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By LINDSEY TANNER, AP Medical Writer

2 hours, 29 minutes ago

CHICAGO - Scientists for the first time have grown human heart valves using stem cells from the fluid that cushions babies in the womb — offering a revolutionary approach that may be used to repair defective hearts in the future.

The idea is to create these new valves in the lab while the pregnancy progresses and have them ready to implant in a baby with heart defects after it is born.

The Swiss experiment follows recent successes at growing bladders and blood vessels and suggests that people may one day be able to grow their own replacement heart parts — in some cases, even before they're even born.

It's one of several sci-fi tissue engineering advances that could lead to homegrown heart valves for infants and adults that are more durable and effective than artificial or cadaver valves.

"This may open a whole new therapy concept to the treatment of congenital heart defects," said Dr. Simon Hoerstrup, a University of Zurich scientist who led the work, which was presented Wednesday at an [American Heart Association](#) conference.

Also at the meeting, Japanese researchers said they had grown new heart valves in rabbits using cells from the animals' own tissue. It's the first time replacement heart valves have been created in this manner, said lead author Dr. Kyoko Hayashida.

"It's very promising," University of Chicago cardiologist Dr. Ziyad Hijazi said of the two studies. "I don't doubt" that it will be applied one day in humans, he said.

One percent of all newborns, or more than 1 million babies born worldwide each year, have heart problems. These kill more babies in the United States in the first year of life than any other birth defects, according to the [National Institutes of Health](#).

Heart valve defects can be detected during pregnancy with ultrasound tests at about 20 weeks of pregnancy. At least one-third of afflicted infants have problems that could be treated with replacement valves, Hoerstrup said.

"It could be quite important if it turns out to work," said Dr. Robert Bonow, a Northwestern University heart valve specialist.

Conventional procedures to fix faulty heart valves all have drawbacks. Artificial valves are prone to blood clots and patients must take anti-clotting drugs for life. Valves from human

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cadavers or animals can deteriorate, requiring repeated open-heart surgeries to replace them, Hijazi said. That's especially true in children, because these valves don't grow along with the body.

Valves made from the patient's own cells are living tissue and might be able to grow with the patient, said Hayashida, a scientist at the National Cardiovascular Center Research Institute in Osaka.

The Swiss procedure has another advantage: using cells the fetus sheds in amniotic fluid avoids controversy because it doesn't involve destroying embryos to get stem cells.

"This is an ethical advantage," Hoerstrup said at the meeting.

Here's how the experiment worked:

Amniotic fluid was obtained through a needle inserted into the womb during amniocentesis, a prenatal test for birth defects that is often offered to pregnant women aged 35 and older.

Fetal stem cells were isolated from the fluid, cultured in a lab dish, then placed on a mold shaped like a small ink pen and made of biodegradable plastic. It took only four to six weeks to grow each of the 12 valves created in the experiment.

The researchers said lab tests showed they appeared to function normally.

The next step is to see if they work in sheep, a two-year experiment that Hoerstrup said is under way.

He and co-researcher Dorthe Schmidt called their method "a promising, low-risk approach enabling the prenatal fabrication of heart valves ready to use at birth."

Hoerstrup said amniotic stem cells also can be frozen for years and could potentially be used to create replacement parts for aging or diseased valves in adults, too.

The research is preliminary and experts say implanting tissue-engineered human valves in human hearts is likely years away. But it's not as far-fetched as it sounds.

Earlier this year, U.S. scientists reported re-engineering seven diseased bladders with tissue grown from the patients' own cells.

And last year, researchers reported that two kidney dialysis patients from Argentina had received the world's first tissue-engineered blood vessels, fashioned from their own skin and vein tissue.

Dr. John E. Mayer Jr., a Children's Hospital Boston heart surgeon and tissue engineering pioneer, said scientists are optimistic that this area of research will revolutionize how people with valve disease will be cared for in the future.

About 250,000 patients worldwide have surgery to replace heart parts each year, according to Mayer.

In one of Mayer's experiments, heart valves fashioned from stem cells harvested from sheep bone marrow appeared to function normally when implanted in sheep. A similar experiment used cells harvested from sheep arteries.

Hoerstrup said amniotic fluid is potentially a richer source of stem cells than other sources.

Mayer said the big question is whether stem cells from amniotic fluid can create valves superior to those made from other cell types.

"I'm pretty sure the ball will continue to be advanced down the field," Mayer said. "We'll get there one way or the other."

On the Net:

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