Press release

Towards 3D bioprinted liver tissue constructs: NEOLIVER

European consortium to develop Automated Generation of Dense, Functional and Perfusable Bioprinted Liver Constructs for Transplantation

European Union (EU) Horizon Europe and Swiss State Secretariat for Education, Research, and Innovation co-funded NEOLIVER Consortium (total €10M award) is set to develop world's first autologous bioprinted liver designed for clinical use. Coordinated by University of Utrecht, twelve consortium members will develop technologies to establish an automated manufacturing line, vascularize the bioprinted liver constructs by a novel strategy and validate them pre-clinically.

Liver disease is a major global health challenge, responsible for approximately 2 million deaths annually. NEOLIVER's innovative approach aims to alleviate the burden of liver disease by providing a scalable and personalized solution which could in the future be utilized for liver transplantation. The consortium combines two bioprinting approaches to create dense, functional, and vascularized liver constructs using patient-derived organoids and supporting cells.

NEOLIVER will tackle key technological challenges and barriers in whole organ engineering by merging two bioprinting technologies and exploring five innovation routes:

1. Cell Sources: NEOLIVER expands and standardizes the production of organoids and supporting cells from multiple donors.
2. Bioprinting Tools: NEOLIVER utilizes LIFT technology for precise and high-speed bioprinting of liver constructs.
3. Vascularization: The consortium integrates bioprinted vessels and native donor vessels to create fully vascularized liver constructs.
4. Automated Manufacturing: NEOLIVER implements a GMP-conform automated manufacturing capability for large-scale production.
5. Clinical Validation: Functionality of bioprinted liver constructs will be validated preclinically and plan for first-in-human trials will be prepared.

NEOLIVER is built upon excellent results of ORGANTRANS EU-funded project, which developed the key technologies and concepts, and which successfully transplanted small liver constructs into mice. NEOLIVER pushes the boundaries of tissue engineering further by automating the bioprinting process and producing a larger functional tissue. According to Professor Spee:

"The combined NEOLIVER consortium expertise will enable us to develop and deploy a larger tissue to demonstrate its potential for future clinical use in addressing the donor organs shortage in the future. If successful, the NEOLIVER approach will be scalable to other organ systems, leveraging organoid technology—a cornerstone of regenerative medicine".

Additional information

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NEOLIVER consortium

About NEOLIVER

Despite advances in organ transplantation technology, there is still a huge shortage of transplantable organs. Yearly, 25% of patients with end-stage liver disease on the donor waiting list die, emphasizing the need for alternatives to organ donations, such as bioprinting. Bioprinting presents a promising approach for creating organs from scratch, yet, it faces significant hurdles due to technical and biological challenges, combined with lacking standardized procedures and materials. In NEOLIVER, we will develop large, dense, and vascularized fully functional bioprinted constructs suitable for transplantation. We will achieve this by establishing a GMP-conform manufacturing line for standardized production, ensuring unparalleled quality and safety for future patients. More specifically, by using patient-derived organoids and supporting cells including endothelial cells, we will generate millions of multicellular spheroids as building blocks for bioprinting. Through laser induced forward transfer (LIFT) bioprinting techniques we will create a vascularized liver construct via precise spatial deposition of spheroids and vessels at high density. By integrating this technology with extrusion-based bioprinted vessels for blood supply, we will generate the world's first autologous bioprinted liver, ready for transplantation. To show the safety and efficacy, we will transplant the bioprinted liver constructs in immune-deficient pigs. This, combined with a clinical validation plan, upscaling strategy and Health Technology Assessment (including patient acceptance), will prepare the bioprinted liver constructs for first-in-human trials. Thus, NEOLIVER presents a disruptive alternative to donor organs for patients dealing with end-stage liver disease.

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The project website is under preparation (www.neoliver.eu).

Project duration: 1 January 2025 – 31 December 2028.

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