

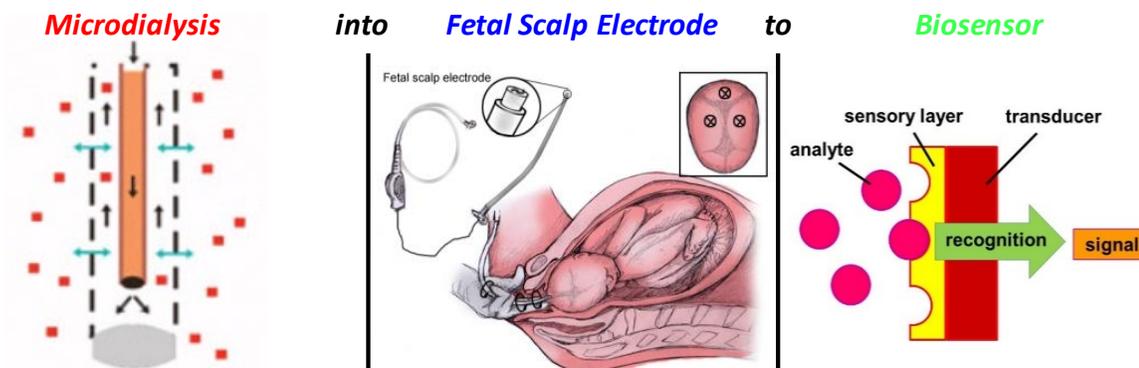
SRPe-Industry Doctorate Programme

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Abstract

Fetal monitoring techniques include heart rate monitoring and blood sampling, neither of which are effective for pre-detection of hypoxia. Fetal hypoxia can occur if for example, the umbilical cord is blocked, restricting oxygen supply to the fetus. This restriction causes a switch to anaerobic respiration which in turn, can lead to increased acidity in the blood and eventually hypoxia which results in tissue death. This can cause a variety of illnesses such as epilepsy, cerebral palsy or even neonatal death. Hence, a real-time continuous sensing platform is of great need to enable proactive clinical intervention before it is too late.

Can integration of these systems be achieved to create a complete platform?



Project Description / Activities

Current research shows that the chemical *lactate* is the best indicator for early detection of hypoxia. In order to develop a continuous sensing platform, two main systems are required. A sampling system and a sensing system, both which must work in harmony. The goal is for the sampling system to extract the lactate within the fetal scalp and then for the sensing system to measure it's concentration. To achieve this, microdialysis sampling will be tested. This involves placing an 'artificial blood capillary' within the fetal scalp to 'trick' the body into diffusing the chemical that we wish to measure, in this case lactate. Then, the lactate will be flown out into the sensor which will measure the concentration of lactate at that point in time. An increase in lactate levels occurs before hypoxia. Hence, with such a system, deviations from normal values can be interpreted in time to save lives.

Key Results / Impacts to Date, Future Work

- In-vitro results with lactate confirm trends found in previous literature
- MetaQuant Microdialysis utilises an extra *carrier* flow that promises higher lactate recovery rates. This will be tested against conventional probes.
- Lactate recovery will be studied on ex-vivo piglet skin; Both abdominal and scalp skin will be tested.
- Different continuous lactate monitors will be tested for sensitivity and accuracy
- Integration of a Microdialysis Probe into a Fetal Scalp Electrode shall be attempted

References/Links: Sensors for fetal hypoxia (1) and microdialysis overview (2)

1. <https://www.mdpi.com/1424-8220/18/8/2648/htm>
2. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2538639/htm>