

Scientists make first human-monkey embryo



Monkey business: Human cells injected into macaque embryos survived for up to 20 days. © Getty

Are scientists opening a Pandora's box? The latest breakthrough could make it possible to grow human organs inside animals. It will save lives, but the ethical implications are enormous.

In a plot twist straight out of Planet of the Apes, scientists confirmed last week they have created the world's first human-monkey in a laboratory in China. The **embryos** were kept alive for only 20 days in petri dishes, but future experiments could produce organs for life-saving transplants.

The US-Chinese team injected human **stem cells** into 132 embryos of long-tailed macaques. These cells were modified to appear bright red so researchers could study their development. The principal investigator Tao Tan said what they saw was "amazing": human cells multiplying and interacting with monkey cells.

Organisms with two sets of DNA are called **chimeras**. The same team, led by Juan Carlos Izpisua Belmonte, created the first human-pig chimera in 2017, but with limited success. Pig and human cells were simply too different. However, in macaques, "the human and monkey cells cooperate with each other in building the embryo".

But why create a chimera in the first place? Belmonte hopes they will solve the global shortage in organ donations. In 1954, doctors accomplished a modern miracle when they carried out the first successful kidney transplant. But only 10% of patients worldwide receive a transplant and the organ shortage fuels the so-called **red market** in illegal body parts.

One solution is to take organs from animals in a procedure called xenotransplantation. In 1984, an American infant known as Baby Fae was given a transplanted baboon heart. She died 21 days later, her body's **immune response** rejecting the foreign tissue. With any transplant, doctors try to match the donor's and patient's blood types and use drugs to suppress the immune system. This is even harder between species.

Chimeras could solve this problem, because they allow human organs to grow inside animals for transplants. This research is in its early stages, but **bioethicist** Julian Savulescu believes "it is only a matter of time" before science fiction becomes reality. This experiment, he says, opens a **Pandora's box** of ethical questions we must face before it is too late.

The key issue is the moral status of these animals. What rights do they have? If chimeras become more like us than non-human animals, would it be ethical to harvest their organs for our benefit? Savulescu says we will have to assess their "mental capacities" to avoid the **dystopian** nightmare of creating an exploited second-class of humans.

Others argue chimeras are not necessary. Biologist Alfonso Martinez Arias says the experiments "do not work" and the alternatives are much more promising. For example, exciting research into **3D bioprinting** and tissue engineering could lead to designer organs, with none of the ethical

concerns. And the economist **Alvin Roth** thinks the solution is even simpler: change the current transplant system to encourage more people to donate.

So, are scientists opening a Pandora's box?

Frankenstein's monkey

Some say yes, this is a monstrous idea. These scientists have clearly never seen any science fiction movie. The story will either end badly for the chimeras, who will live short miserable lives in organ farms so that we can extend ours a little longer. Or the chimeras will break free, reproduce in the wild and take revenge on their creators. We should not play God and meddle with nature.

Others say no, we shouldn't confuse medical progress with science fiction. From hybrid fruit likes clementines to animal crosses like mules, humans have been engineering nature for millennia. Scientists are nowhere near making a race of superintelligent apes. The current research is about a small number of human cells in a laboratory that could help cure disease and save lives.

Glossary

Embryos – A small cluster of fertilised cells that will develop into a new organism. Research on human embryos is limited to the first 14 days of development but the exact point it becomes a living being is a hotly debated and highly emotional issue.

Stem cells – A special embryonic cell with the ability to develop into many different cells and repair damaged tissue. In 2006, researchers discovered how to reprogramme adult cells to become stem cells, overcoming ethical concerns surrounding embryo research.

Chimeras – In Greek mythology, the fire-breathing Chimera had the head of a lion, the body of a goat and a snake for a tail.

Red market – Iran is the only country where it is legal to sell organs. In the rest of the world, they are traded illegally by criminal gangs who exploit vulnerable and desperate groups.

Immune response – The body attacks the organ, treating the transplant like an invading virus.

Bioethicist – Bioethics is the study of moral and philosophical questions arising from advances in biology and medicine.

Pandora's box – In Greek mythology, a jar that, when opened, released sickness and death into the world.

Dystopian – For example, in Kazuo Ishiguro's 2005 science fiction novel *Never Let Me Go*, self-aware clones discover their fate as organ donors.

3D bioprinting – Instead of ink and plastic, tissue engineering uses a "bio-ink" of living cells to make artificial tissue and organs.

Alvin Roth – The Nobel Prize-winning economist devised a "kidney exchange", using economic theory to link up matching pairs of patients and donors.