

Invited keynote lecture**18:15-19:00, Wednesday 9th September 2015****The Moesgaard Museum Auditorium****Extremity as the mother of metabolic invention: The neurobiology of the naked mole-rat****Dr. Gary R. Lewin, Ph.D.**Department of Neuroscience, Max Delbrück Center for Molecular Medicine
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African mole-rats (Bathyergidae) are a family of subterranean rodents with very unusual physiological traits for mammals. The most famous African mole-rat is the naked mole-rat (*Heterocephalus glaber*), which is a mouse-sized rodent that shows several extraordinary phenotypic features like poikilothermy, extreme longevity (up to 32 years), and cancer resistance. We found that naked mole-rats are essentially insensitive to at least two substances that normally produce pain in rodents, the algogens capsaicin and acid [1]. Insensitivity to the stinging pain produced by contact with a weak acid (pH3.5) can at least partially be accounted by a novel variant in the naked mole-rat voltage gated sodium channel Nav1.7 that makes acid act like a local anesthetic on peripheral nerves [2]. We hypothesized that acid insensitivity may be related to the ability of naked mole-rats to thrive in the very low O₂ and high CO₂ environments that comes with living in very large underground eusocial groups. I will present new data using systems biology approaches combined with physiology that provides a molecular explanation for the unique lack of thermogenesis ability in this species as well as its extraordinarily low basal metabolic rate. These and other metabolic adaptations enable the naked mole-rat to survive extreme anoxia. Some of these adaptations involve changes in the way cells use oxidative metabolism and may be conserved with other species that are confronted with challenging hypoxic environments. The naked mole-rat, as well as closely related African mole-rat species, share a rodent genome that is, like the mouse, around 95% identical to the human genome. We believe that it is now feasible to identify differences in gene composition as well as expression that enable the naked mole-rat to deal with environmental stresses that are deadly for most other mammals.

References

1) Park et al PlosBiol 2008 e13. doi: 10.1371/journal.pbio.0060013. 2) Smith et al Science 2011 334(6062):1557-60. doi: 10.1126/science.1213760.