



WINN FELINE FOUNDATION

For the Health and Well-being of All Cats

637 Wyckoff Ave., Suite 336, Wyckoff, NJ 07481 • www.winnfelinefoundation.org
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DETERMINING NONINVASIVE CHRONIC STRESS MEASURES IN CATS

PROJECT STUDY: Quantification and evaluation of long-term cortisol in the hair and nails of cats using novel, noninvasive measures of chronic stress in cats. (*Dr. Contreras was recipient of Winn's New Feline Investigator Grant Awards*)

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Chronic stress, implicated in feline behavioral and health issues, is often unrecognized and inaccurately assessed. Cortisol is a hormone that is sometimes measured in the serum, saliva, urine, or feces of animals (or humans) as an indicator of stress. However, the cortisol found in those bodily fluids/secretions, only reflects a short time period (<24 hours). Estimating chronic stress requires measuring cortisol over longer time periods. Since cortisol accumulates in hair and nails over weeks to months, increases in hair and nail cortisol concentrations might be indicators of chronic stress. The first goal of this study was to determine if cortisol could be measured by enzyme immunoassay (EIA) in cats' nails and hair, as this had not been previously reported. The second goal was to determine whether the quantified nail and hair cortisol concentrations might be related to chronic stress in cats.

The investigators collected and evaluated hair and nail samples from 47 adult cats owned by the public and veterinary students and staff members, or samples were from cats that were stray or community cats that were either being sterilized or euthanized. Hair samples were obtained by clipping approximately 2x2cm patches from two or more different areas of the body from each cat, and nail samples were obtained by clipping front and/or rear nails. A commercial laboratory extracted cortisol from the samples, validated a commercial EIA kit, and analyzed the samples. The measurement of cortisol in cats' nails and hair was successful.

Medical and behavioral/lifestyle questionnaires were designed. These were completed by the owners of the owned cats. Questions included inquiries regarding number of litter boxes, household atmosphere, being allowed on furniture, children in household, other pets, indoor/outdoor/catio use, owner assessed behaviors and temperament/personality of the cats, grooming behaviors, owner assessed stress level, physical characteristics, appearance, and medical history. Community cat information was extrapolated during sample collection.

Results showed that hair cortisol concentration was correlated with nail cortisol concentration; as average hair cortisol concentration increased, nail cortisol concentration also increased. However, hair cortisol concentrations varied greatly within each cat; it varied by body location from which the hair was clipped, type of hair, and portion of hair sampled.

Nail cortisol concentrations were more consistent within each cat, but less cortisol was detected within the nails as compared to the hair. As the study progressed, the investigators improved upon the methods to extract more cortisol from the nails.

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The Winn Feline Foundation is a non-profit organization [501(c)(3)] established by The Cat Fancier's Association.
Member Combined Federal Campaign #10321



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The only behavioral or medical factor that was found to have a significant association with hair cortisol concentration, was being front declawed. If a cat was front declawed, that cat was more likely to have a higher hair cortisol concentration. On the other hand, the following factors were found to have significant associations with nail cortisol concentrations: being front declawed; unkempt fur; chronic illness; litterbox issues; and age. As each of these variables increased or had an answer of “yes” instead of “no,” then nail cortisol concentration also increased. Interestingly, owner-reported stress assessment of cats, was not found to be significantly associated with hair or nail cortisol concentrations. This might indicate that owners do not accurately gauge the stress or lack of stress in their cats.

This specific project is the first study to successfully use EIA to measure cortisol concentrations in the nails and hair of cats. Although measuring the amount of cortisol in hair has been suggested as a means to determine long term cortisol, our study showed that the amount of cortisol in the hair of cats varies too widely in each cat and thus seems to be an unreliable and inaccurate medium to evaluate long term cortisol and thus chronic stress in cats. On the other hand, their findings suggest that measuring the amount of cortisol in the nails of cats may be an accurate and reliable means to determine long term cortisol in cats. Furthermore, they found that nail cortisol concentrations were significantly associated with multiple behavioral and/or medical factors related to chronic stress in cats; therefore, the measurement of nail cortisol concentration appears to be a promising method to evaluate chronic stress in cats. This non-invasive, objective tool could be used to better identify and more readily recognize this as a problem in individual cats with behavioral or medical problems and in cats in group settings. Being able to objectively identify such an indicator of decreased quality of life would substantially improve prevention, intervention, management, treatment, and monitoring strategies, ultimately substantially improving the welfare of cats.

(This study was a poster presentation at the 2019 American Association of Feline Practitioner’s Conference in San Francisco, CA. A manuscript will be prepared and submitted to the Journal of Feline Medicine and Surgery)

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