Pediatric Advisory Committee Meeting
Sept 19th, 2023
Artificial Womb Technology in a piglet model

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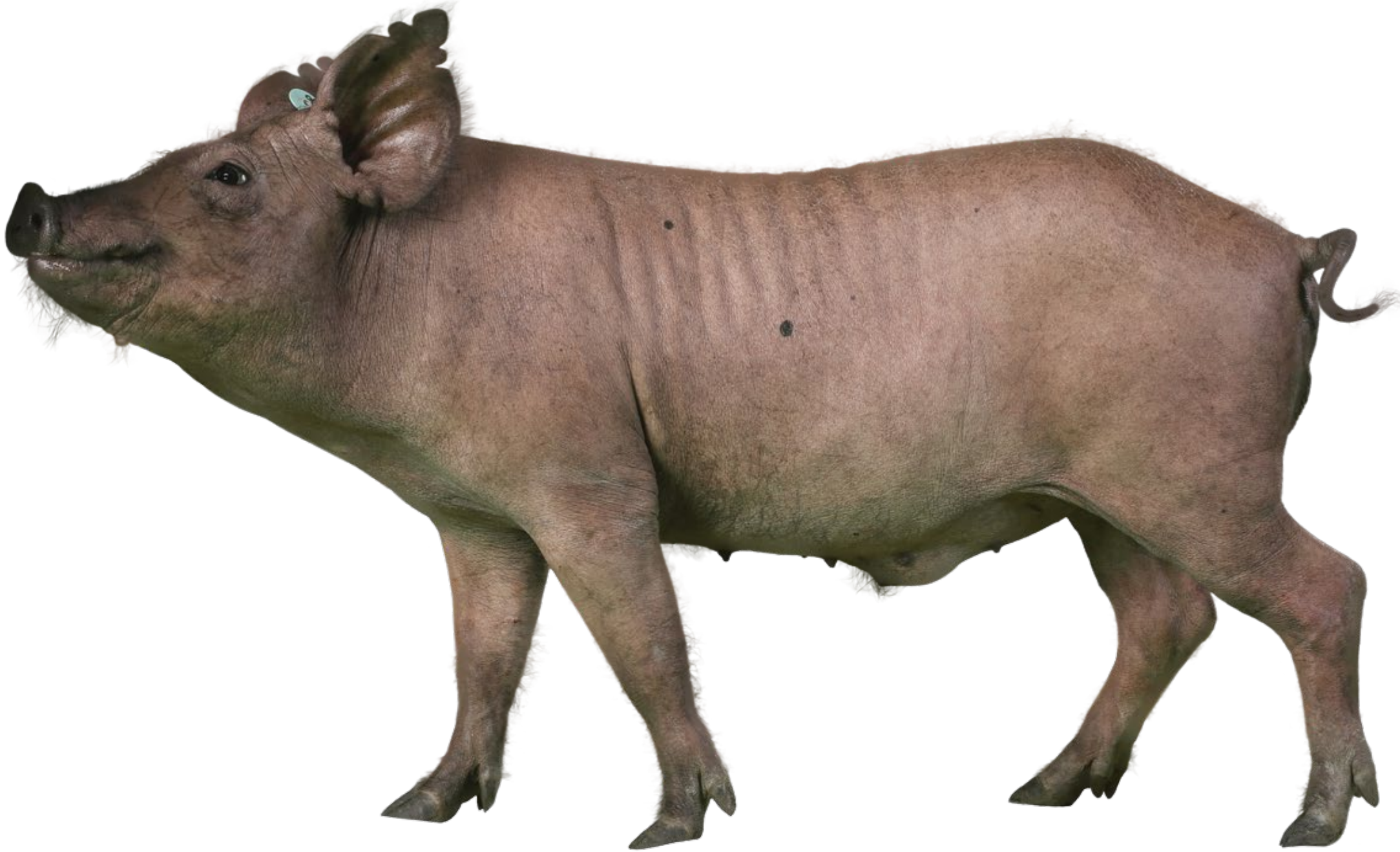
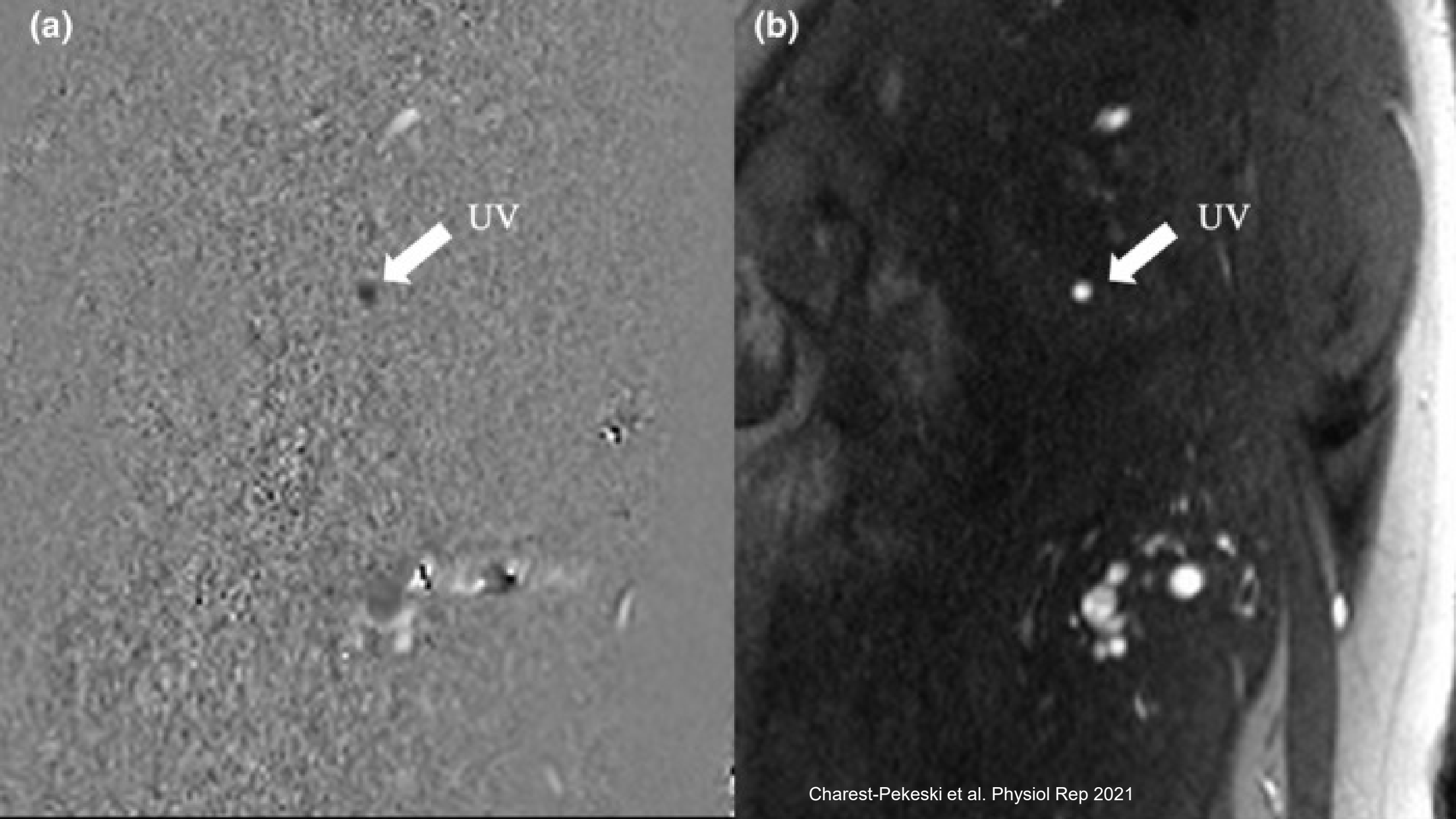
Charest-Pekeski AJ, et al. Achieving sustained extrauterine life: challenges of an artificial placenta in fetal pigs as a model of the preterm human fetus. Physiol Rep. 2021;9:e14742
Charest-Pekeski AJ, et al. Impact of the addition of a centrifugal pump in a preterm miniature pig model of the the artificial placenta. Front Physiol. 2022;13:925772





Charest-Pekeski et al. Physiol Rep 2021

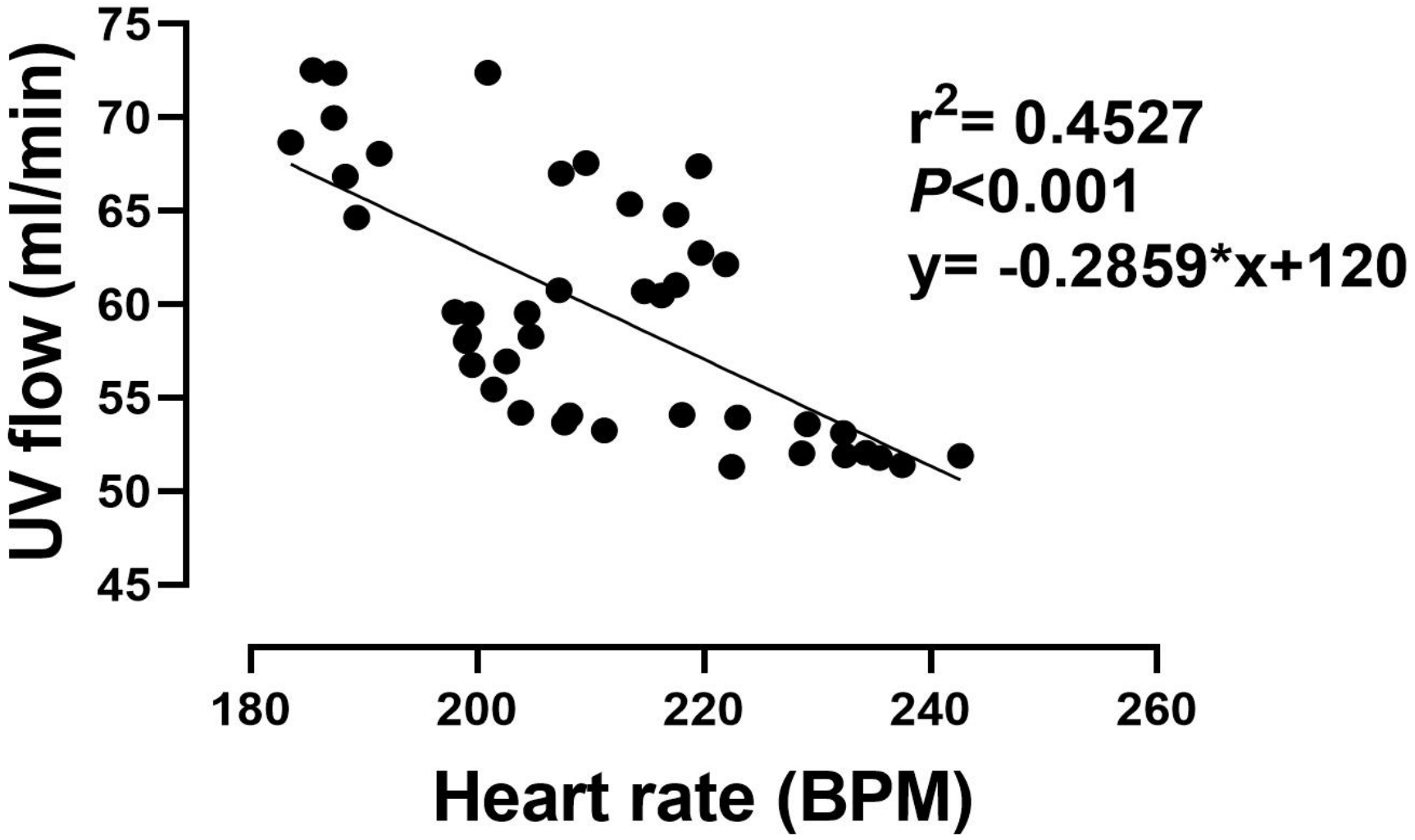
2018

Comparison of pig hemodynamics in utero and on the AP

	In Utero	On AP	P value
UV flow (mL/min/kg)	173 ± 45	97 ± 39	0.002
Heart rate (bpm)	130 ± 10	206 ± 38	0.0007

Charest-Pekeski et al. Physiol Rep 2021

Relationship between circuit flow and heart rate

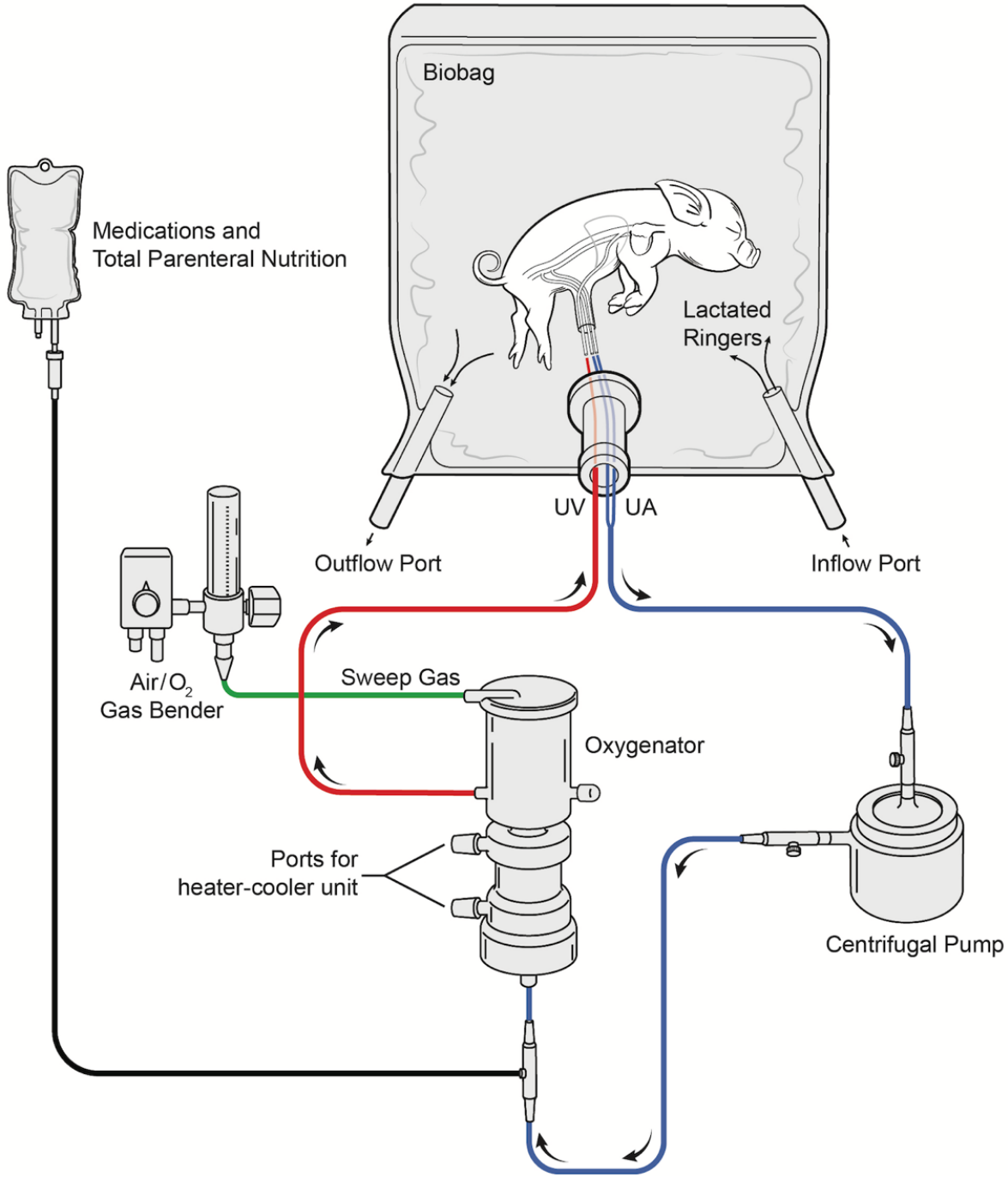


Charest-Pekeski et al. Physiol Rep 2021

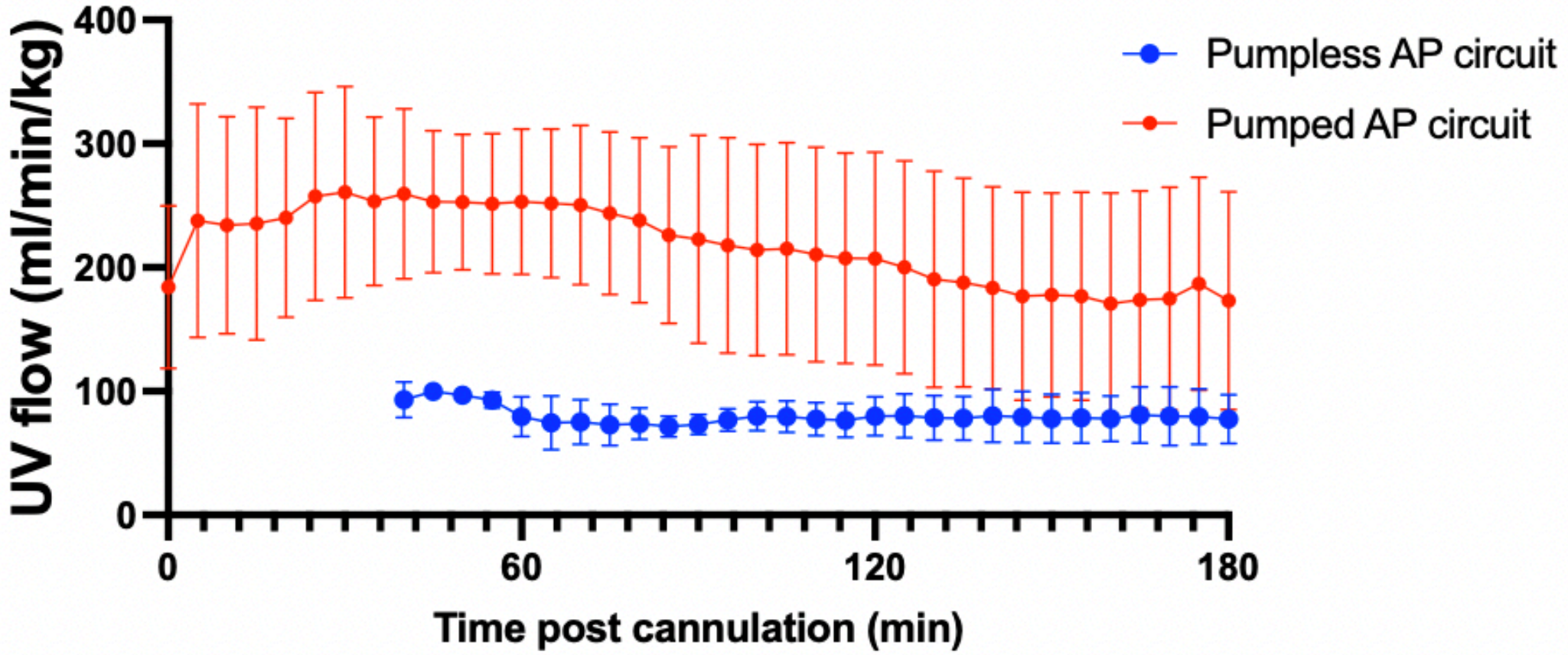
Right ventricular function

START

END

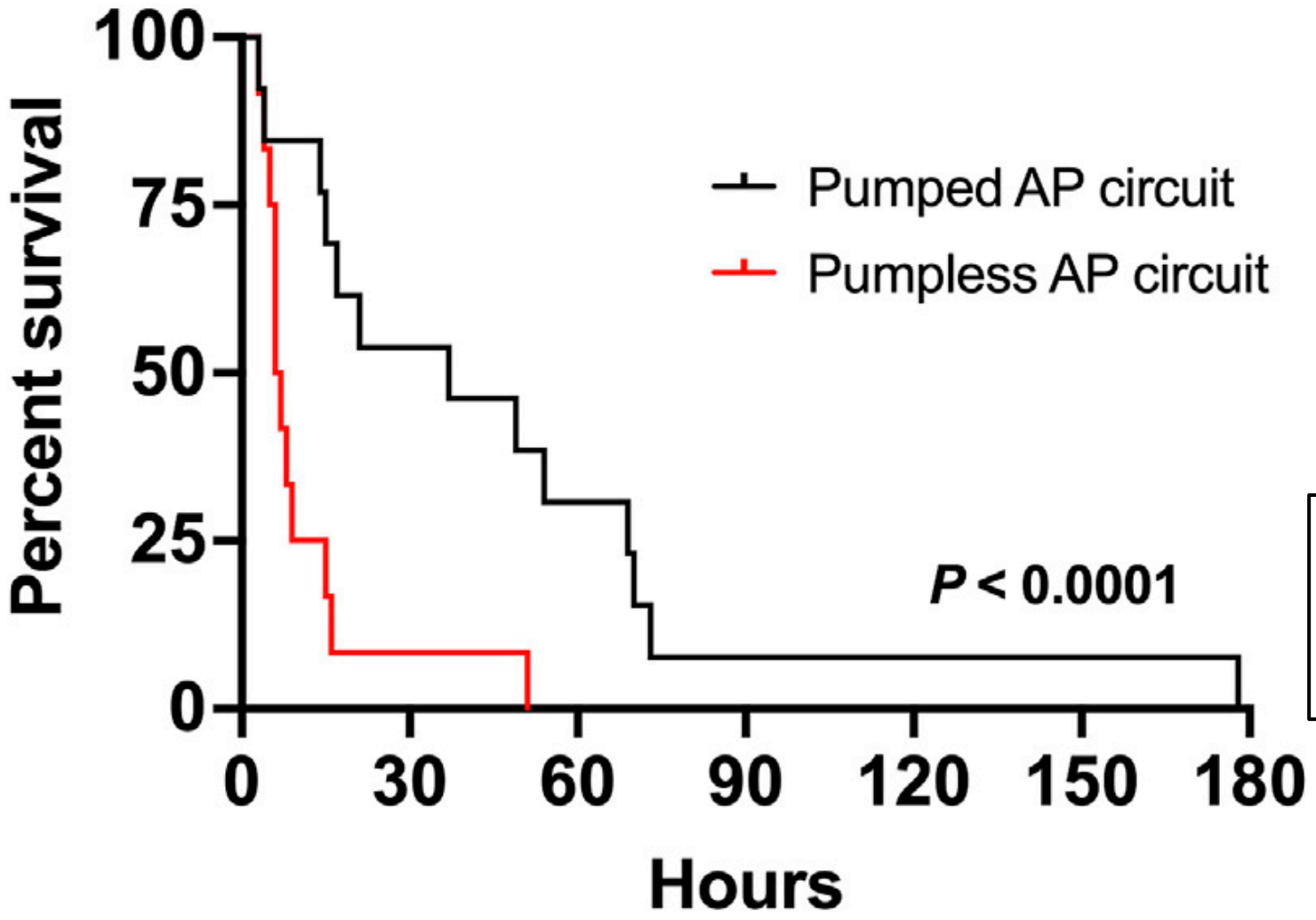

Biobag
Medications and
Total Parenteral Nutrition
Lactated
Ringers
UV
UA
Outflow Port
Inflow Port
Air/O_2
Gas Bender
Sweep Gas
Oxygenator
Ports for
heater-cooler unit
Centrifugal Pump

Improved circuit flow with a pump



Charest-Pekeski et al. Frontiers Physiol 2022

Improved duration of survival with the addition of a pump



Pumped circuit:
Gestational age: 102 +/- 2 days
Fetal weight: 616 +/- 139 g

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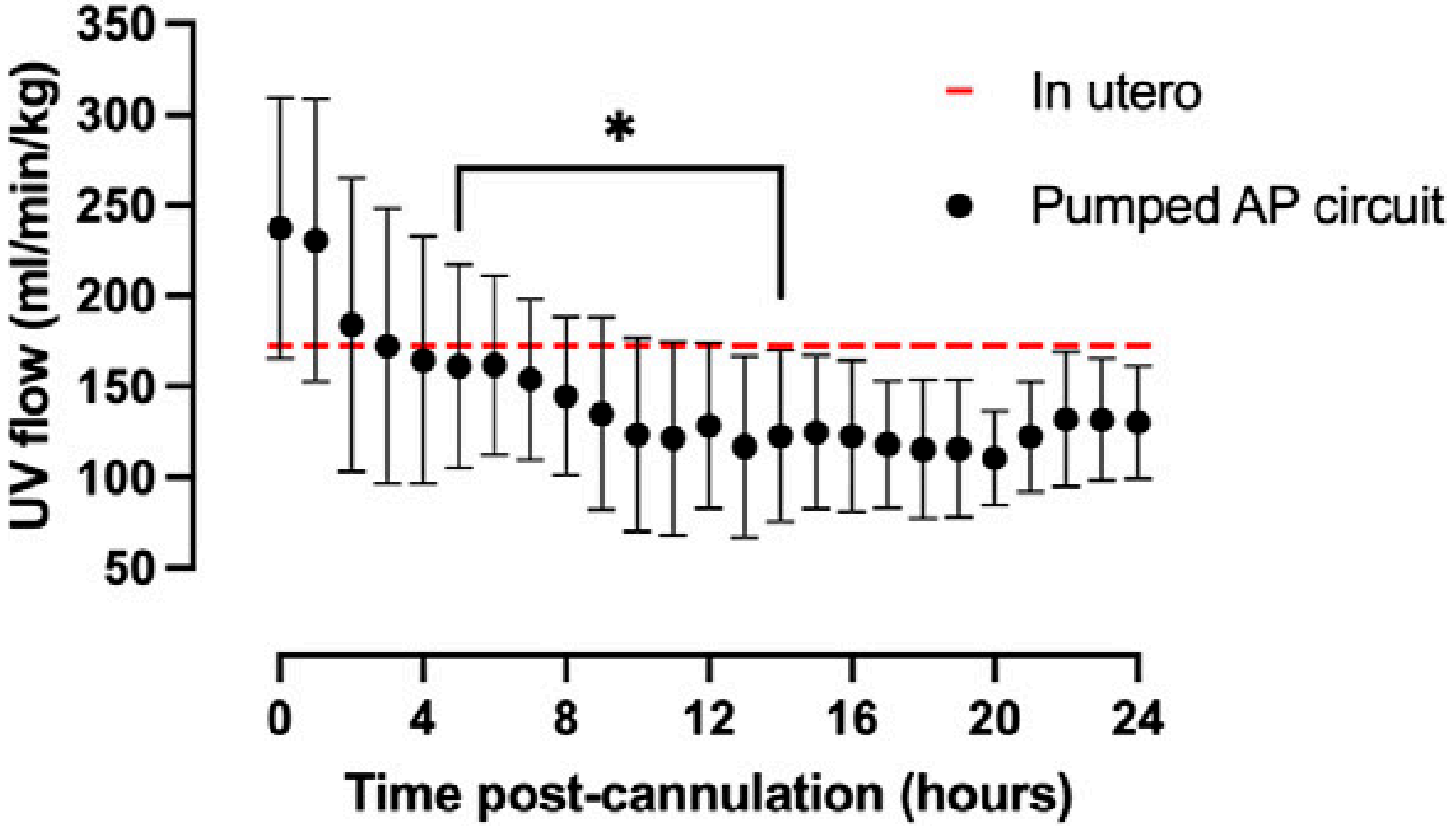
Circuit flows on the pumped AP system



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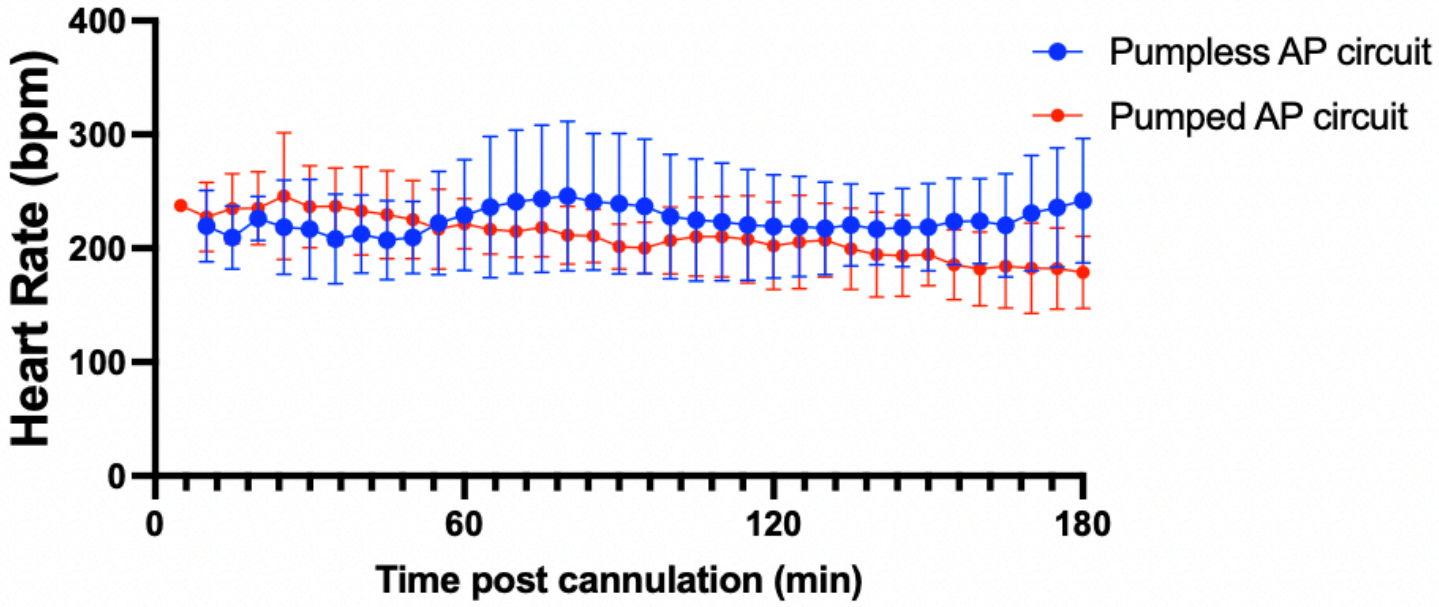
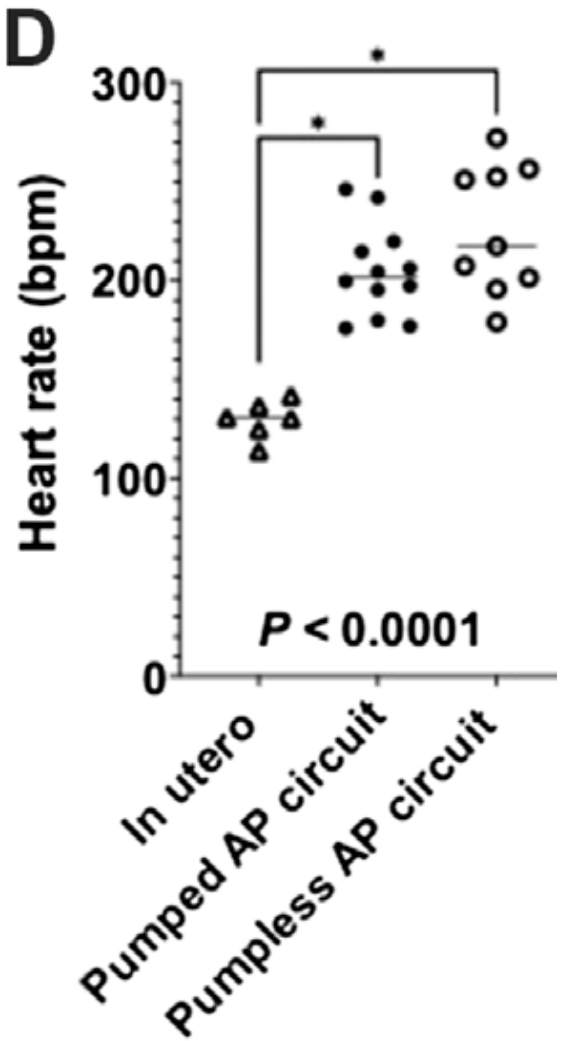
No change in heart rate with a pump





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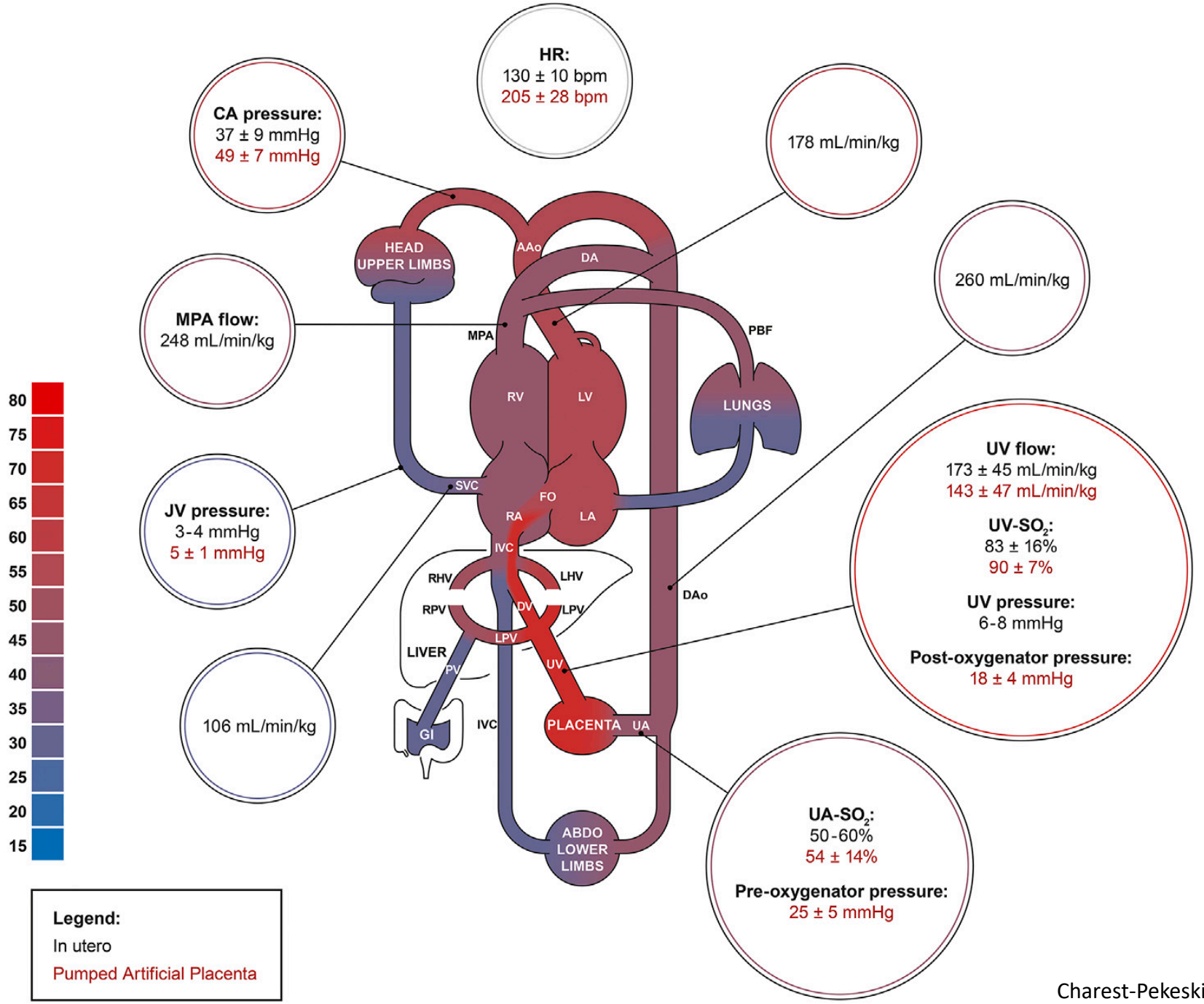

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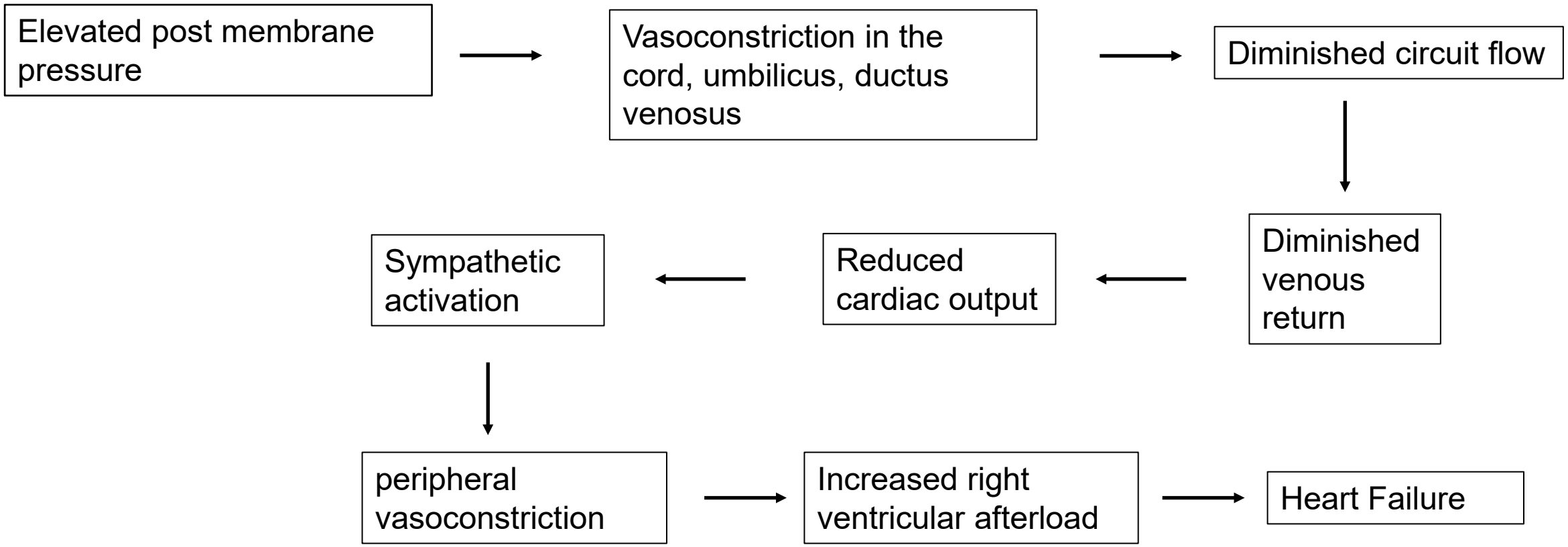
Proposed mechanism of circulatory failure – pumped circuit



Conclusions

- **Artificial womb technology is likely to be more difficult to employ at younger gestations and in smaller patients due to intrinsic anatomic and physiologic constraints**
- **Currently available commercially devices are unlikely to adequately reproduce normal placental physiology to be suitable**
- **Circuit flow and heart rate may be useful parameters for assessing the condition of the fetal circulation**