates injuries elsewhere.

Implants called NGCs (nerve guidance conduits) are often used; they help direct nerves to be regenerated along specific paths.

### **SOLUTION:**

A new way to improve NGCs is to load them with a mix of proteins from the extracellular matrix (ECM). The idea was to mimic the body's usual nerve repair processes to reduce the need for drugs or stem cells.

\*) - a scaffold structure that provides support and nutrients for cells in the body.

Nerve repair:

The researchers tested this new NGC approach on rats that had lacerations to their peripheral nerves.

And sure enough, in the weeks following treatment, the rats showed higher density of regenerating axons, and a strong increase in blood vessel density, which aids the healing tissue. It also showed higher rates of pro-repair inflammation.

# HEART TRANSPLANTS

## PROBLEM:

Last year, there were just over 3,800 heart transplants in the U.S.  
On an average, 3,100 are on a waiting list daily (>110,000 people/yr)  
Avg waiting time is 144 days

## SOLUTION:

xenotransplant - transfer of animal organs to human





Two questions:

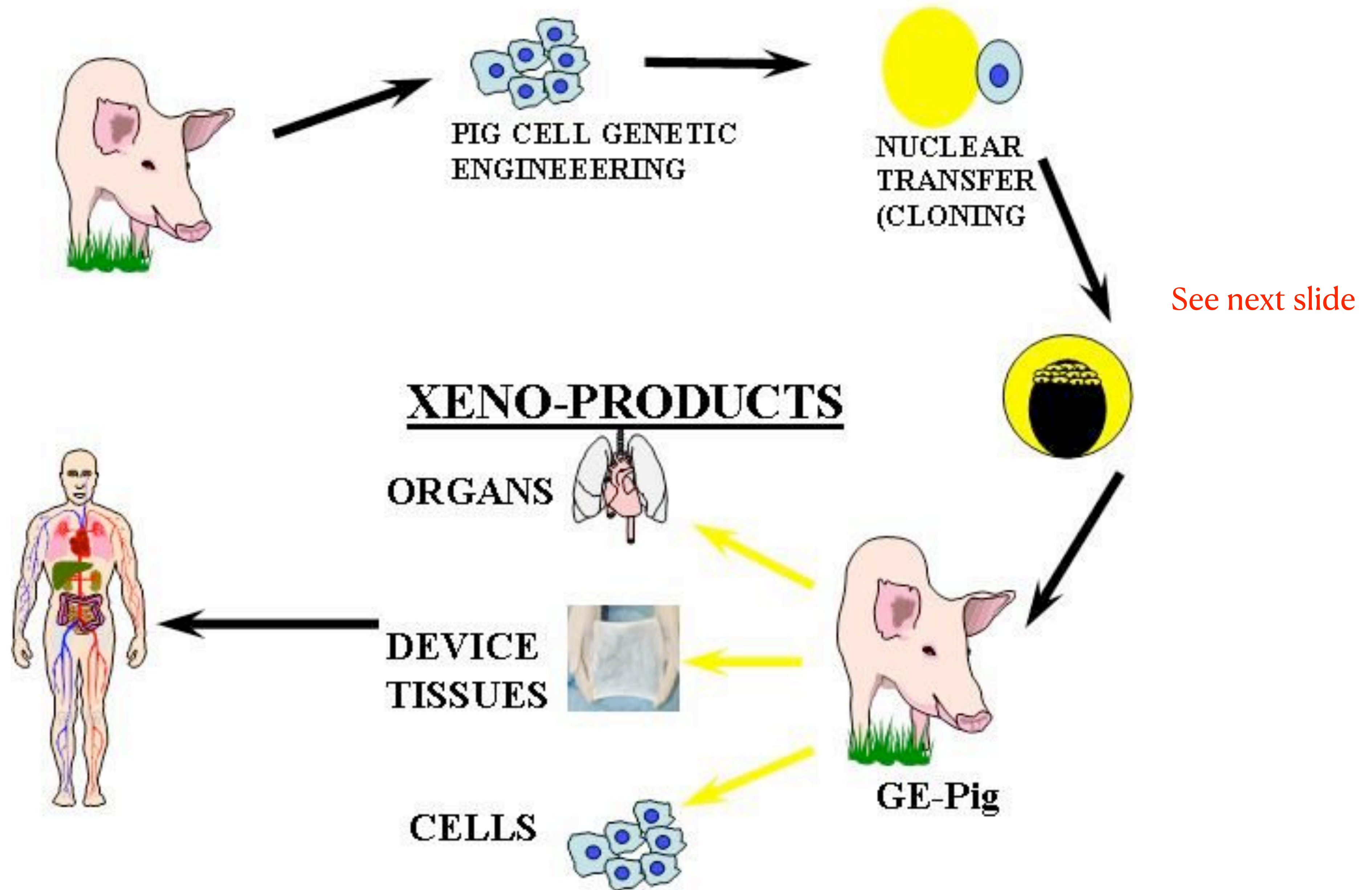
1. Why pig hearts?
2. How do you genetically modify a heart?

Answer:

1. pigs are the mammal that is the most similar to humans
2. You don't!  
So, what *do* you do?

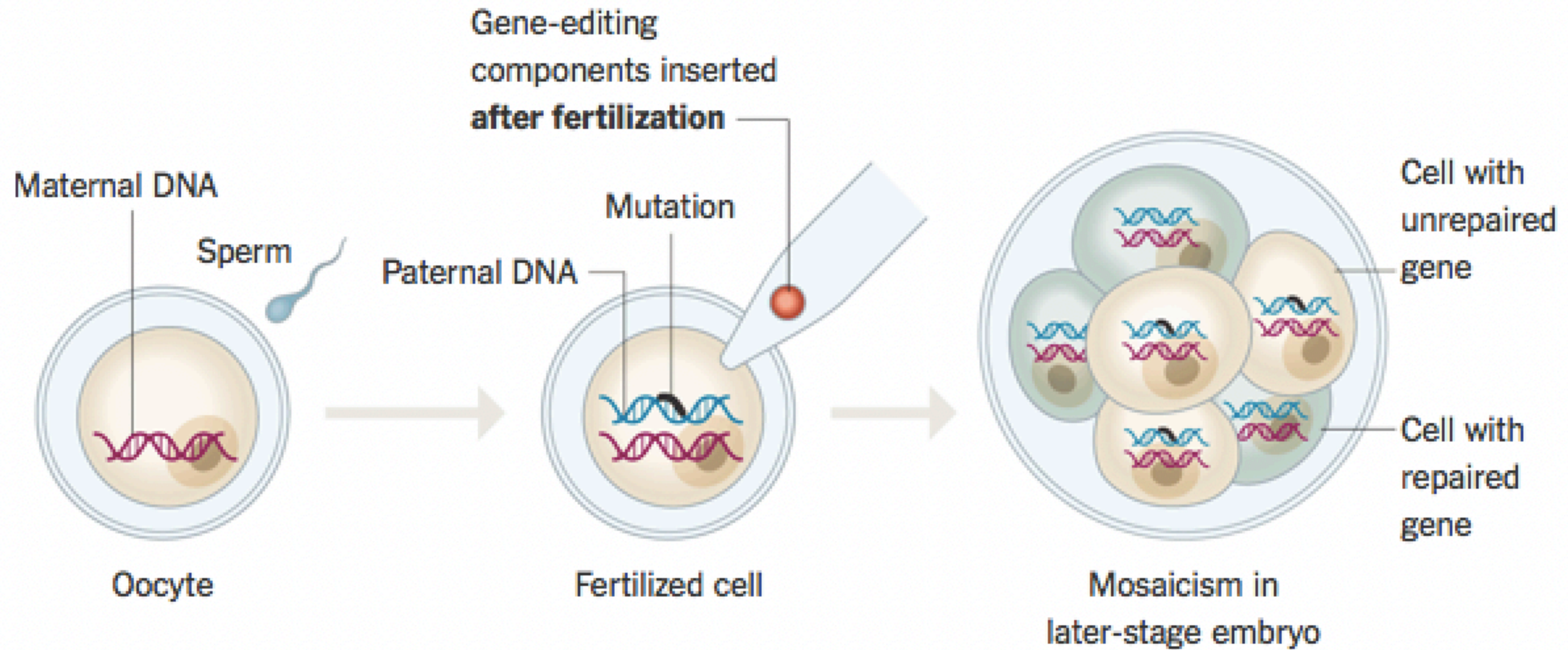


# XENOGRAFT PLATFORM





A pig has 2.8 Bn base-pairs containing 21,640 protein coding genes







What was modified?

10 modifications:

- *elimination* of 4 *pig* genes (3 responsible for rapid antibody-mediated rejection of pig organs by humans) and 1 (responsible for excessive growth of the pig heart)
- *insertions* of 6 *human* genes (responsible for immune acceptance of the pig heart)

It all started with 50 baboon trials (successful)  
before the first human test was conducted on a terminally ill patient