

The role of Perfluorocarbon-based nanodroplets in Machine Perfusion

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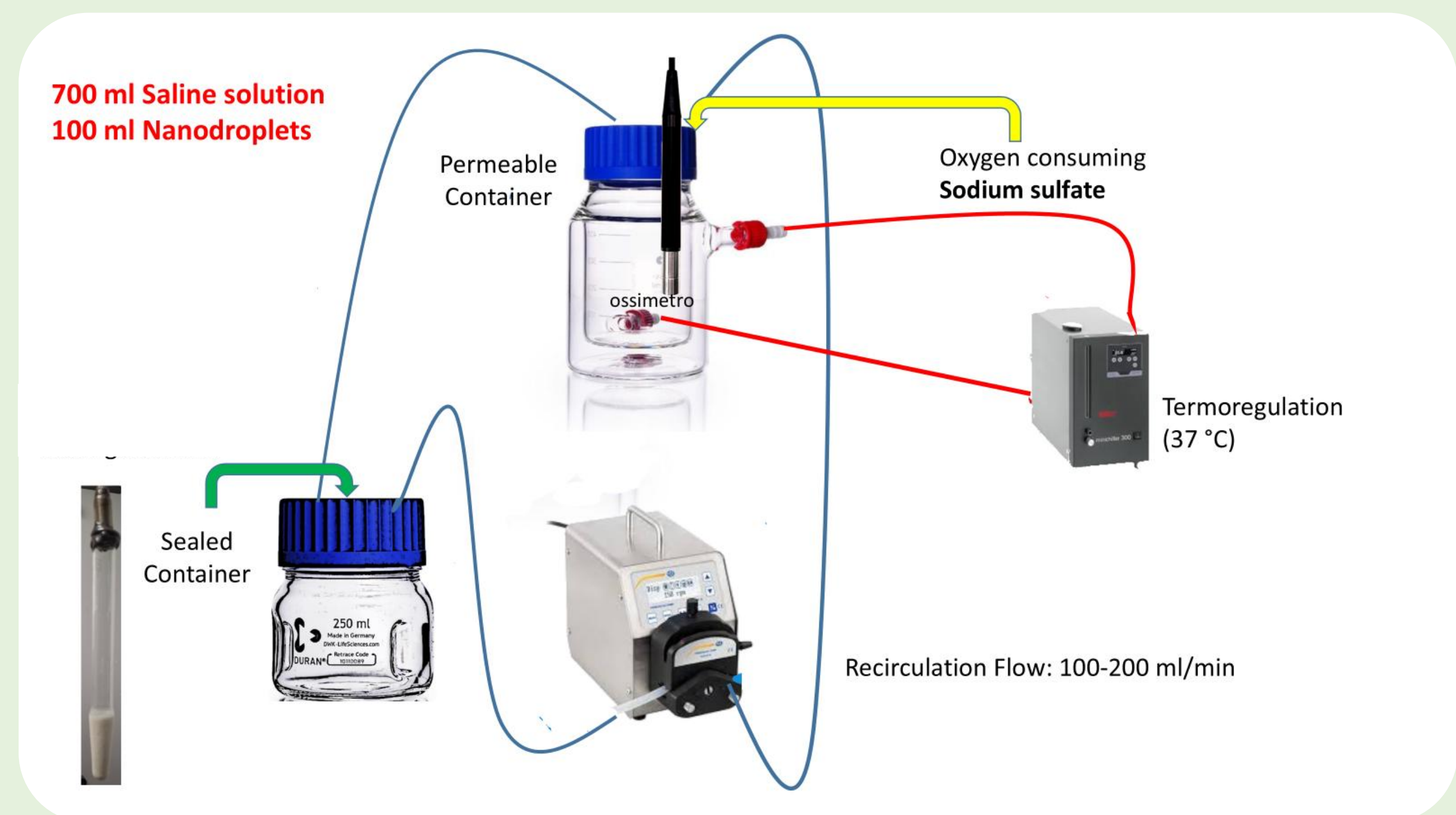
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Background

Perfluorocarbon-based nanodroplets are emerging as promising tools in advanced medical imaging and therapeutic applications, particularly in the fields of tissue engineering, vascular interventions, and drug delivery^[1,2]. Graft perfusion, which refers to the process of ensuring adequate nutrients and oxygen supply to transplanted organs, plays a critical role in the survival and function of grafts. Efficient graft perfusion can be enhanced by utilizing perfluorocarbons (PFCs), which possess unique properties, such as high oxygen-carrying capacity, low viscosity, and biocompatibility. Furthermore, their small size allows for enhanced tissue penetration and improved distribution within the body, making them ideal candidates for monitoring and enhancing graft survival in transplant and regenerative medicine. We report an experimental study of PFCs performed to assess the basic characteristics of these additives and their potential use in machine perfusion (MP).

Methods

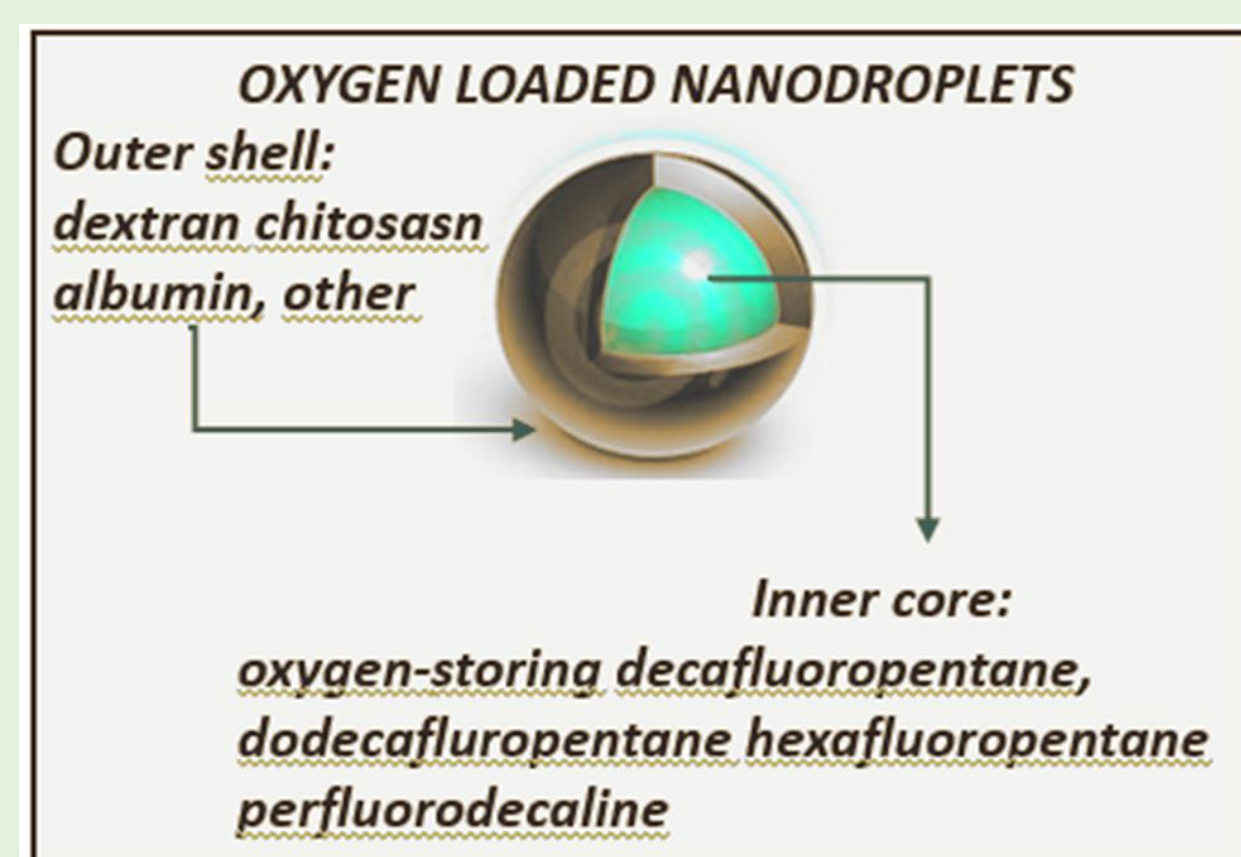
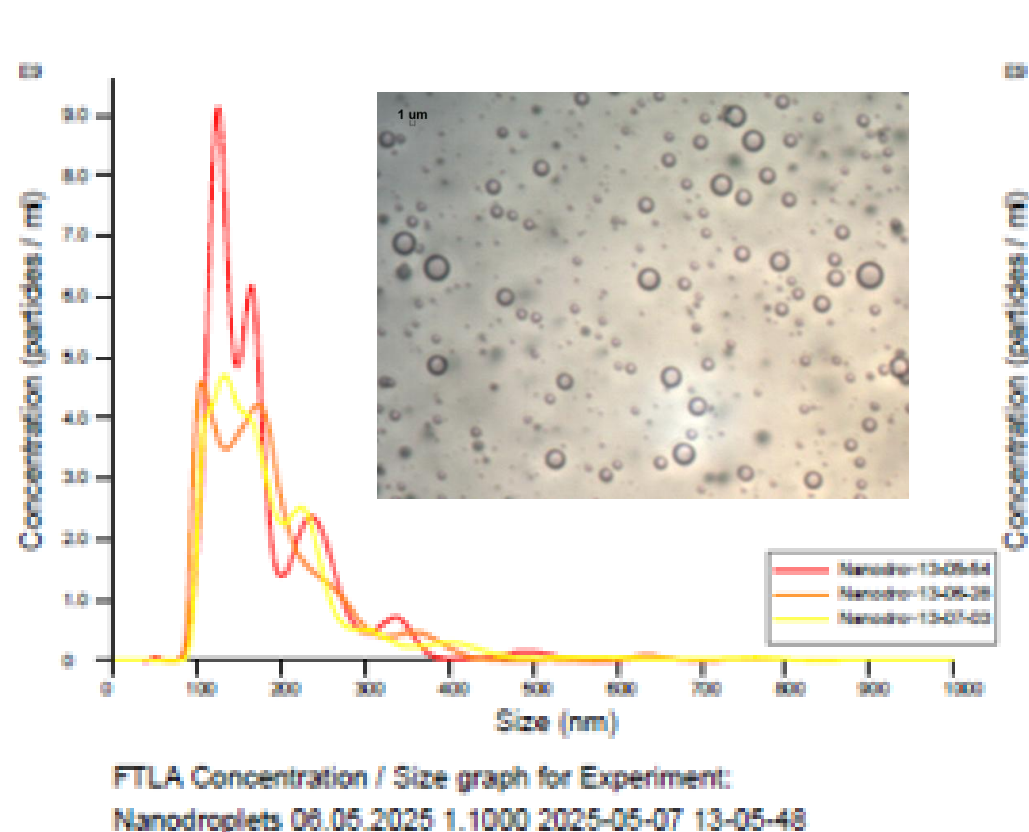
We tested perfluorocarbon Nanodroplets coated with dextran and low molecular weight chitosan at room (22°C) and body temperature (36-37°C) with volume ratio 1:7 respect the circulating fluid using a simple circulating perfusion apparatus to assess the oxygen levels with optical sensor (Hach Lange LDO) over time (from 60m to 3h).



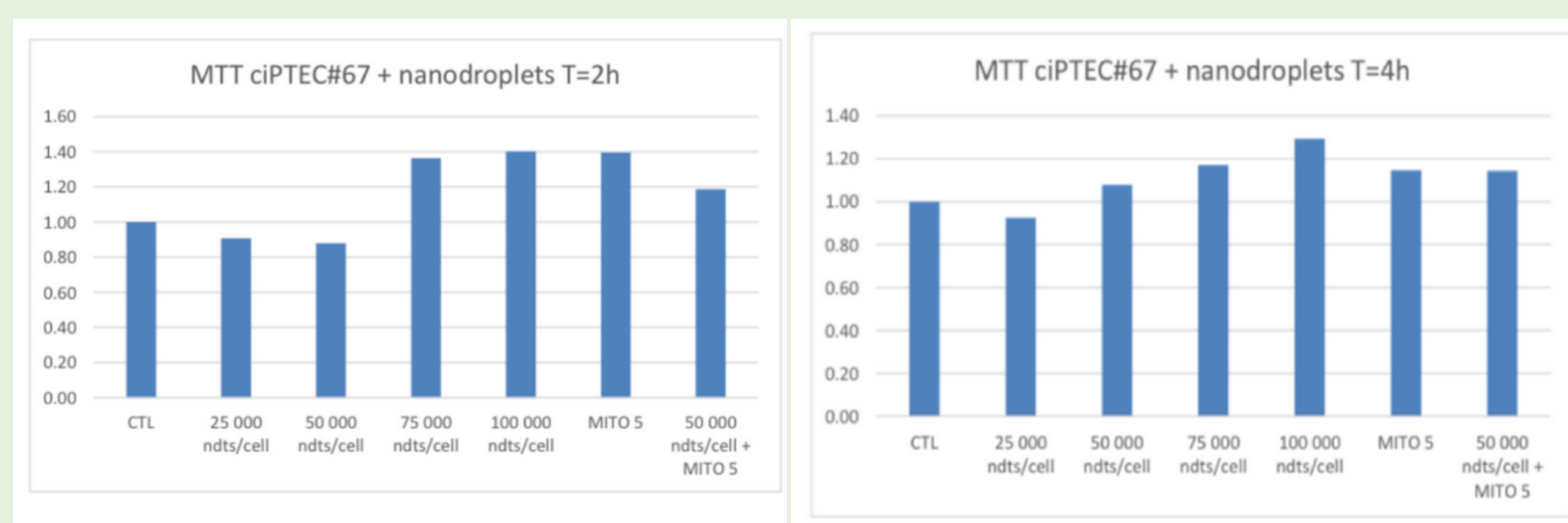
Results

The tests were conducted on saline solutions and special medias, like dulbecco and gelofusine solutions in order to simulate the real-life perfusates of normothermic machine perfusions. At room temperature the % of O₂ increment remain constant after 3 hours while at body temperature the increment of Oxygen decrease after 90 min to the initial value. In gelofusine/Dulbecco solution remain higher even at at 36 °C. Preliminary test on Cptec tubular renal cells have reveal an increase of cell viability using OLND both on stressed than under normal condition cells.

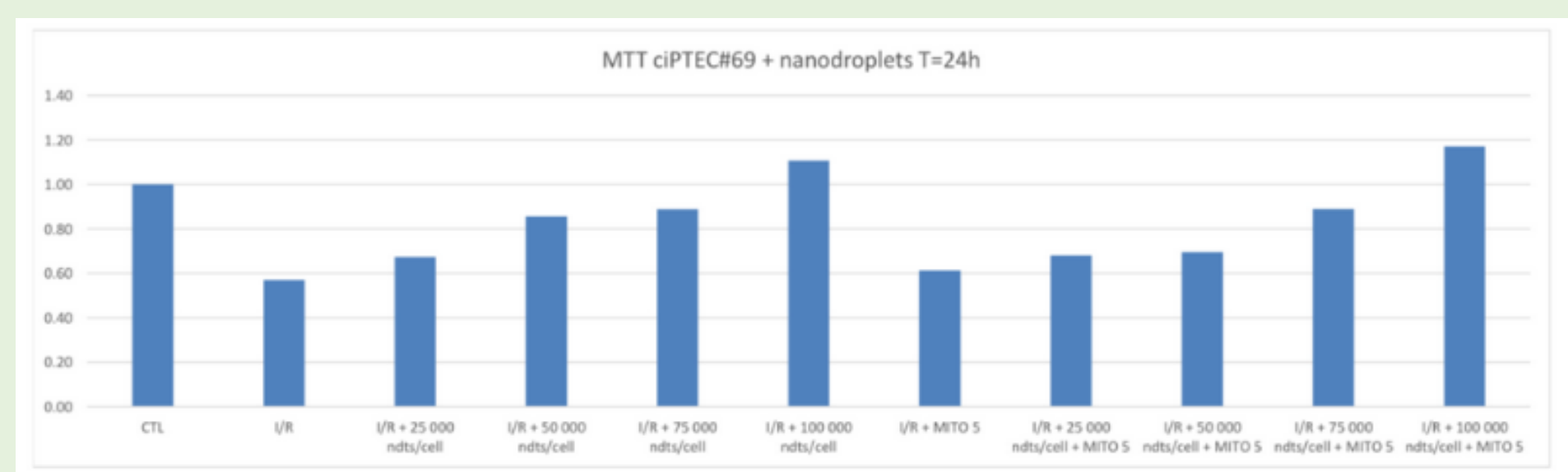
NANOSIGHT



PFC nano-droplets have beneficial effect on Cptec cell in normal and....

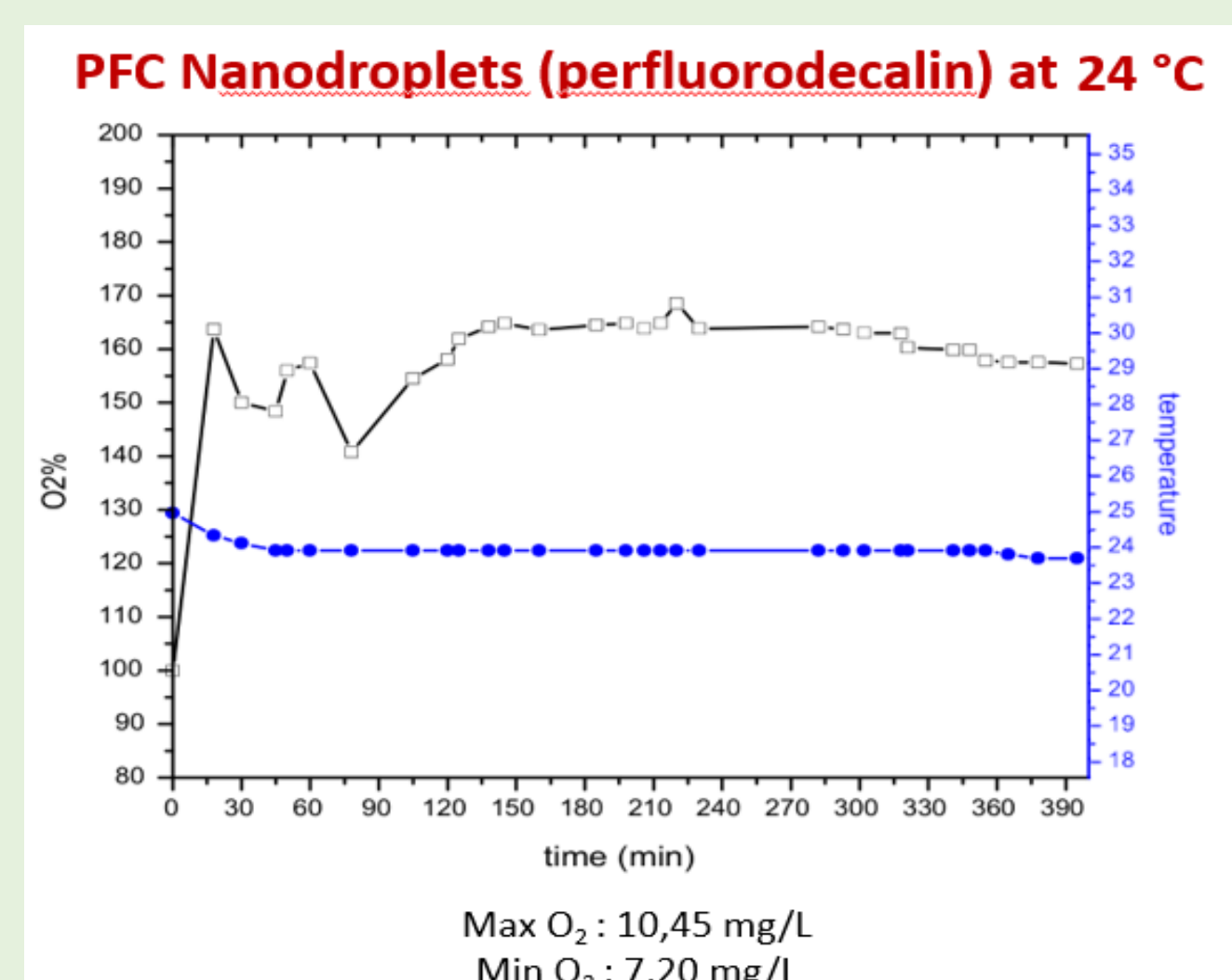


stress conditions



Conclusions

PFC may constitute a promising alternative to red blood cells during MP. Further experiments are needed to fully characterize these additives potentials and benefits in MP.



PFC Nanodroplets (perfluorodecalin) at 36 °C
(50 % solution of Gelofusine - blood plasma replacement- and Dulbecco medium)

