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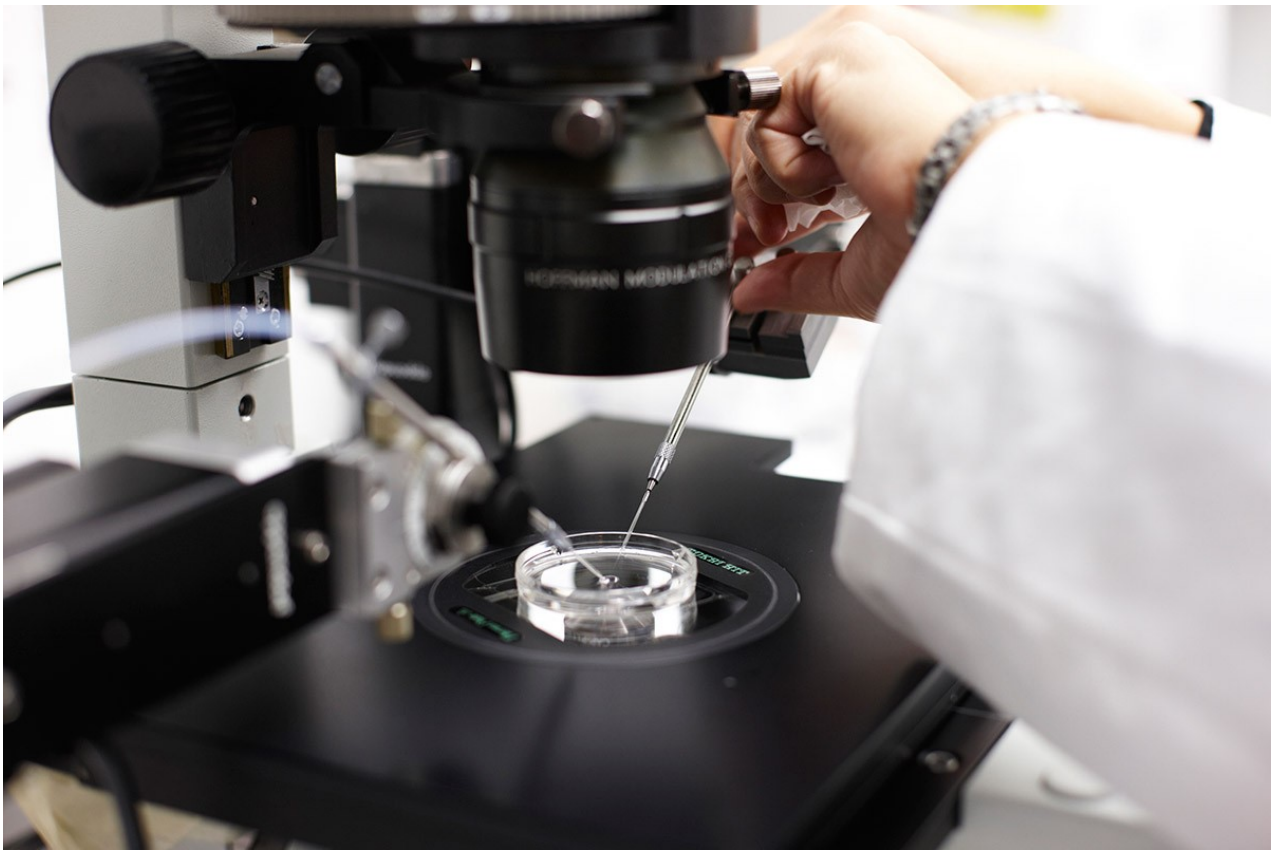
It's time to relax the rules on growing human embryos in the lab

Researchers can only study human embryos up to 14 days past fertilisation, but new techniques can go beyond that – a change in the law would benefit all of us



A week more would help
Chris Leschinsky/Getty

By **Sam Wong**

WHEN it comes to studying our earliest existence, how far are we willing to go? Growing human embryos in the lab beyond the seventh day after fertilisation – the moment when embryos normally implant in the wall of the uterus – has been a long-standing challenge for

biologists, but the latest research is allowing us to extend past that.

Earlier this year, a team led by Ali Brivanlou at Rockefeller University, New York, and another group at the University of Cambridge managed to keep embryos alive for longer than seven days, but they stopped the experiments two weeks in.

It's not that the embryos perished. Guidelines set by national medical societies in the US prohibit growing embryos in the lab for more than 14 days. In the UK and 11 other countries, that limit is enshrined in legislation, and embryos must be destroyed before they develop further.

Until now, this restriction wasn't an issue, but as science has caught up with the law, many researchers are eager to revisit the rule. Clearly, experimenting on well-developed embryos (or fetuses, past the 12th week from conception) would be ethically unacceptable to almost everyone, but that doesn't mean we shouldn't go beyond the first two weeks. The question is, how far, and to what end?

Magdalena Zernicka-Goetz, who led the Cambridge group, wants to open the "black box" surrounding this period of our lives. "It's one of the most critical phases of our early development and we don't know anything about it," she says. By extending the limit we could learn why many pregnancies are lost in the early stages, for example, and improve the current one-in-three success rate of IVF.

At present, our understanding is limited by growing embryos in the lab only up to day 14. Brivanlou's and Zernicka-Goetz's embryos are not organised exactly like human embryos that attach to the uterus, in part because they grow in a flat environment. "The next stage is to be able to grow these embryos in a more three-dimensional structure," says Janet Rossant, a developmental biologist at the Hospital for Sick Children in Toronto, Canada.

Brivanlou argues that many genetic and neurodegenerative diseases start early in embryonic development. Observing how organs grow naturally might let us cure these diseases, or make new organs from scratch, he says.

So there is much to be gained from revising the 14-day limit, given its origins are more pragmatic than scientific. Little was known about the timing of human development when the rule was first proposed in 1979, though studies of other animals hinted at its importance (see "Baby steps").

After two weeks, a feature called the primitive streak appears in the embryo, the first indication of bilateral symmetry. And before this point, two embryos can fuse into one, or one embryo can split to form identical twins. Because of this, policymakers argued that an embryo cannot be considered an individual person before 14 days.

But this limit was not supposed to be philosophical. The Warnock Committee, which advised the UK government on human embryology in 1984, noted that "biologically there is no one single identifiable stage in the development of the embryo beyond which the in vitro embryo should not be kept alive".

Nevertheless, the committee felt a time limit was appropriate, "in order to allay public anxiety". By drawing the line at 14 days, policymakers in the UK and US hoped to permit

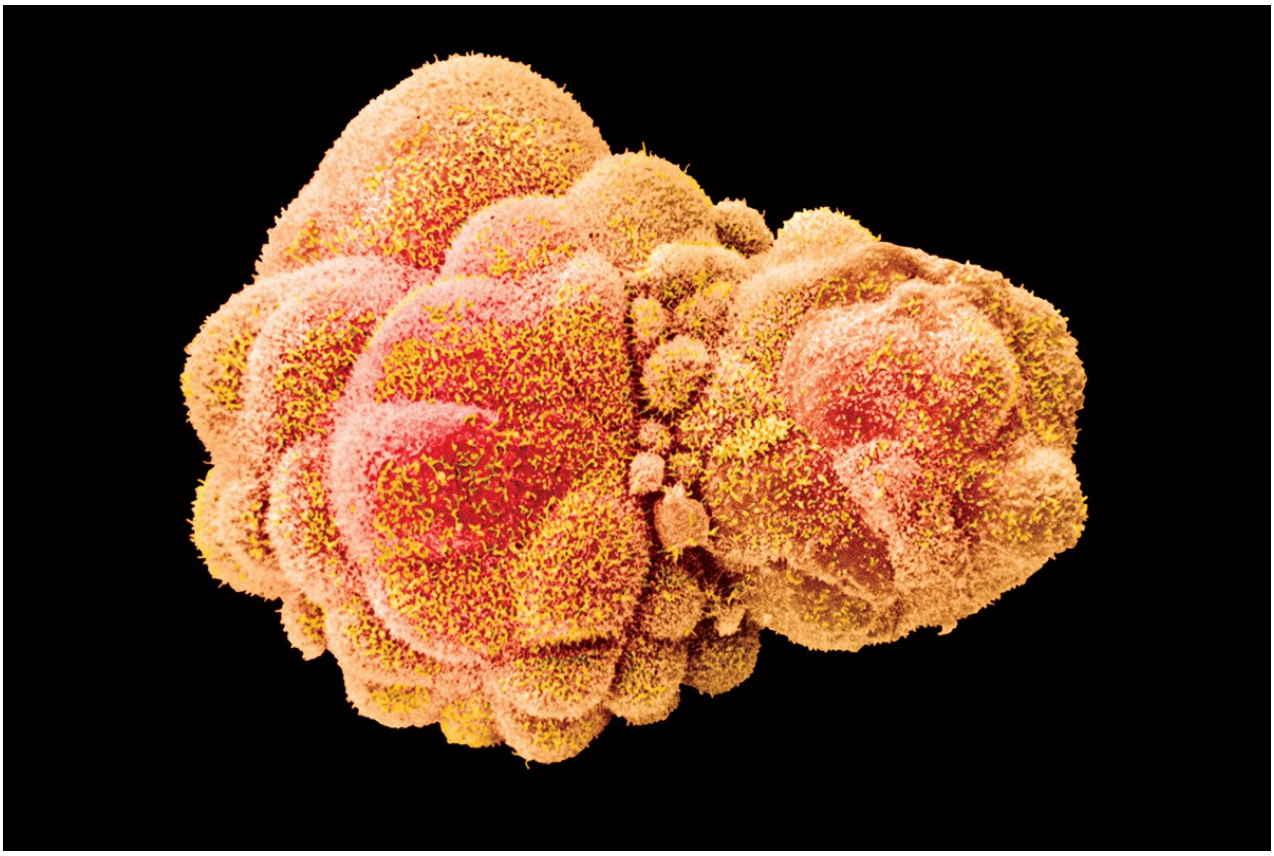
research while showing respect for those with strong views about when life begins.

Jonathan Montgomery, chair of the UK's Nuffield Council on Bioethics, says although the limit was passed into British law in 1990, it's still fair to question it. "We shouldn't think that somehow 14 days was a line at which Parliament had previously decided the embryo was sacrosanct," he says. If scientists make a strong enough case for revisiting it, Parliament could consider changing the law.

Beyond the limit

Discussion among researchers is well under way. Earlier this month, Harvard Law School hosted a conference on the future scope of the 14-day rule, and another meeting will discuss the rule in London in December.

One of the speakers at the Harvard meeting, Insoo Hyun, a bioethicist at Case Western Reserve University in Cleveland, Ohio, says there may be no need to extend the limit just yet. "They're just starting getting up to this time point," he says. "There's still so much more to learn about day 13, for example."



A six-day embryo
DR Yorgos Nikas/SPL

More urgently, grey areas need to be clarified on the fringes of the rule. Brivanlou's group has shown that human embryonic stem cells can grow into structures that resemble post-implantation embryos. These could be a useful model for studying early development, but no one is sure if the rule applies to them.

It might be too soon to shift the 14-day line, but it's worth beginning the conversation, says

Rossant. “There are lots of inputs that need to be considered, ethical, legal, societal, as well as the scientific.”

For those who believe life begins at conception, any research on embryos is unacceptable. “I think the basic question still comes down to what sort of moral worth do we want to give to various human beings,” says Kevin Fitzgerald, a geneticist at Georgetown University, Washington DC, who is also a Jesuit priest.

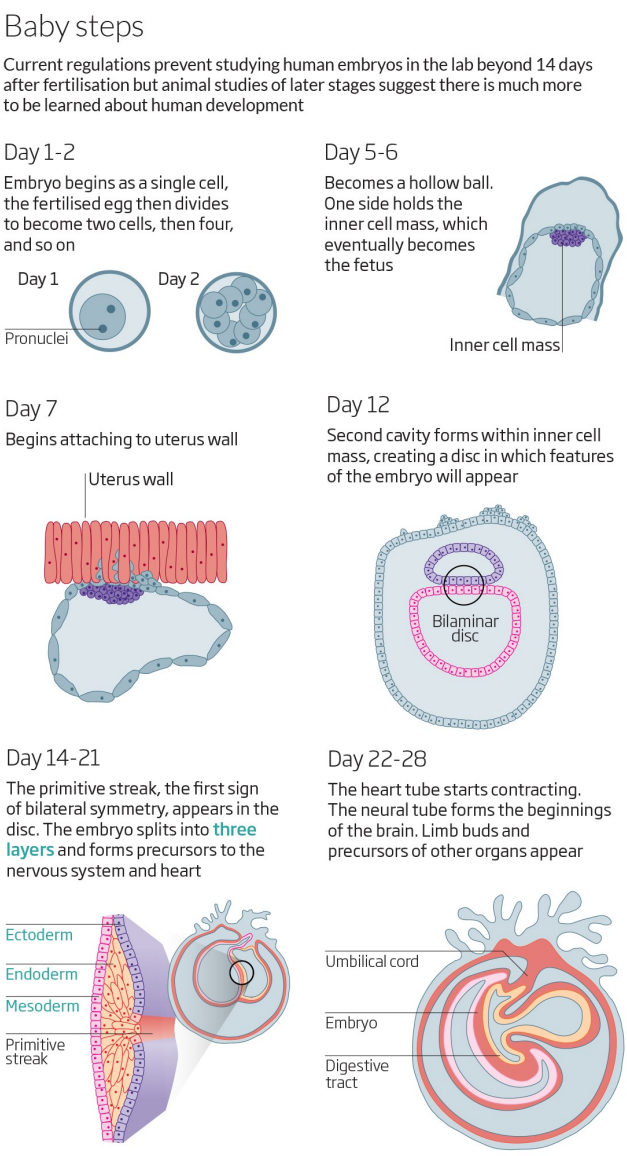
David DeGrazia, a bioethicist at George Washington University in Washington DC, thinks the current rule is overly accommodating of those holding strong beliefs on when life begins. By comparison, abortion law is much less accommodating of conservative views, he says.

If not 14 days, where else could we draw the line? From a philosophical point of view, the crucial matter for moral status is sentience, and the capacity to have feelings, says DeGrazia. That comes much later, perhaps early in the third trimester – far beyond the stage we can imagine embryos reaching in the lab, and what many people would be comfortable with.

So a more realistic suggestion is a smaller change, such as a three-week limit. After that, the precursors of vital organs become identifiable, including beating heart cells and the beginnings of the central nervous system.

Setting the limit at this stage would allow the current trajectory of research to continue, without ruffling too many feathers. “If you can do all the science you want without alienating people with moral concerns so that they’re firebombing clinics, it’s good politics, and it’s respectful,” says DeGrazia.

Hyun argues that we shouldn’t swap the 14-day rule for another arbitrary line in the sand, given we might wish to cross it in future. “Rather than one rule for all research across the board, it needs to be more nuanced,” he says. “We have to look at real specifics about what the research is trying to do and if there’s no other way to answer that question.”



The political reality is that there must be a cut-off point to reassure the public that the research is being tightly regulated. “I strongly think it’s important to have boundaries beyond which we cannot go,” says Zernicka-Goetz.

She and Brivanlou hope the limit will be extended by one or two weeks, but both are adamant that people of all backgrounds and cultures should have their views heard. “This is not a decision for scientists,” says Brivanlou. “It’s a decision we must make as humans.”

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