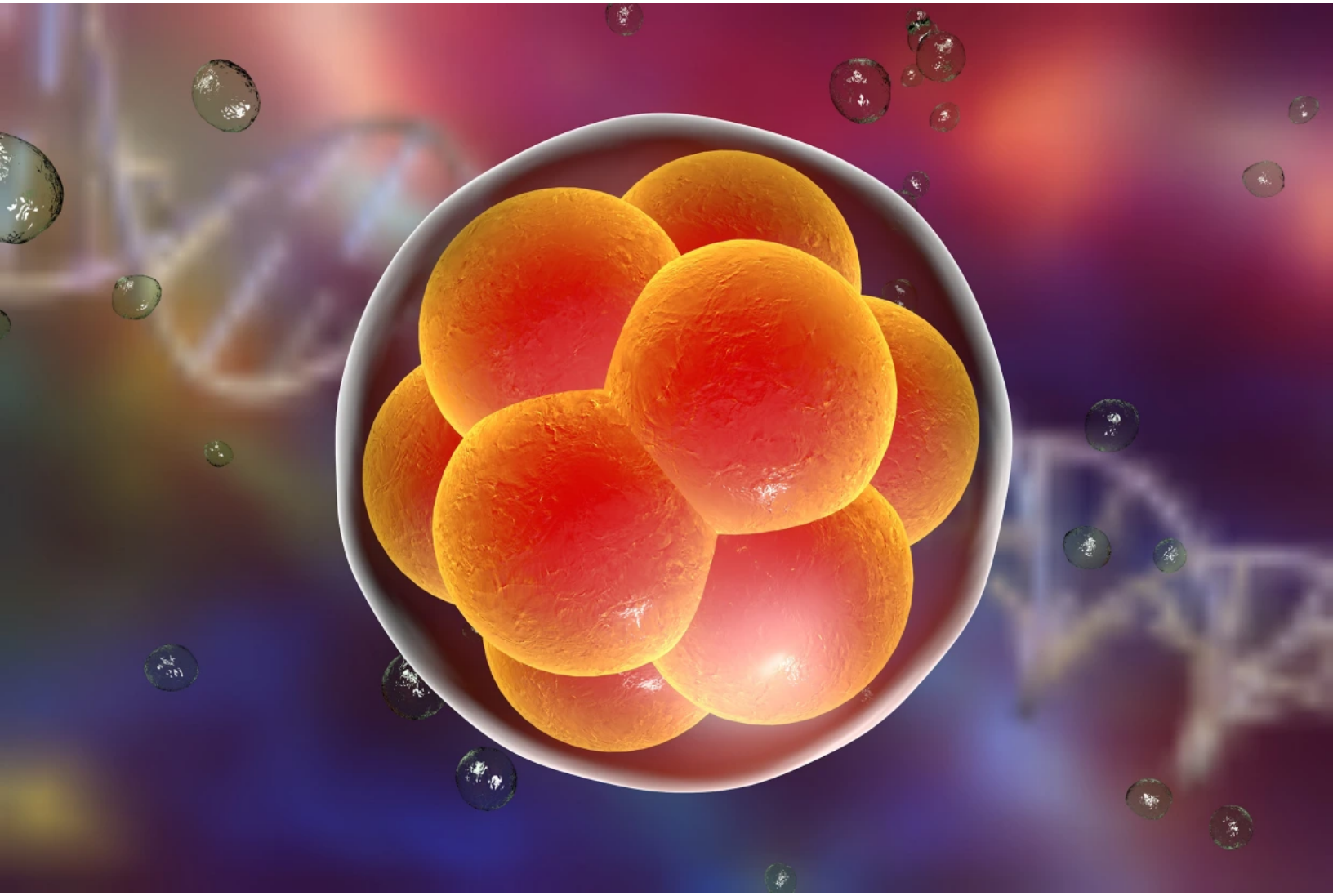
INNOVATION

Why scientists created a human-chicken hybrid embryo

Interspecies mashup could bring cures for deadly diseases, but not everyone is on board.



Scientists say hybrid embryos will offer insights into fetal development. Dr_Microbe / iStockphoto - Getty Images

June 6, 2018, 9:43 AM EDT

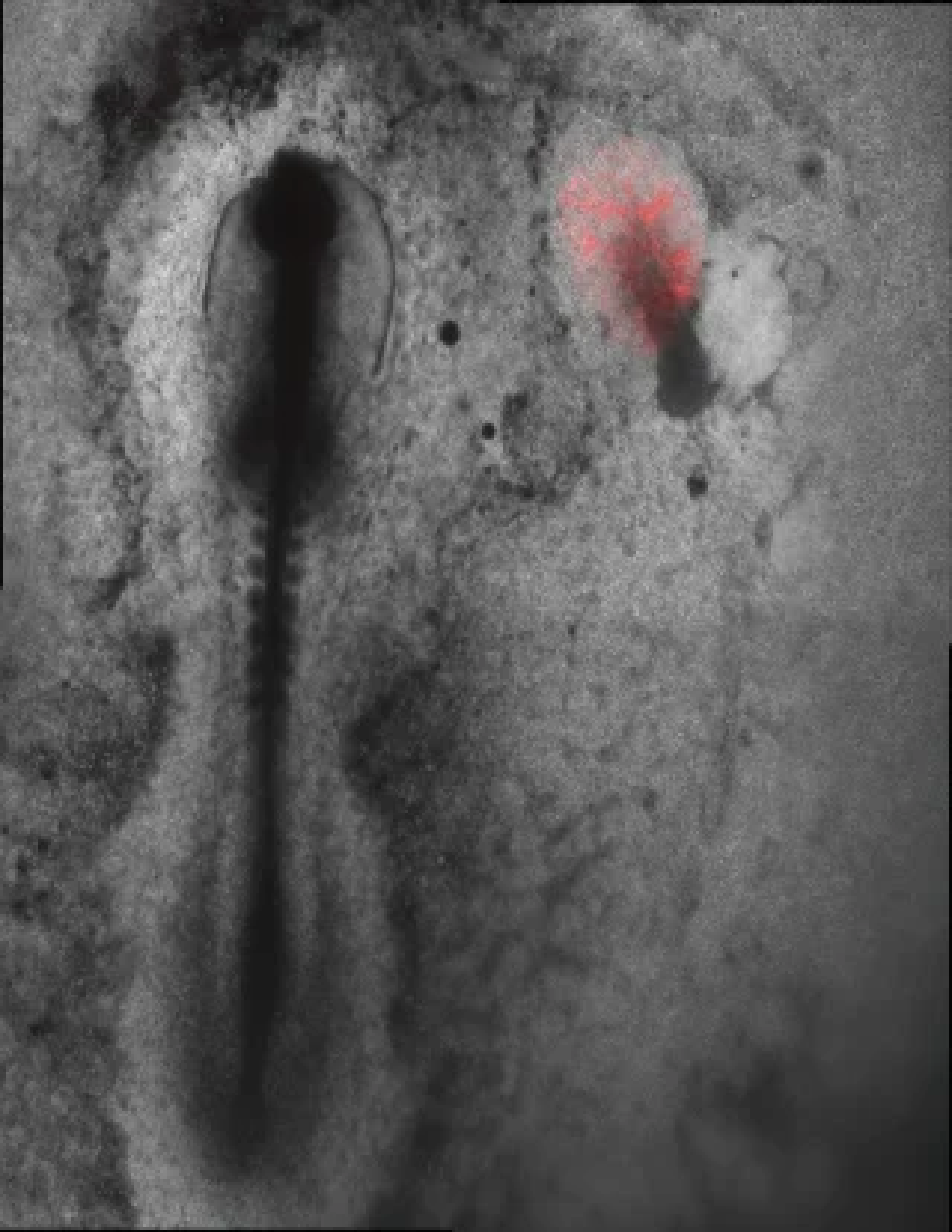
By David Cox

One of the biggest mysteries of human life is how we develop from a tiny ball of cells into a being with bones, muscle and organs. The process starts inside the mother's womb shortly after conception, but legal and regulatory restrictions on research involving human embryonic tissue have stymied scientists' efforts to explain the process.

Now scientists have found a workaround. By transplanting human embryonic cells onto chicken embryos, researchers at Rockefeller University in New York City have created a hybrid embryo that they say will bring insights into fetal development – and perhaps lead to new cures for several diseases – without bumping up against the so-called "14-day rule" that prohibits research on human embryos more than two weeks old.

The popular media blasted the interspecies mash-up, with one headline reading "Half human-half chicken abomination created in US lab," even though no one is talking about creating a race of human-chicken beings. And the scientists defend their work, saying the hybrid embryo will help them understand why some human cells grow into the brain and nervous system, for example, while others form the trunk and limbs.

"We know a lot about the development of a human embryo from a single cell to about 200-300 cells by the time it's transplanted into the mother at the end of the first week," says Ali Brivanlou, head of the university's Laboratory of Stem Cell Biology and Molecular Embryology and the leader of the research. "But for the second week and beyond when the body axis, the structures of the head start forming, and these major decisions are made, it's a black box."



Human embryonic cells (stained with a red dye) transplanted onto the chicken embryo. Rockefeller University

Eric Siggia, a professor of developmental biology at Rockefeller and another scientist involved in the research, said that while there's no proof hybrid embryos will behave in the same way as their human-only counterparts, "this hybrid system is the next best thing. It's a compromise to gain some data on this unknown aspect of human development in a socially responsible yet scientifically valid way."

But not everyone is on board with the idea of mashing up cells in this way.

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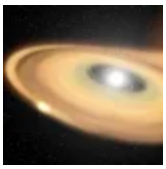

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"They seem to think this is a wonderful solution, but I think they are just creating a different problem," says Arthur Caplan, a professor of bioethics at New York University. "While in their case they're not making a half-man, half-chicken, many politicians will be unnerved that other people could take this and it could be turned into potential cross-species creatures. Engineering unnatural things with your genetic knowledge is touching one of people's deepest fears. It's like Frankenstein."

Caplan says a better solution would be if scientists were allowed to conduct research on human embryos discarded from IVF clinics. "There are hundreds of thousands of these excess embryos which are left unwanted due to couples who wanted children divorcing or destabilizing or even dying in the meantime," he says. "At the moment they're just in freezers, and no one knows what to do with them."

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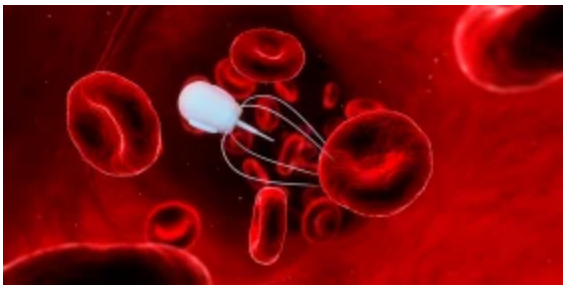

MACH

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For now, it seems likely that scientists will pursue research on the human-chicken hybrid embryos. The Rockefeller scientists plan to use them for research on Huntington's disease, a deadly neurological disorder. The mutant gene that causes Huntington's is already at work in the earliest stages of embryonic development, and the scientists say that understanding how it affects the first few weeks of life could lead to new treatments, possibly within a decade.

The scientists also hope to use the hybrid embryos to find cures for other complex diseases caused in part by mutant genes, including amyotrophic lateral sclerosis (Lou Gehrig's disease) and Alzheimer's.

To study Huntington's disease, Brivanlou is planning to insert the mutant gene into hybrid embryos to see how their subsequent development differs from that of hybrid embryos that lack the gene. Ultimately, he hopes it will be possible to identify drugs that might counteract the abnormal developmental processes and enable humans with the gene to develop normally.

"For every disease where the problem genes are expressed early on in human embryonic development, but the symptoms develop many decades later in life, it would be a good idea to start attacking the problem sooner," Brivanlou says. "In my opinion, this could change reproductive medicine. If we're able to find out what goes wrong early on, maybe we have a better chance of curing it."

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