

# Assessing well-being in free-ranging red deer (*Cervus elaphus*): are new approaches needed?

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The effects of various potentially stressful handling procedures and the physiological and behavioural needs of animals are commonly assessed by measuring changes in endocrine, autonomic and behavioural parameters. As in other species, plasma levels of hormones, such as cortisol, increase in response to stress. Unfortunately, due to the flighty nature of deer, the traditional methods used to obtain blood are sufficiently stressful to mask the effects of handling practices. In order to reduce the confounding effects of such handling, researchers have tamed, sedated or short the subjects prior to collecting blood. These methods have limitations: shooting does not allow repeat sampling; habituation and taming results in atypical animals.

The recent development and use of remote blood sampling devices offers the potential to eliminate much of the confounding effects of blood sampling stress. The procedure to fit the devices involves restraint. In order to evaluate the time taken to recover from this procedure, the devices were attached to six two-year-old red deer (*Cervus elaphus*) stags, and changes in the levels of haematocrit, cortisol, lactate and glucose were monitored in the animals after release to pasture. Mean cortisol levels declined from a peak of 56.5 ng/ml during restraint to a nadir of 10.1 ng/ml after approximately 3.5h at pasture. Similarly, percentage haematocrit, glucose and lactate levels were elevated during restraint (49.8%, 8.6 mmol/l and 4.2 mmol/l, respectively) and declined to 30.6%, 5.8 mmol/l and 1.0

mmol/l, respectively, after periods of up to 3.5 hours at pasture. The remote blood sampler has been used to assess the stressfulness of velvet removal under local analgesia. One group of nine two-year-old stags were velvetted and a second group served as controls. There was no difference between treatments in plasma cortisol concentrations. The plasma cortisol levels increased with yarding and restraint to 70 ng/ml and declined to approximately 20 ng/ml after 2.5 hours in both groups.

Measures of preference, aversions and abnormal activities are helpful in assessing welfare but they must be interpreted with care. As with measures of physiology, any taming to facilitate handling produces atypical animals. In addition, it is likely that deer have evolved the ability to mask the expression of some behaviours that would normally be associated with pain. More importantly, none of the traditional behavioural techniques provide ideal measures of the behavioural needs of animals. Recent advances using behavioural demand functions may provide a means for achieving this. With this procedure animals pay a price to gain access to, or avoid, environmental stimuli and the demand ("consumption") as price varies is measured. High demand items, such as food, are important for welfare. Welfare will be poor if such items are not available. In addition, welfare will be adversely affected if animals cannot escape from situations which they have shown to have a high demand to avoid.