Improved Conservation of Transplant Organs with an Innovative Organ Perfusion Solution

Background & Innovation

The **loss of organ** function can lead to severe physical disability and ultimately death. In many cases, the **transplantation of donor organs** is the only therapeutic option for the patients. The demand for kidneys is by far the highest, the waiting time is correspondingly long: ~10 years (Germany). For all other organs as well, the need by far exceeds the number of donations. Transplantation of these organs – e.g. heart, lungs, or liver – is often even more urgent because respective treatment methods do not allow for prolonged survival as dialysis allows in case of the kidney.

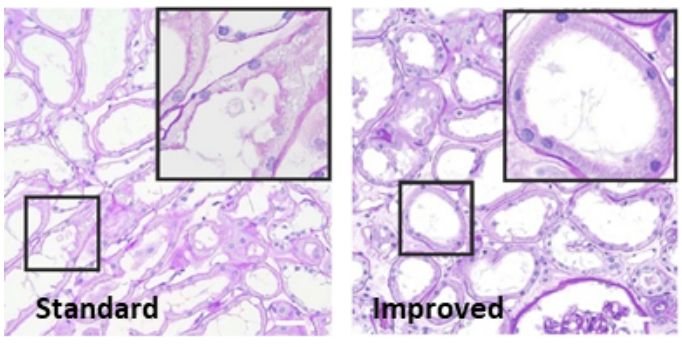

Fig. 1: Periodic acid-Schiff (PAS) staining of human kidneys treated with standard and improved NMP

The supply of donor organs can be effectively increased (via prolonged storage, function testing and conditioning) by **normothermic machine perfusion (NMP)**.

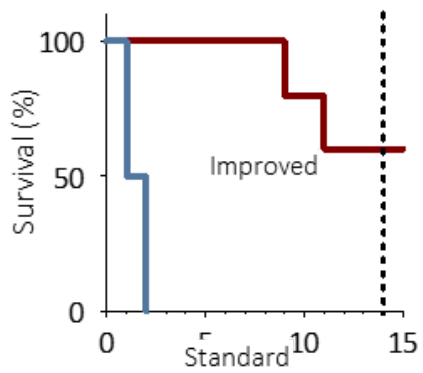

Fig. 2: Improved survival in rat kidney Tx model

We developed a **new, innovative perfusion buffer to improve normothermic machine perfusion** which shows **increased cellular viability** compared to previous perfusion buffers in kidney and liver (mouse, rat, pig and human model) and a **significantly longer survival** of transplanted animals (rat model).

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Technical Description

We analyzed the transcriptome, proteome and metabolome of kidneys before and after NMP. Based on our findings we composed an innovative buffer for NMP.

Our new buffer is a synthetic, buffered crystalloid solution to which albumin, components of the citric acid cycle, several fatty acids and β-nicotinamide (NADH) are added.

This new organ perfusion solution was tested in NMP of mouse, rat, pig and human kidneys. The PAS staining in Fig. 1 shows improved kidney tissue integrity after NMP with the improved buffer.

When tested in a survival model of rat kidneys transplanted after NMP with the improved buffer, kidney function was improved and **survival greatly enhanced** with the improved buffer.

The degree to which apoptosis was induced was determined using the TUNEL method. This method detects apoptotic DNA fragmentation, hence quantifies apoptotic cells. The use of the innovative improved NMP resulted in a **significantly lower induction of apoptosis compared to the standard NMP** in mouse, rat, pig and human kidney and pig livers, as can be seen in Fig. 3.

Competitive advantage

- **Significantly lower induction of apoptosis**
- **Increasedcellular viability**
- **Prolonged survival**

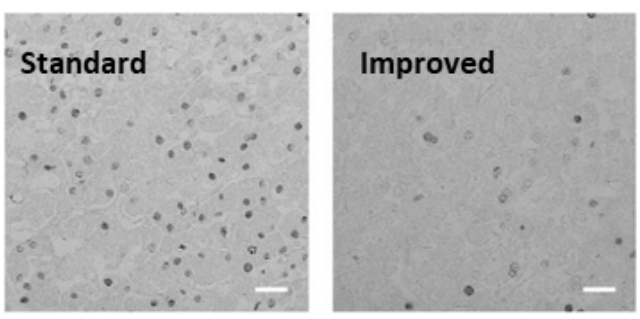
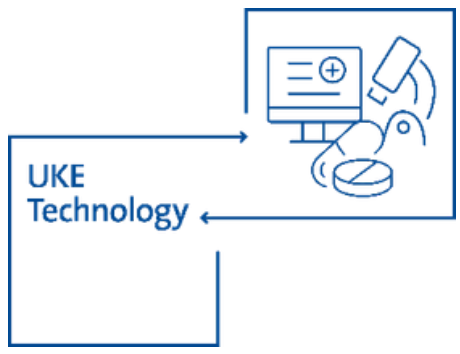


Fig. 3: TUNEL (Apoptosis) staining of pig livers with standard and improved NMP



FOCUS SECTORS

- Medtech
- Nephrology
- Organ transplantation
- Hepatology

PROJECT KEY WORDS

- Organ transplantation
- Normothermic machine perfusion
- Organ perfusion solution

DEVELOPMENT STATUS

- POC
- Test in *ex-vivo* model of kidney (mouse, rat, pig, human) and liver (pig)
- *In-vivo* transplantation studies (rat)

PATENT PROCEDURE STATUS

- EP and PCT Patent application filed

POTENTIAL FOR COOPERATION

- R&D Cooperation
- Licensing
- Transfer of rights

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