



ANGEL NEWS

Alström Angels Newsletter

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Lab-Grown Organs, Custom Made for YOU!



Senator Pat Toomey Speaking on behalf of Sara Murnaghan on the Senate floor.

You may remember a few months ago when 10-year-old Sarah Murnaghan finally got the lung transplant she'd been waiting for after her parents sued to give her a better shot at surgery.

Her cystic fibrosis was threatening her life, and her case spurred a debate on how to allocate donor organs. Lungs and other vital organs for transplant are scarce among children.

Growing organs

What if you could grow a custom-made organ in a lab? It sounds like science fiction, but just a three-hour drive from the Philadelphia hospital where Sarah got her transplant, another little girl is benefiting from just that sort of technology.

Two years ago, Angela Irizarry of Lewisburg, Pa., needed a crucial blood vessel. Researchers grew her one in a laboratory, using cells from her own bone marrow. Today the 5-year-old sings, dances, and dreams of becoming a firefighter — and a doctor.

The advantage of growing organs, especially in young children, is that the implant can grow along with the child, so it would not have to be replaced later.

Growing lungs and other organs for transplant is still in the future, but scientists are working toward that goal. In several labs across the country, scientists are studying how to grow organs from a patient's own cells to create custom-made implants.

Organs on demand

Here's the dream scenario: A patient donates cells, either from a biopsy or a simple blood draw. A lab uses those cells and "seeds" them onto a scaffold that's shaped like the organ that patient needs. Then, says Dr. Harald Ott of Massachusetts General Hospital, "we can regenerate an organ that will not be rejected (and can be) grown on demand and transplanted surgically, similar to a donor organ."

Unfortunately, that won't happen anytime soon for complex organs like lungs or livers. But simpler body parts are already being grown and used as researchers explore the possibilities of the field.

In some cases growing organs has even become standard practice. Surgeons can use a patient's own cells to repair cartilage in the knee, and burn victims can be treated with lab-grown skin.



Human ear grown in a laboratory from healthy cells donated from a patient

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Dr. Anthony Atala holds the "scaffolding" for a human kidney created by a 3-D printer in a laboratory at Wake Forest University in Winston-Salem, North Carolina.

Livers, hearts, and kidneys....fresh off the printer!

So far, the lab-grown parts implanted in people have involved fairly simple structures - basically sheets, tubes, and hollow containers notes Dr. Anthony Atala of Wake Forest University, whose lab has also made scaffolds for noses and ears. Solid internal organs like livers, hearts and kidneys are far more complex to make.

His pioneering lab at Wake Forest is using a 3-D printer, similar to an ink-jet printer; it "prints" different types of cells and the organ scaffold one layer at a time. Instead of depositing ink, the printer puts down a gel-like biodegradable scaffold plus a mixture of cells to build an organ layer by layer. However, Atala expects it will take many years before printed organs find their way into the human body.

100,000 stem cells = endless possibilities

Growing a copy of a patient's organ may not always be possible - for instance, when the original organ is too damaged by disease. One solution for such patients may be stem cells. Atala's

team has shown that stem cells can be collected without harming human embryos (eliminating political controversy) from amniotic fluid in the womb. Researchers can manipulate those cells into becoming heart, liver, and other organ cells. A bank of 100,000 stem cell samples, Atala says, would have enough genetic variety to match nearly any patient. Surgeons could order organs to be grown as needed instead of waiting for cadavers that might not be a perfect match.

Are donor cells the future?

Others look to stem cells from bone marrow or body fat that could be nudged into becoming the right kinds of cells for particular organs. In the near future though, organs are more likely to be grown with donor cells stored in a lab, but this would still require the organ recipient to take anti-rejection drugs.

How long until doctors start testing solid organs in people? Some doctors hope to see human studies on lab-grown organs in five-to 10-years. Other doctors call this timeframe very optimistic and think 15-to 20-years is more realistic.

Because Alström Syndrome causes multiple organ failure, many children require life saving transplants. To date, Alström children have successfully received heart, lung, liver, kidney, and pancreas transplants. Many children need more than one vital organ transplanted during their lifetime.



Top Left: Scaffolding of a human nose. Side Right: Scaffolding of a human ear.



Both were printed from a 3D printer in a laboratory at Wake Forest University.

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