**Modelling fetal electrocorticogram and heart rate during labour and inflammation**

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**Description**

In late gestation, especially during labour, fetal well-being is typically monitored by measuring fetal heart rate (FHR). FHR monitoring, however, has low positive predictive value for detecting acidemia. As for early detection of fetal inflammation, no reliable noninvasive methods exist. Both conditions (fetal acidemia and inflammation) are associated with increased risk for brain injury at birth with lasting neurological deficits that often can only be diagnosed years after birth. We have showed that fetal electroencephalogram (EEG) is feasible during labour and would enhance the ability to detect early onset of acidemia. In addition, heart rate variability dynamics reflects temporal profile of fetal inflammatory response.

In order to develop more robust techniques for online detection of fetal inflammation during late gestation and acidemia/inflammation during labour, it will be desirable to have a physiology-based mathematical model for fetal electrocorticogram and heart rate under "stress", e.g., when the supply of fetal oxygen is reduced because of a variety of causes and inflammatory response is ongoing due to infection or worsening acidemia (i.e., septic or aseptic).

**Objectives**

During the workshop, data from animal experiments will be provided for the participants. The primary goal is to develop a quantitative neuronal/cardiovascular model capable of generating electrocorticogram and heart rate signals that mimic the observed patterns from animal experiments. A secondary objective is to find a robust approach that can be used to fit model parameters using the experimental data.

**Background literature**

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3. Zandt BJ, ten Haken B, van Dijk JG, van Putten MJ. Neural dynamics during anoxia and the "wave of death". PLOS ONE 2011;6:e22127.
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