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ABSTRACT – FENS 2016 MEETING, COPENHAGEN

The preterm pig as a model of premature infant gait ataxia

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Aims/background

Compromised gait, balance and motor coordination (ataxia) as observed in cases of cerebral palsy is a serious complication to premature birth. The cerebellum is a central region with regards to these brain functions and its development shows high sensitivity to premature birth. Our group has over many years refined a pig model of premature birth focusing on gut and immune system development. Phenotypically, we have observed distinct motoric problems e.g. falls, tiptoe walking and swaying in preterm pigs relative to term born counterparts, indicating compromised brain function. The aim of this study was to compare gait patterns and cerebellar neurodevelopmental gene expression of preterm and term piglets.

Methods

We compared gait patterns and T-maze performance of caesarean born preterm (3 litters, 90% gestation) and term born pigs (1 litter, 100% gestation) recorded at five distinct postnatal days. MatLab was used to determine a list of spatiotemporal gait characteristics e.g. stride length/ frequency, "duty factor" and asymmetry indices. These data were paralleled by qPCR of >60 selected neurodevelopmental genes of isolated cerebellar tissue.

Results

While most genes did not differ significantly, we found higher (fold change [1,5-2]) mRNA levels of Midkine, Doublecortin, Neurotrophin3, p75 and Ephrin-B1 in preterms. Preliminary results from gait and T-maze showed significant functional differences between terms and preterms.

Conclusions

The preterm pig shows functional delays relative to terms, yet the limited cerebellar gene expression differences (mainly related to angiogenesis) suggest other brain regions e.g. motor cortex and basal ganglia to also be involved in compromised gait.