



UKE Paper of the Month September 2022

Pregnancy-induced maternal microchimerism shapes neurodevelopment and behavior in mice

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ABSTRACT:

Life-long brain function and mental health are critically determined by developmental processes occurring before birth. During mammalian pregnancy, maternal cells are transferred to the fetus. They are referred to as maternal microchimeric cells (MMc). Among other organs, MMc seed into the fetal brain, where their function is unknown. Here, we show that, in the offspring's developing brain in mice, MMc express a unique signature of sensome markers, control microglia homeostasis and prevent excessive presynaptic elimination. Further, MMc facilitate the oscillatory entrainment of developing prefrontal-hippocampal circuits and support the maturation of behavioral abilities. Our findings highlight that MMc are not a mere placental leak out, but rather a functional mechanism that shapes optimal conditions for healthy brain function later in life.

STATEMENT:

Molecular Our work identifies maternal immune cells as a novel immunological mediator between mother and offspring that determines the development of behavioural and cognitive competences by seeding into the fetal brain, dictating fetal microglia activity, and thus manipulating prefrontal-hippocampal circuits. Due to the accessibility of maternal immune cells in the human cord blood, it is a promising biomarker for the early identification of children at risk and simultaneously a potential fundament for future intervention strategies.

BACKGROUND:

This work was performed at the Division for Experimental Feto-Maternal Medicine (Prof. Dr. Petra Arck) and at the Institute of Developmental Neurophysiology (Prof. Dr. Ileana Hanganu-Opatz), in close collaboration with scientists from the UKE, Göttingen, and Berlin. It was part of the PhD thesis of Dr. Steven Schepanski, who has strong interests in how the maternal immune system during pregnancy determines neurodevelopment of the offspring later in life. This work was funded by the German Research Foundation, the European Research Council, and State Research Funding, Authority for Science, Research and Equality, Hamburg.