Corticosterone in chameleon claws

Steroid hormones act throughout life to regulate numerous physiological processes such as development, reproduction and immunity as well as behavioral responses, e.g. stress response and risk taking. Steroid levels vary rapidly according to varying conditions and stressors. Measuring steroids in wildlife is challenging, and developing methods that are unaffected by the stress of capture and handling should be explored. Using non-invasive tools, such as hair, feathers and claws to extract steroids is ideal for sample acquisition with minimal stress. Unlike traditional blood sampling, hair and claw collection is relatively pain and infection-free. Hair and claws may be cut and collected quickly and efficiently. The origin of steroids found in hair and claws is assumed to be the blood capillary vessels that nourish them as they grow. Therefore, these matrices provide a long-term integrated record of circulating steroid hormone. Thus, hair and claws provide multiple advantages over blood sampling, where steroid concentrations reflect a momentary value.

We developed a method for extraction and quantitation of steroids from common (i.e., Mediterranean) chameleon claws. Chameleons were collected during the breeding period (August-October) during the night, using a spotlight. All individuals were weighed and sexed, and marked by clipping the tip of 1-3 claws using a fingernail cutter prior to release. We extracted steroids from collected claws using our modified protocol for hair-testing. Following extraction, corticosterone, an important steroid hormone, was quantitated in claw extracts using commercial enzyme-linked immunosorbent assay (ELISA). The principle of this assay is the quantification of a color reaction that is generated by marked analytes (in this case, corticosterone) interacting with a specific antibody.

Utilizing this method we found a correlation between body weight and corticosterone in chameleon claws. Heavier males had higher claw corticosterone levels. Interestingly, in humans, a positive association was seen between urinary glucocorticoid metabolites and body size. Moreover, in several species, body size and weight are related to social dominance. Indeed, we recently found that larger and heavier chameleon males were more dominant in their social hierarchy (unpublished data).

Our method is simple and reliable and can be carried out with minute amounts of sample, without the need for costly equipment. The application of this method for wildlife research will allow monitoring long-term trends and steroid profiles in reptiles in a relatively non-invasive manner. Steroids quantitation in wildlife may provide more information on individual wellbeing, supporting wildlife population management decisions.

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A method to determine integrated steroid levels in wildlife claws.
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