

From Research to Clinics "The End of the Beginning"

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PRE-CLINICAL RESEARCH WITH MACHINE PERFUSION OF SWINE LIVERS: VETLAB EXPERIENCE OF A PEDIATRIC LIVER TRANSPLANTATION CENTER

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INTRODUCTION / BACKGROUND

Liver transplantation is the treatment of choice for many pediatric liver diseases. Advances in machine perfusion reduce ischemia and improve organ quality [1]. Normothermic mechanical perfusion (NMP) allows for the ex vivo study of liver metabolic disorders, providing a platform for testing new therapies [2]. Longer perfusion times and improved technologies such as dialysis and glucose monitoring are needed to improve the use of NMP in research.

METHODS

Six porcine livers weighing between 3100-1800 gr were used. Three organs were used to develop a perfusion protocol tailored to the specific porcine anatomy, which included the use of the PerLiver system from Aferetica.

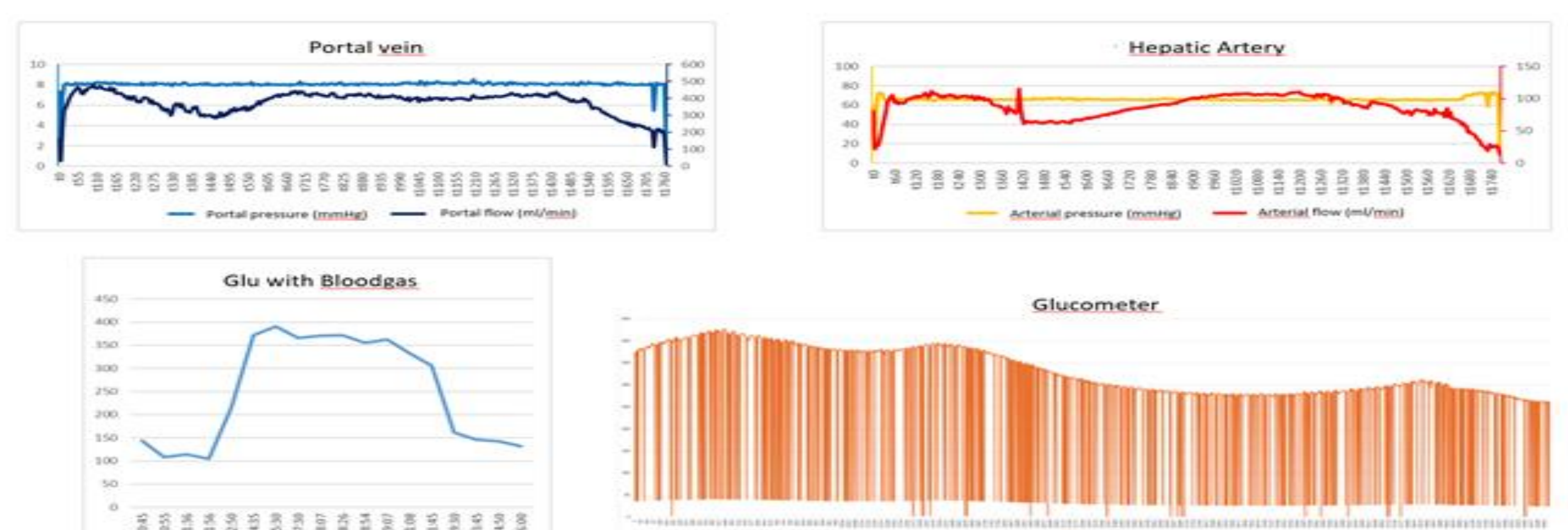
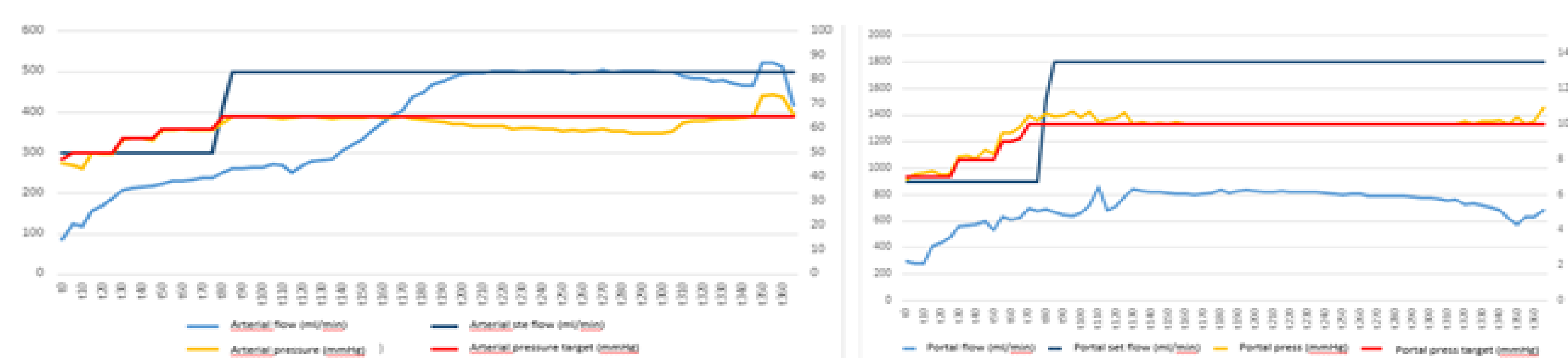
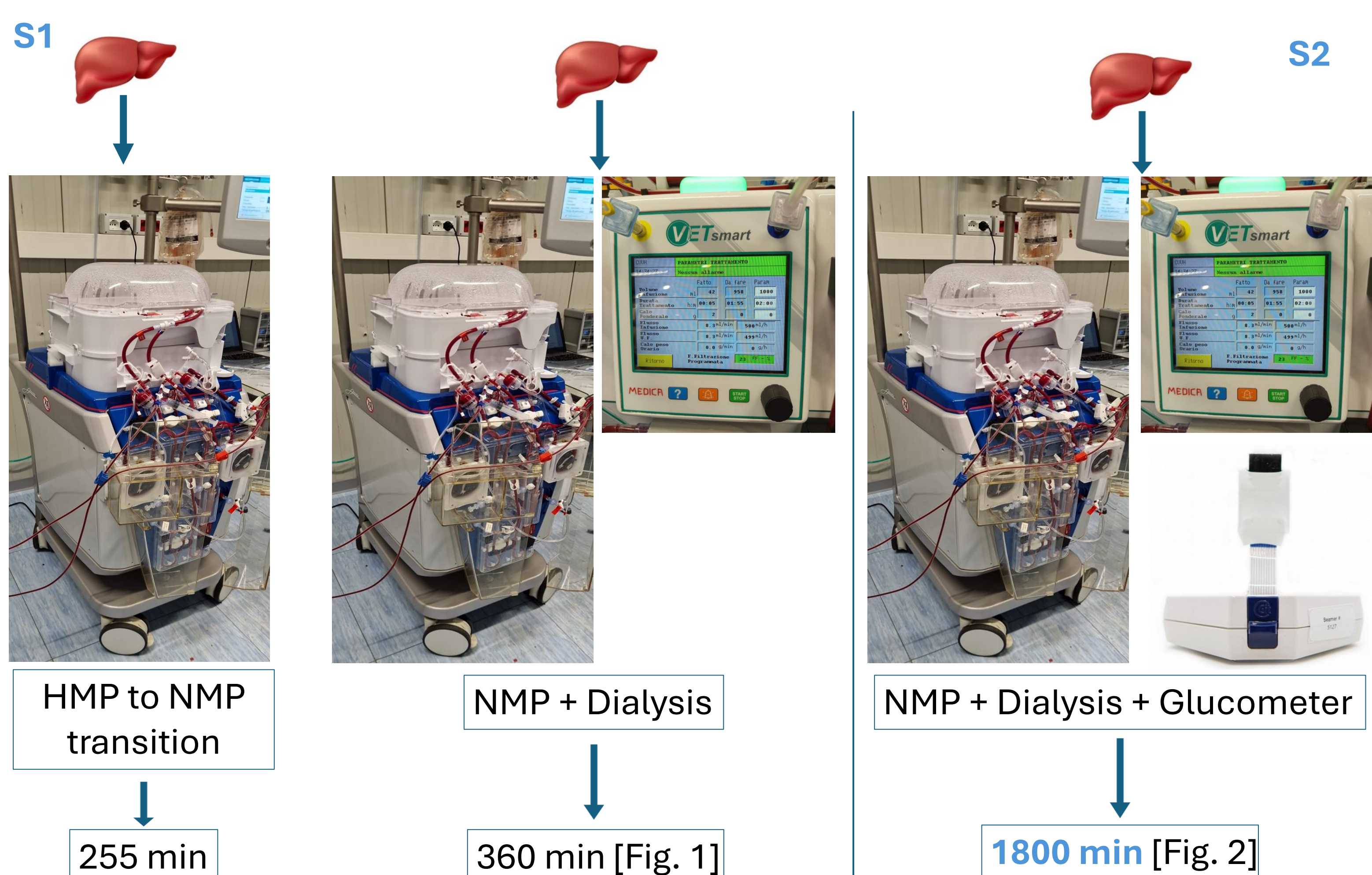
In session 1 (S1), one liver underwent HMP with transition to NMP, and one underwent NMP with dialysis (VETsmart Medica S.p.A.). In session 2 (S2), one underwent NMP with dialysis and glucose monitoring (CITSens, MeMo). Perfusate was sampled at predetermined intervals, viability was assessed via blood gas analysis, and pressure/flow were continuously monitored.

RESULTS

In S1, the HMP-to-NMP liver was perfused for 255 min., reaching normothermia at 210 min. without interruption. Flows increased during rewarming but remained below targets (Fig. 1). The NMP + dialysis liver was perfused for 360 min, reaching pressure/flow targets. Glucose dropped by 110 mg/dL, transaminases remained stable, and ammonium was cleared; dialysis kept electrolytes balanced (Fig. 1). In S2, the NMP liver was perfused for 30 h, with stable flows and viability up to 600 min under dialysis. The glucometer provided reliable real-time glucose monitoring (Fig. 2).

CONCLUSIONS

VetLab's experience has been effective to test the integration of dialysis and continuous glucose monitoring into the PerLife system. This will enable the implementation of a prolonged perfusion platform equipped with catabolite removal and automated glucose concentration correction, intended for preclinical testing of translational therapies and organ conditioning.



REFERENCES

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- [2] Safarikia S, Cirelli R, Spagnoletti G, Martinelli D, Bravetti G, Francalanci P, D'Alessandro A, Di Felice G, Maistri M, Baldissoni E, Fratti AM, Simeoli R, Sacchetti E, Cairoli S, Rizzo C, Pariante R, Vacca M, Cappoli A, Albano C, Pietrobattista A, Spada M, Vici CD., Normothermic Machine Perfusion of Explanted Human Metabolic Livers: A Proof of Concept for Studying Inborn Errors of Metabolism., *J Inherit Metab Dis*. 2025 Mar;48(2):e70010.