

ECaBox "Eyes in a Care Box" Project: Regenerating human retina from resuscitated cadaveric eyes

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<https://ecabox.eu>

BACKGROUND/AIMS

In the last decade, basic and translational research dramatically expanded the development of new drug and regenerative therapies. Preclinical research still lacks adequate models of human organs and even though human organoids approaches are a major step forward in mimicking physiological conditions, they fail to reflect the overall tissue physiology and complexity. Human dissected retinæ and non-vascularised human eye organoids fail to recapitulate the vascular and tissue systems. To address these needs, the ECaBox project aims to develop a dedicated platform, the ECaBox (Eyes in aCare Box) to resuscitate the human cadaveric eye while ensuring eye function and structure *ex vivo*.

METHODS

To develop the ECaBox technology, a multidisciplinary and international consortium was assembled, including experts in biology, biotechnology, modelling, engineering and physics. One of the main objectives was to develop a functioning prototype to assess the regeneration and functional rescue of the eye. The team defined high level requirements in terms of: organ containment, liquid containment and hydration, liquid recirculation and oxygenation.

RESULTS

We developed a prototype that enabled perfusion and resuscitation of *ex vivo* eyes under defined conditions. Preliminary outcomes support the feasibility of post-mortem ocular support using our first-of-its-kind ECaBox system.



CONCLUSION

The ECaBox should have an enormous impact in advancing regenerative medicine by providing an intact human organ to explore and analyse regenerative processes *ex situ*, allowing to: resuscitate human eyes to test human eye therapies *ex situ*, serve as a proof of concept to develop therapies also in other organs contributing to reduce the current gap between the organ demand and the suitable organ availability for transplantation.



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