Fifth Annual Meeting of the Northeastern Evolutionary Primatologists

Amherst, Massachusetts

Noninvasively Monitoring Orangutan Health Status: Determining Urine Concentrations

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Biomarkers including reproductive hormones and indicators of energy balance can be used to analyze health status in wild animals. Non-invasive measures, analyzed through urine or feces, enable biomarker monitoring without interfering with organisms, important for critically endangered species like orangutans. A measure of urine concentration such as creatinine concentrations or specific gravity is necessary when analyzing urine samples. Here, we measure specific gravity in urine samples from three captive female orangutans using a digital hand-held urine specific gravity refractometer. We compare specific gravity to previously measured creatinine values for two orangutans, and assess the influence of time of collection and refractometer temperature on specific gravity for all three. We found a significant positive correlation between specific gravity and creatinine concentrations ($N=1021$, Pearson's $R=0.578$, $p<0.001$). While we found no significant correlation between the time that samples were collected and specific gravity readings ($N= 314$, Pearson's $R = 0.079$, $p=0.17$), readings from samples collected in the morning were slightly but significantly lower ($N=255$, mean=1.008) than samples collected in the afternoon ($N=60$, mean=1.009) (independent samples t-test, $t312=-1.969$, $p=0.05$). We found a significant negative correlation between specific gravity and the refractometer temperature (Pearson's $R=-0.23$, $p<0.001$). In future studies, specific gravity can be used to determine urine concentration rather than creatinine, which is more costly and requires more time for lab work. Our future research will examine the correlation between specific gravity and creatinine concentrations as orangutans age, and the effects of aging on muscle wasting and reproductive status.

Funders: Boston University Undergraduate Research Opportunities Program, NSF (BCS-1638823, BCS-0936199); Woodland Park Zoo; AZA

Malbouf B, E Kane, L Durgavich and CD Knott. (2019). *Noninvasively monitoring orangutan health status: determining urine concentrations.* V Meeting of the Northeastern Evolutionary Primatologists. University of Massachusetts, Amherst, MA.