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WASHINGTON (ABP)–Scientists have successfully tested two new methods designed to achieve the same ends as embryonic stem-cell research while avoiding the ethical controversy over the destruction of embryos.

The two methods are detailed in articles published on the website of the journal Nature. Both involve extraction of stem cells from embryos–highly valued for their potential to treat destructive diseases–without destroying an embryo that could otherwise grow into a healthy fetus.

Previously there was no definitive evidence such cells could be harvested without destroying the embryos that produced them.

Nonetheless, both new methods raise their own sticky ethical questions.

In the first study, two biologists from the Massachusetts Institute of Technology took nuclei from mouse skin cells and implanted them in unfertilized mouse eggs. The resulting bundle of cells was essentially a cloned mouse embryo–a method scientists have referred to as “therapeutic cloning.”

However, researchers Rudolf Jaenisch and Alexander Meissner disabled genes in the cells' nuclei that allow embryos to grow placentas and continue to develop. The alterations rendered the bundles of cells incapable of further development.

The scientists then extracted the stem cells from the disabled embryos. In the second article, a team of researchers from Advanced Cell Technology in Worcester, Mass., grew eight-cell mouse embryos and then removed one of the cells, called blastomeres.

They then extracted the stem cells from the blastomere, while the other seven cells went on to develop into “apparently healthy mice,” the Nature article said.

Scientists are optimistic, the journal reported, both methods could be replicated using human embryos.

The first new method raises the specter of human cloning, as well as issues about the precise moral status of the disabled embryo that is created.

“I think this is an artificial concept, and I'm not comfortable with it,” said Alan Trounson, an Australian reproductive biologist who has done work on stem-cell research. “You do an engineering step to essentially destroy the embryo so that you can then use it.”

“It is unclear whether such an entity should be considered not an embryo, or simply an embryo altered for self-destruction,” said Tony Perkins, president of the Washington-based Family Research Council, in his e-mail newsletter. Perkins' group, like many conservative religious organizations, is strongly opposed to stem-cell research that destroys human embryos, as well as human cloning.

But an advocate of the first method told Nature the embryos created are not ones with an ethical status. “You have the embryonic equivalent of

brain death," said William Hurlbut, a professor at Stanford University.

The second method, meanwhile, poses moral difficulties for two reasons. First, scientists don't know with a high degree of certainty if the removal of one cell at the embryonic stage will cause long-term developmental problems for the resulting human. Second, the removed blastomere destroyed in the process itself may have the potential to grow into an embryo.

"If you grow it in certain conditions, it could divide and differentiate to have the same properties as embryos," said Yuri Verlinsky, head of the Reproductive Genetics Institute in Chicago, according to Nature.