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Spotlight on: artificial organs

Background

Hannover Medical School (MHH) is Europe's largest lung transplant centre. Various working groups are currently researching a biohybrid lung that is intended to offer an alternative to donor organs. The research project has been financially supported by the German Research Foundation with the focus „towards an implantable lung“ since 2017. The promising research approach will also be funded in the next three years.

A big step for medicine

The first organ or tissue transplant was performed in 1886. Since then, doctors around the world have been trying to save seriously ill people through targeted organ donations and help them back to a normal life. The problem is obvious: there are not enough organ donations to do justice to all the people on the waiting list. Patients who need a life-saving organ are often on the waiting list for years and are constantly on call. Not only is the number limited, but the organs have to be compatible with the patient's characteristics.

In Germany, 9,100 people are currently waiting for an organ that will determine their lives. Just 36% of Germans have an organ donor card, which enables medical personnel to remove organs after their death and release them for transplantation. In 2020, 4,900 people were added to the waiting list, the majority of whom are waiting for a donor kidney. Last year alone, 767 people on the waiting list died as a result of their diseases or acute organ failure.

In Germany, a total of 3,518 organ transplants were performed in 2020, of which around 1,900 were kidneys. In comparison, only 339 lungs and 92 hearts successfully saved another person's life. But what can be done when resources are limited and demand is steadily increasing? With the development and successful transplantation of artificial, customised organs, medicine is taking a giant step into the future. But can organs be grown in the laboratory and what advantages does it offer?

The research team at Hannover Medical School (MHH) is working on a biohybrid lung. The basis of the construct is an extracorporeal membrane oxygenation system, which takes over the task of a heart-lung machine and is already being used clinically. The system simulates the gas exchange of the lung by extracting carbon dioxide from the blood and enriching it with oxygen. The problem with an ordinary ECMO is that they cannot be implanted permanently, but only temporarily support lung function. The reason for this is the formation of blood clots on the artificial surface, which clog the tubes and cause thromboses. The aim is now to cover the surface of the ECMO, i.e. the blood pump, gas exchange membranes and tubes, with endothelial cells.



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In addition, the endothelial cells are to be slightly genetically modified so that they are not perceived as a danger by the immune system and as a result no rejection reactions are caused.

In the next step, the research group will focus on the friction resistance and adhesion of the endothelial cells to the ECMO surface. In addition, the so far angular shape of the biohybrid lung needs to be revised in order to be optimally adapted to the conditions of the human body and to be implanted.

Researchers hope that the greatest advantage will be the faster treatment and provision of organs that match the biological characteristics of the waiting patients. Because of this compatibility, doctors expect a massive reduction in the body's agonising rejection reactions to the new organ.

What do you think of the idea of artificial organs? Are you an organ donor yourself or have you already dealt with the issue? Would you like to know more about it? We would be happy to research the subject in more depth for you or put you in touch with a company, a research group or even a personal contact with a specialist. Simply contact us with your request! arcoro CONNECT connects research, companies and interested parties - personally and directly.

RESEARCH CENTER	LOCATION	WEBSITE	FIELD OF EXPERTISE
Medizinische Hochschule Hannover (MHH)	Germany	https://www.mhh.de/	Artificial organs
RMIT-University	Australia	https://www.rmit.edu.au/	Artificial organs
Rice University	USA (TX)	https://www.rice.edu/	Artificial organs
Leibniz Forschungslaboratorien für Biotechnologie & künstliche Organe (LEBAO)	Germany	https://www.lebao.de/	Artificial organs
NMI Naturwissenschaftliches und Medizinisches Institut	Germany	https://www.nmi.de/de/	Artificial organs
McGowan Institute for Regenerative Medicine	USA (PA)	https://mirm-pitt.net/	Artificial organs
Institute of Transplantology and Artificial Organs (NIITiO)	Russia	https://www.istc.int/en/	Artificial organs
Artificial Organ Centre for Bio-medical Engineering Research	Swiss	https://www.artorg.unibe.ch/	Artificial organs
Niedersächsisches Zentrum für Biomedizintechnik, Implantatforschung und Entwicklung (NIFE)	Germany	https://nife-hannover.de/	Artificial organs



Would you prefer a direct contact person to exchange information about innovative research approaches and trend developments of artificial organs? During our research, we were able to identify some very interesting experts for you. Convince yourself of the industry experience and the outstanding competences of the specialists.

INDUSTRY EXPERTS	JOB POSITION	FIELD OF EXPERTISE
Prof. Dr. rer. nat. Torsten Blunk	Head of Accident Surgery Research	Trauma Surgery Research / Tissue Engineering & Biofabrication
Dr. Bettina Wiegmann	Research leader for an implantable biohybrid lung at NIFE	Biohybrid lung & biohybrid heart support system
Univ.-Prof. Dr. med. Jan Gummert	Director of the Clinic for Thoracic and Cardiovascular Surgery	Artificial heart medicine

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