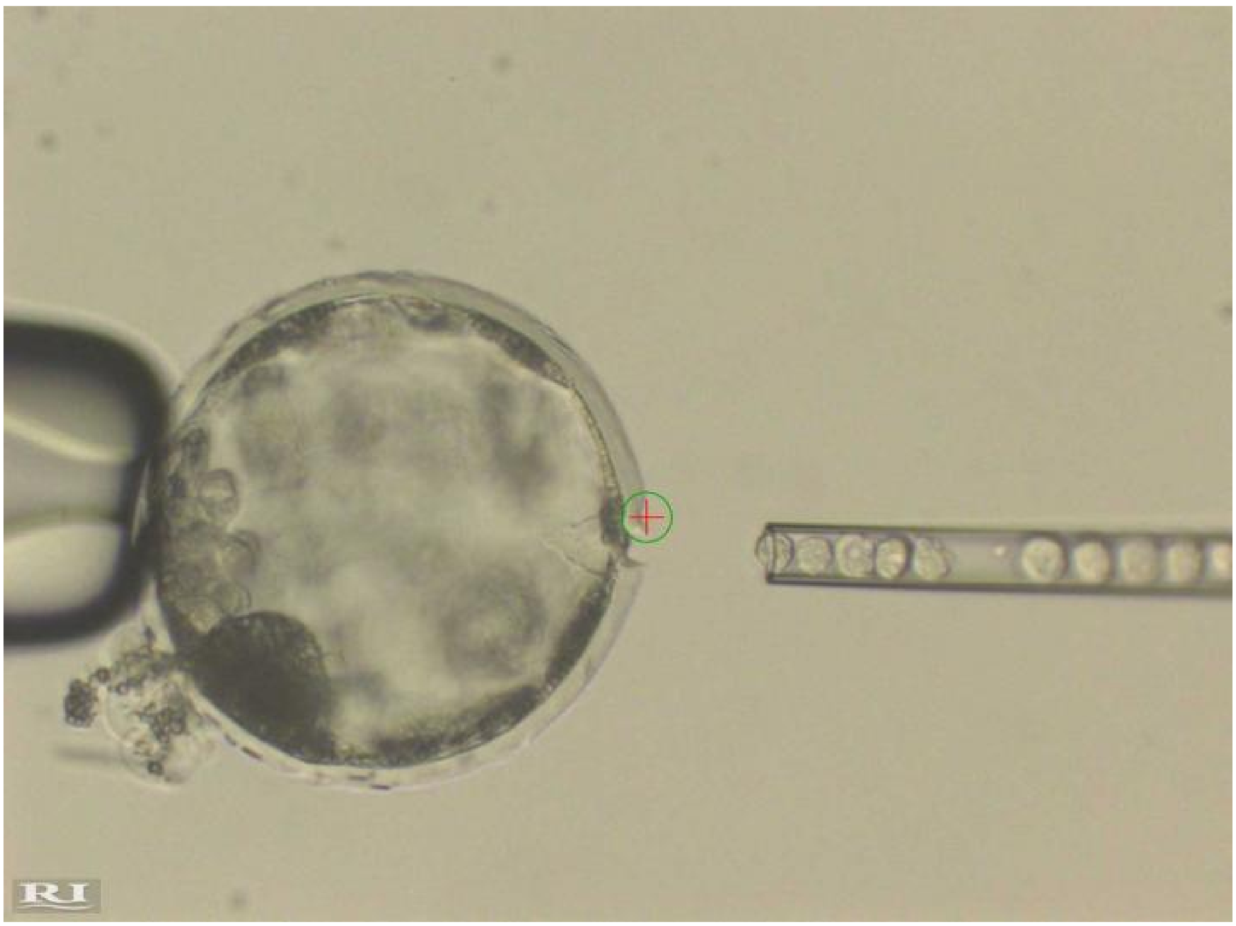
Second successful human-animal hybrid: sheep embryo with human cells

February 20 2018, by Bob Yirka



This photograph shows injection of human iPS cells into a pig blastocyst. A laser beam (green circle with a red cross inside) was used to perforate an opening to the outer membrane (Zona Pellucida) of the pig blastocyst to allow easy access of an injection needle delivering human iPS cells. Credit: of Juan Carlos Izpisua Belmonte

Carrying forward the results of a team that created a pig/human hybrid last year, a team led by researchers at Stanford University has created a sheep/human hybrid. The team has not published a paper on their efforts as yet, but recently gave a presentation outlining their work at this year's American Association for the Advancement of Science meeting in Texas.

As with the team last year, the current researchers say the purpose of creating the human-animal hybrid was to find out if it might be possible to grow human organs in animals to replace defective ones in humans. Such patients would not reject the organs, because the cells used to create them would be their own. The researchers used a sheep in their experiments because its organs are roughly the same size as humans and because in vitro fertilization of sheep is easier than pigs.

The process of creating a hybrid starts with collecting human stem cells, which can grow into any kind of organ. Next, an embryo is harvested from an animal such as a pig or sheep, and its DNA is modified to deactivate the part that would normally be in charge of developing the desired organ, for instance, a liver. Then the human stem cells are inserted into the embryo, which is implanted back into the uterus of the animal that donated it. In this manner a human organ, such as a liver, could be caused to grow inside of a volunteer animal—the embryo would grow into an adult pig or sheep with a human organ inside of it, instead of its own.

The researchers noted that in their work, just 0.01 percent of the cells in the sheep embryo were human, the rest were native sheep cells. Much more than that would be required to actually grow an organ, perhaps as much as 1 percent. The embryos were also not allowed to mature into adults—they were killed after growing for 28 days.

Such research tends to be contentious—some are firmly for it, while others believe it is unethical. NIH, for example, currently does not allow such research using money from the government. Many believe that as researchers move closer to allowing hybrid embryos to grow into adults, more voices will be raised against it.

More information: Towards Xenogeneic Generation of Human Organs, AAAS 2018 meeting, aaas.confex.com/aaas/2018/meet … gapp.cgi/Paper/20877

Abstract
Interspecies blastocyst complementation offers the possibility of generating human organs in animals. The approach requires a host embryo for which development of a specific organ is genetically disabled and human cells with interspecific chimera formation potential. I will present results on the use of CRISPR-Cas9-mediated zygote genome editing for creating pig and sheep organogenesis-disabled host embryos. Also, to address whether human pluripotent stem cells (hPSCs) can contribute to chimera formation in livestock species we systematically evaluated the chimeric competency of several types of hPSCs. The procedures and observations that will be presented regarding the capability of human pluripotent stem cells to integrate and differentiate in an ungulate embryo may constitute a first step towards realizing the potential of interspecies blastocyst complementation for xeno-generating transplantable human tissues and organs towards addressing the worldwide shortage of organ donors.

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