

Science

HOW SCIENTISTS PULLED OFF THE FIRST-EVER PIG-HEART

TRANSPLANT

BY AMANDA SCHUPAK • ILLUSTRATIONS BY GIACOMO GAMBINERI

ON JAN. 7, a man named David Bennett went into an operating room with a diseased and failing heart. He had just days left to live if he didn't get a new one. But Bennett, 57, hadn't been approved for a traditional heart transplant, so the surgery he was about to have was an experiment. Eight hours later, his old heart was gone and a new one was in its place: He left the operating room with a heart that once belonged to a pig.

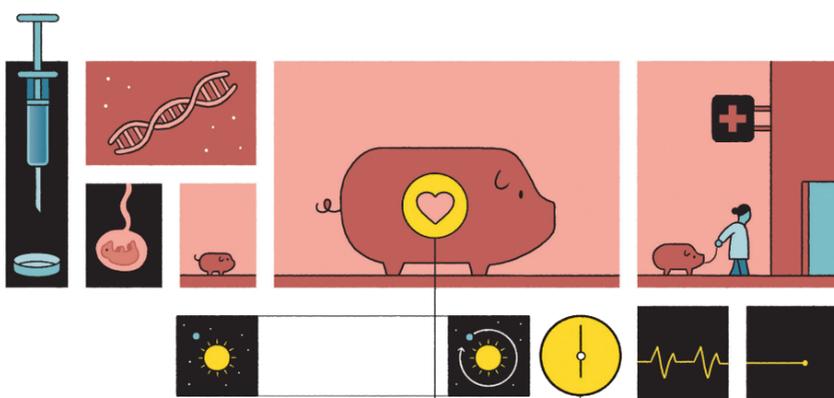
This transplant was the first time a pig heart was transferred to a human, and it could be the start of something big. At any given moment there are millions of people around the world who are waiting to receive much-needed organ transplants — but most will never get one, because there are not enough donor hearts, kidneys and livers to go around.

Not enough human ones, anyway. Dr. Muhammad

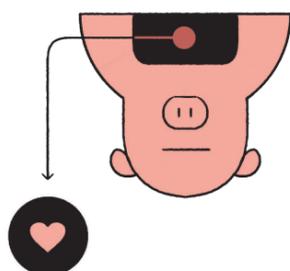
Mohiuddin, who works on animal transplantation at the University of Maryland School of Medicine, where the transplant took place, hopes that being able to use pig parts will mean that in the future “no patient in the world will die because an organ was not available.” Yes, the pigs do have to die. But it could save lots of human lives. Here's how the doctors and scientists pulled off this big-news transplant.

1. GROW THE PERFECT PIG

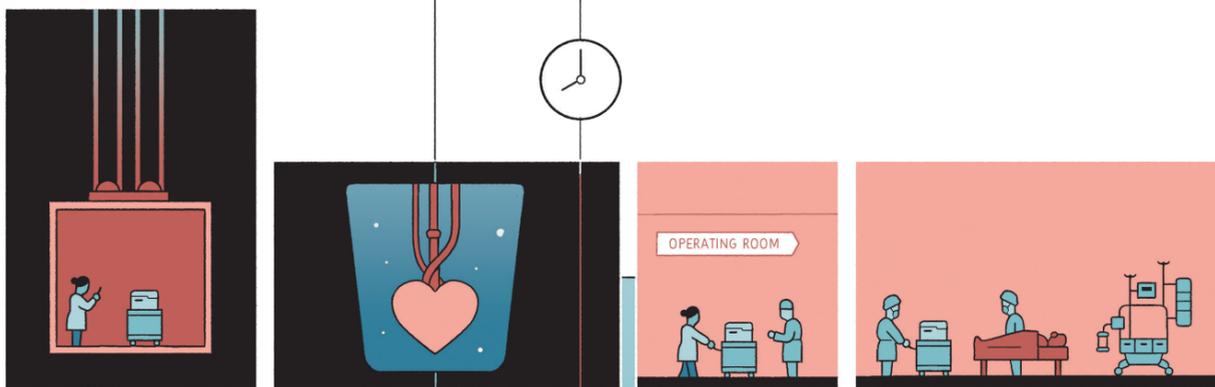
Not just any pig heart can go inside a human. Why? Because the immune system, which is trained to attack invaders, isn't easily fooled. “It says: ‘Whoa, this is very different. Let's get this thing out of our body,’” says Dr. Bartley Griffith, who performed the surgery. That's called organ rejection, and it can happen even with a human heart transplant. To create a pig whose heart wouldn't be rejected, scientists tinkered with its DNA before it was even born, removing genes that would make its heart read as an invader and adding human genes to help it pass under the immune system's radar.

**2. REMOVE THE PIG HEART**

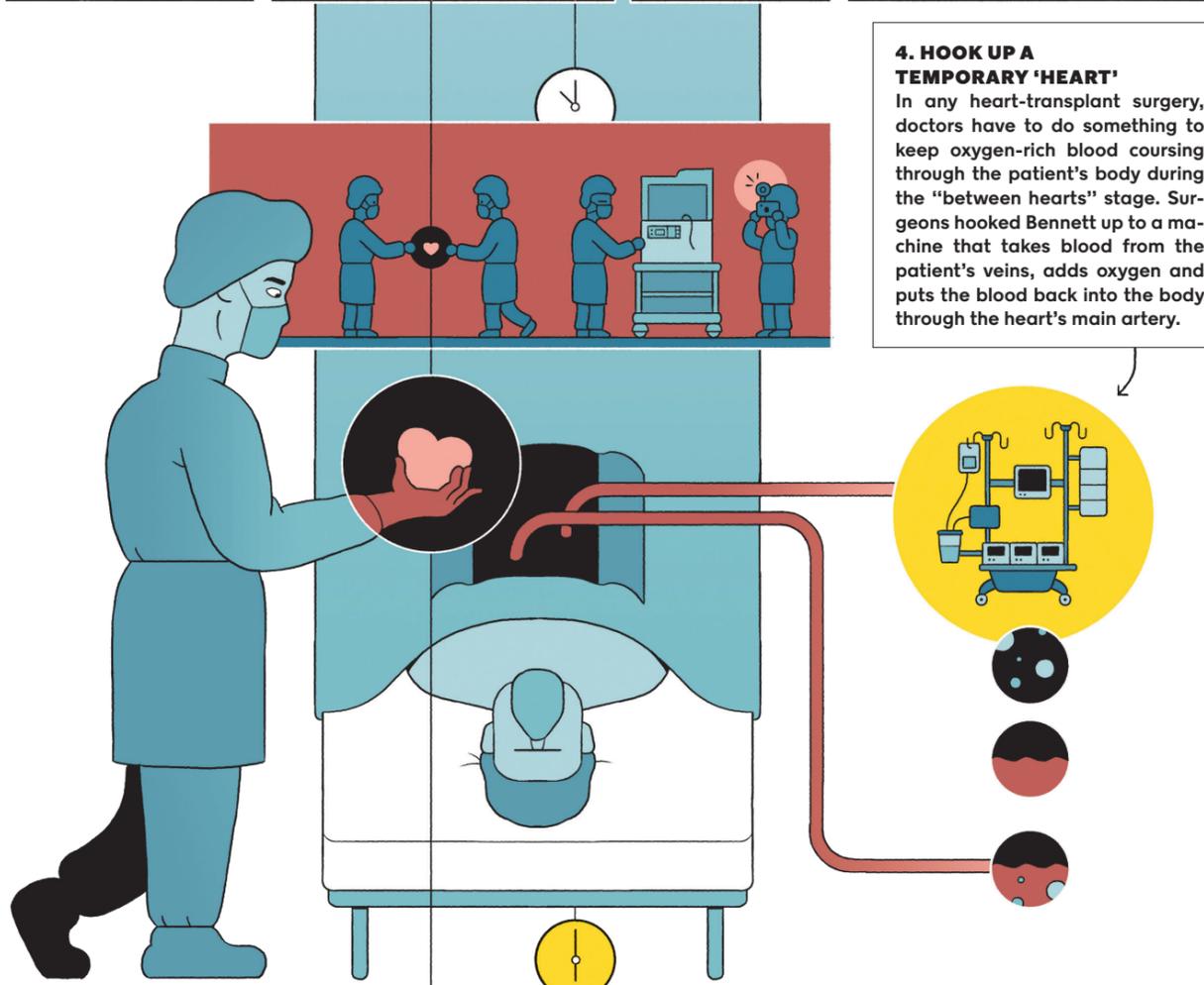
When the pig was a year old, its heart had grown to the right size and was ready for removal. The surgical team put the animal under anesthesia so it wouldn't feel any pain and opened its chest. Then they ran a cool, salty liquid through the blood vessels and chambers of the heart to stop it from beating, and cut the veins and arteries holding it in place.

**3. KEEP THE HEART HEALTHY**

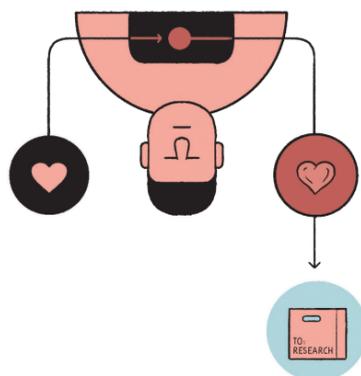
In a normal transplant, doctors usually stick organs that are on their way to a recipient in a cooler full of ice. But for this surgery, to keep the pig's heart in tiptop shape, they put it in a special box with tubes and pumps that circulated fluids through the heart. That kept it healthy while it made its way to the operating room where the patient was being prepped for surgery.

**4. HOOK UP A TEMPORARY 'HEART'**

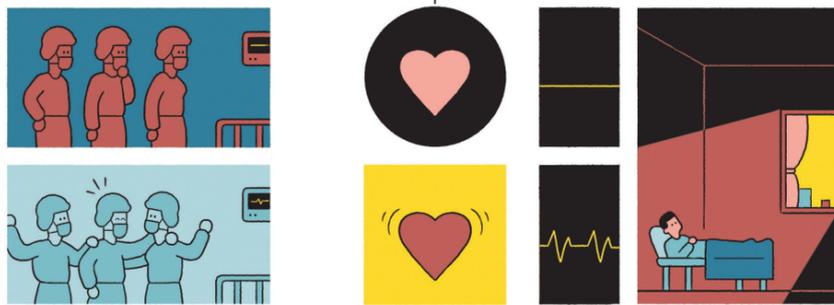
In any heart-transplant surgery, doctors have to do something to keep oxygen-rich blood coursing through the patient's body during the “between hearts” stage. Surgeons hooked Bennett up to a machine that takes blood from the patient's veins, adds oxygen and puts the blood back into the body through the heart's main artery.

**5. MAKE THE SWAP**

Time for the switcheroo. The surgeon clamped the blood vessels feeding Bennett's heart, and cut the organ out of his body. Because it had been diseased for a long time, his veins and arteries were stretched out. After putting the pig heart in, the operating team had to do some creative “nipping and tucking” to stitch its narrower young blood vessels to the old human ones.

**6. THE MOMENT OF TRUTH**

Organ rejection can happen the moment blood starts flowing into the new heart. So everyone in the crowded operating room watched with suspense as the new heart began to beat. When it kept pumping away, the team knew that for the moment at least, his body had accepted the pig heart.

**7. WATCH AND WAIT**

Twelve hours after the pig's chest was cut open, doctors sewed up Bennett's chest and sent him to a hospital room to begin recovery. They'll keep watching for signs of organ rejection, and Bennett will have to take special medicine for the rest of his life. But so far, “the heart is working beautifully,” Griffith says, and all is going well. ♦

4 MORE PIG PARTS WITH POTENTIAL

Scientists and doctors have been putting organs, tissues and cells from animals into humans for hundreds of years, though usually without much success. Many attempts have used organs from chim-

panzees and baboons. In recent decades, though, researchers have come to think that pigs are a better fit. Here are four other pig parts that doctors currently use in humans or are experimenting with.

**HEART VALVES**

Although this was the first time an entire heart was transplanted, doctors have been transplanting pig-heart valves — flaps at the openings of the heart chambers that keep blood flowing the right way — into humans for years.

**SKIN**

If a person is badly burned, doctors sometimes cover the wound temporarily with a piece of pig skin to help it heal.

**CORNEA**

In a study in China, doctors successfully transplanted pieces of pig corneas — the clear dome at the front of the eyeball — into dozens of patients whose own corneas had become infected.

**KIDNEYS**

Last month, surgeons in Alabama replaced a brain-dead man's kidneys with a pair from a genetically modified pig — the first successful pig-kidney transplant.