University of Zurich[UZH]

Zurich Center for Integrative Human Physiology (ZIHP)

ZIHP Special Seminar

Monday, July 18, 2022, 10:00 - 11:30 h
Animal hospital, main building
Seminar room TFA 01.23

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Lab mice and rats raised at high altitude show divergent mitochondrial postnatal development in the brain

Species adapted to life in high altitude (HA) have physiological mechanisms to optimize the use of oxygen for energy production. This is particularly important during postnatal development, when energy requirements are maximal. If such mechanisms are constrained or absent during this period, individuals may see their health, and even their survival, endangered. Although it is logical to imagine the mitochondrion as the main hub for these tunings, little -or nothing- is known about the postnatal development of cerebral mitochondrial function in HA- adapted species. And even less about the effects of development at HA in non-adapted species. Based on the fact that mice, but not rats colonized HA regions, we used our model of divergent adaptation to HA in FVB mice and SD rats to evaluate mitochondrial oxygen consumption rates (OCR) of the retrosplenial cortex (a critical region in the regulation of spatial memory, navigation, and other cognitive events). We collected the samples from euthanized animals raised at HA for over 50 generations (La Paz-Bolivia, 3600m) at postnatal days P7, P14, P21, and P90 (adulthood). We measured the OCR by high-resolution respirometry (OROBOROS O2K).

We observed divergent developmental profiles in mice and rats. In mice, mitochondrial respiration increases in a biphasic manner. An initial upsurge at P14 is followed by stable OCR values until P21. Then, a second rise occurs into adulthood (P90). This maturation process is governed in early stages (first 3 weeks) by complex I. Then, after a late activation, complex II becomes equally important in adulthood. On the other hand, rats show a rapid maturation at P14 driven by complexes I and II simultaneously. We speculate that these divergent developmental profiles may be related with the inability of rats to colonize high-altitude settlements contrary to mice.

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