

ScienceWatch – The Cost of Life at the Top



“We’ve known for decades that alpha males have an advantage in reproduction, but these results show that life at the top has a real downside, and that being an alpha male comes at a cost” – S. Alberts

The effect of socioeconomic status on health has bedeviled scientists for decades—and tortured many a poor primate in the process. For example, experiments in the 1950’s comparing “executive” rhesus monkeys able to decrease the likelihood of electrical shocks with others passively receiving them, led scientists to believe that “executive distress” syndrome could cause ulcers. The work was later discredited because the monkeys were preselected for their greater emotional response. By the 1960’s the opposite became the prevailing view. It was believed that individuals of lower rank experience greater stress from being “picked on” by those above them. This too proved to be an incorrect generalization.

Now a team headed by evolutionary biologists Laurence Gesquiere from Princeton University, and Susan Alberts from Duke University, show that top-ranking alpha male baboons have much higher levels of stress hormones than second-ranking beta males. The researchers measured levels in feces of the male sex hormone testosterone and cortisol, a stress hormone, which in high amounts is associated with hypertension, diabetes and suppressed immune function. The study, published in the July 15, 2011 issue of *Science*, is considered notable by other scientists because it involved many individuals for a long time. The team followed 125 adult males over a 9-year period from five troops of savannah baboons (*Papio cynocephalus*) living wild in Kenya’s Amboselli National Park. The large sample size and long time-frame means the study wasn’t skewed by the quirks of any particular male, but rather reflected the effects of his rank in the troop.

Baboons live in a nerve-wracking environment. Males constantly compete to raise their rank within the troop, resulting in high levels of aggression and a shifting of dominance hierarchies. High-ranking males also vent their anger on females as well as lower-ranking males. When the scientists compared testosterone levels with rank, they found that higher-ranking males had higher levels than lower-ranking males. Alpha and beta males had the highest levels. This is expected because the alpha and beta males perform most of the matings and are aggressive toward all the lower-ranking males.

In general, cortisol levels also showed a predictable pattern. Higher levels of this stress hormone were found in lower-ranking males because they are harassed by those higher in rank and have limited access to food. However, the cortisol levels of alpha males were

surprisingly high, much higher than the beta males, even surpassing those found in the lowest-ranking males.

Alpha males do not make “executive” decisions for the troop, but they do engage in more sexual contacts and therefore spend more time guarding mates than beta males. They also fight with other males more often. Both behaviors use up more energy leaving less time for eating, which generates more stress, according to the authors. “Alpha males have higher reproductive success than other male baboons, but those benefits come at a significant cost”, said lead author Gesquiere. Whatever the cause, alpha males are under a lot of stress.

Other studies had shown that during periods of shifting dominance among top males within a troop their stress levels increase. Gesquiere *et al.* say that the nature of their study, i.e., following many males for the long-term, eliminates these short-term perturbations and teases out what really happens to a male when he becomes top dog.

While it is tempting to make human comparisons (for example, are vice-presidents healthier than presidents?), we are not a strictly hierarchal species. Those who rank lower on the job may gain status in other venues like coaching, teaching or playing a sport. Furthermore, baboon bosses may be stressed out, but human bosses shouldn't be—that is unless they are having sex with lots of women and yelling at their subordinates.

Know anyone like that?

Saul Scheinbach