

# Cow-Calf and Stocker

## Evaluation of a Stress Index for the Study of Shipping Fever in Stocker Cattle

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### Story in Brief

A method was developed as a possible index to evaluate adrenal function of steers in response to the stress imposed at different times during weaning and transportation to wheat pasture or the feedlot. This test involves determining the maximum corticoid secretion following treatment with ACTH (adrenocorticotrophic hormone). Since adrenal secretion of corticoids is normally controlled by ACTH produced by the animal's pituitary, the response obtained in this test indicates the ability of the adrenal to secrete corticoids in response to stress. Cannulae were inserted in the jugular veins to reduce the stress associated with frequent blood sampling. Our results demonstrate that steers can be cannulated in the morning and adrenal function can be evaluated in the afternoon of the same day. Plasma corticoids are at maximum concentrations between one and two hours after ACTH treatment.

### Introduction

Each year hundreds of thousands of calves are transported from farms in the humid southeastern U.S. to the sub-humid and semi-arid grain producing areas of the southern great plains. While these are usually referred to as "feeder calves," such calves would more appropriately be called "stocker calves" since many actually spend several months grazing winter small grains pasture after arrival in the plains areas. Regardless of whether calves are shipped directly from the farm to the feedlot or whether they pass through a stocker phase, the process of weaning, assembling and transporting these calves imposes a tremendous stress which results in death losses approaching three to five percent. Thus, it would appear that the development of a stress index would aid in evaluating which phases of the process are most detrimental to animal health.

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In cooperation with U.S.D.A., Agricultural Research Service, Southern Region.

The adrenal glands, through the release of the adrenal hormones (corticoids), play an important role in adaptation of an animal to many kinds of stress. The secretion of corticoids by the adrenal gland is controlled by adrenocorticotrophic hormone (ACTH) secreted by the anterior pituitary gland. Thus, changes in the secretion of corticoids by the adrenal gland in response to the ACTH released by the pituitary gland should be related to the ability of the animal to adapt to stress.

Concentrations of corticoids in the blood vary greatly both between different animals at the same time or in the same animal at different times. For this reason, collecting a single blood sample from a group of animals and measuring concentrations of corticoids gives little useful information about adrenal function. There is a clinical test used in human medicine that does give a fairly accurate estimate of adrenal function. This test involves the measurement of blood concentrations of corticoids following an injection of enough ACTH to stimulate the adrenal to the maximum. The assumption is that the greater the response obtained to maximum stimulation, the greater the capacity of the adrenal glands to produce corticoids to help resist stress.

The purpose of this experiment was to evaluate this technique for measuring adrenal function in cattle.

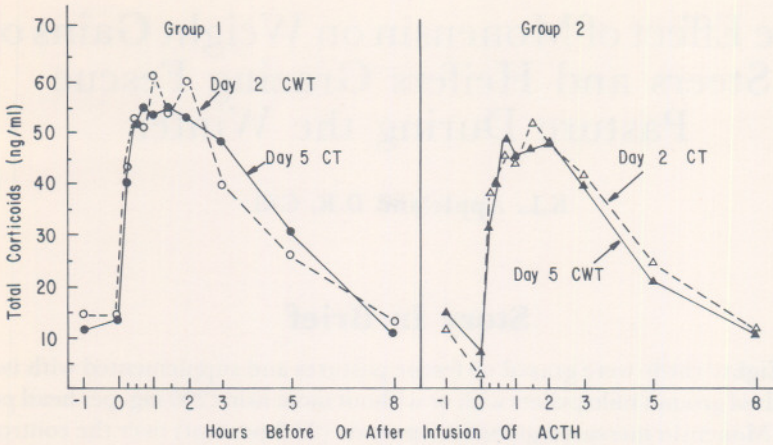
## **Materials and Methods**

Ten steers each weighing about 600 pounds were used in this experiment. The steers were maintained in individual slotted-floor pens and fed approximately 12 pounds of ground alfalfa hay daily. On the first day, indwelling cannulae were inserted into the jugular veins of five steers selected at random (Group 1) between 8 and 10 a.m. On day two, cannulae were inserted into the other five steers (Group 2) between 8 and 10 a.m. Cannulae were used to permit the collecting of frequent blood samples without disturbing the animals. The restraint necessary for bleeding by jugular puncture may release ACTH from the steers pituitary, which would alter plasma corticoids. At 1 p.m. on day two, all ten steers were infused with 200 I.U. of ACTH via cannulae. Blood plasma samples were collected one hour before and at selected intervals until eight hours after ACTH treatment. On days four and five the above procedure was repeated, and the groups of five steers were switched between the two cannulation times so that Group 2 was cannulated on the day preceding ACTH and Group 1 was cannulated on the day of ACTH. Total plasma corticoids were measured in the samples by a radioisotope protein binding assay.

## **Results and Discussion**

Plasma corticoid concentrations increased rapidly after ACTH infusion, reaching a maximum between one and two hours after treatment (Figure 1).





**Figure 1. Total plasma corticoids in two groups of five steers infused with ACTH either on the day of cannulation (CT) or the day after cannulation (CWT).**

Therefore, this would be the optimum time to sample steers to determine maximum adrenal response to ACTH.

Average plasma corticoids were greater after ACTH treatment in Group 1 than in Group 2 at both times that the animals were treated. This indicates that evaluation of the same steers before and after a treatment is helpful to reduce some of the variability in plasma corticoid concentrations.

It was anticipated that the restraint of animals and the stress associated with cannulation might influence the evaluation of adrenal function if both were done on the same day. However, time of cannulation did not influence plasma corticoids after ACTH treatment. Within a group of steers, plasma corticoid concentrations were similar whether the animals were cannulated approximately three or 27 hours before treatment. Therefore, these data demonstrate that it is possible to cannulate steers in the morning and evaluate adrenal functions in the afternoon of the same day. Using this procedure, it should be possible to develop a stress index based on an evaluation of the adrenal function of calves at different stages of the process of transportation from site of weaning to wheat pasture or feedlot.