

C-PEPTIDE OF INSULIN AS A TOOL FOR TRACKING THE COSTS OF REPRODUCTION IN WILD CHIMPANZEES

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Wild primates face a challenge to maintain a positive energy balance in habitats of fluctuating food availability and high energetic demands. For females, high costs of gestation and lactation add to this burden and require behavioral and metabolic accommodations to divert energy towards the nutritional needs of infants. Few methods are available to evaluate the costs of reproduction for mothers and the changes in metabolism that occur over the reproductive cycle, particularly for species with long and intensive infant dependence. Validating research on several primate species has identified urinary C-peptide of insulin as an accurate and non-invasive biomarker of energy balance. C-peptide is a by-product of the production of insulin, which plays a central role in managing metabolic fuels and serves as a signal regulating energy balance in the brain. Insulin's specific role in maximizing nutrient availability for the fetus and milk production make it promising indicator of shifts in the costs of reproduction. We evaluated C-peptide of insulin in urine collected from pregnant (400 samples, 15 females) and lactating (1700 samples, 17 females) chimpanzees in the Kanyawara community of Kibale National Park between 1998-2008. C-peptide levels doubled on average between early and late pregnancy. In nursing mothers, C-peptide initially dropped but increased steadily over the first two years of lactation, consistent with a gradual lessening of nutritional demands on mothers. Parity and core area location affected the stability of C-peptide increase during early lactation. These patterns closely parallel findings for humans, including relationships of insulin dynamics to cycle resumption.

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