**NYU Dental Study Links Life’s Milestones to a Biological Rhythm in Teeth**

Why do rats mature faster than humans? While the daily circadian clock controls much of an organism’s *daily* pace of development, it’s impossible to explain enormous variations in age at maturity and other developmental *milestones* just by looking at differences in this daily rhythm. Now, metabolomic analysis of blood plasma has for the first time linked these variations to another biological timing mechanism operating on multi-day rhythms of growth and degradation, according to a study led by Dr. Timothy Bromage, a professor of Biomaterials & Biomimetics and of Basic Science & Craniofacial Biology at the New York University College of Dentistry. The findings were published today in the online journal *PLOS ONE*.

This research builds upon earlier studies by Dr. Bromage that observed multi-day biological rhythms within incremental growth lines in tooth enamel and skeletal bone tissue. These rhythms, originating in the hypothalamus, a region of the brain that functions as the main control center for the autonomic nervous system, affect bone and body size and many metabolic processes, including heart and respiration rates, Dr. Bromage hypothesized. In fact, he added, the rhythms affects an organism’s overall pace of life and its lifespan. So, a rat that grows teeth and bone in a fraction of the time of a human also lives faster and dies younger according to a study that Dr. Bromage first published in the February, 2009 issue of *Calcified Tissue International*.

In the research published today, Dr. Bromage and his team further characterized these rhythms through metabolome and genome analysis of blood plasma from a medium-sized mammal, the domestic pig. The study is the first ever use of metabolomics to address a question in evolutionary biology.

The researchers found that blood plasma metabolites and RNA drawn from 33 domestic pigs over a two-week period oscillate on a five-day rhythm. Using microscopic analysis, the investigators also observed a corresponding five-day rhythm in the pigs’ tooth enamel.

Further study revealed two five-day rhythms in tandem – one controlling tissue growth and a second one beginning three days later for degradation of growth-related molecular compounds back to their basic biological entities for use in the next growth round.

“These findings provide new insight into biological processes regulating growth and body size and controlling gestation length, weaning, age at maturity and other developmental milestones,” Dr. Bromage said.

Dr. Bromage will next use metabolic profiling to reveal the intricacies of a four-day growth rhythm he observed in the rhesus macaque monkey’s teeth. The final stage of research will examine humans, who are expected to clock eight- to nine-day rhythms, reflecting a larger body size and longer average lifespan than the macaque.

Dr. Bromage’s coinvestigators included Dr. Youssef Idaghdour of the Department of Biology at NYU Abu Dhabi; Dr. Rodrigo S. Lacruz of the Department of Basic Science & Craniofacial Biology at NYU College of Dentistry; Dr. Thomas D. Crenshaw of the Department of Animal Science at the University of Wisconsin at Madison; Dr. Olexandra Ovsiy of the Department of Biomaterials & Biomimetics at NYU College of Dentistry; Dr. Björn Rotter and Dr. Klaus Hoffmeier, both of GenXPro GmbH in Frankfurt, Germany; and Dr. Friedemann Schrenk, head of the Palaeoanthropology Division at the Senckenberg Research Institute and professor of Paleobiology at the Institute for Ecology, Evolution, and Diversity at Goethe University, both in Frankfurt.

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