

# Blood Chemistry Weaning Stress Study

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## Introduction

Shipping fever complex in the weaning calf is a paramount problem to the beef cattle industry. The highest incidence of disease and death loss is associated with weaning, transportation, handling, and ration adaptation. Most research has concentrated on the bacterial and viral aspects; however, some research has been done on the changes in physiological status of the animal as a result of stress. These changes are related to clinical signs, blood composition alterations, and adrenal gland changes (1). Perhaps the most constant indicator of stress has been the changes in the activity of the adrenal gland. The cortisol activities on the immune system in the weaned and trucked calf may play a major role in the susceptibility and subsequent disease in this calf.

**This study was conducted to evaluate the effect of weaning stress on 10 blood serum components, hematology, and weight changes. As in the previous study, the most noticeable changes were in the cortisol level and weight change (1).**

## Materials and Methods

This study was done at the North Platte Station in cooperation with the Veterinary Toxicology and Entomology Research Laboratory (VTERL), USDA-ARS, College Station, Texas. The blood chemistry work was done at VTERL at College Station. The hematology work was done at the Veterinary Science Laboratory at the North Platte Station.\*

This was a fall weaning study involving 170 crossbred calves averaging 450 lbs. Seventy of these calves had been weaned four weeks before the start of the study. The 170 calves were divided into four groups: (1) 20 calves, early weaned (EW) controls; (2) 50 calves, early weaned trucked (EWT); (3) 50 calves, weaned (W); and (4) 50 calves, weaned trucked (WT). The trucked groups were loaded and hauled 24 hours (1,000 miles) in western Nebraska. Each group was divided into five subgroups. Blood samples were taken at 0, 1, 2, 3, 7, 15, 21, 28 and 42 days after the start of the trucking period. One subgroup from each

treatment was bled at 0, 1, 2, 3, and 7 days with no subgroup being bled more than once during this period. The 15, 21, 28 and 42-day samples were taken from groups that had not been bled for at least 14 days. Any calf showing signs of illness was treated and bled, and one asymptomatic calf from the same subgroup was bled at the same time for comparison purposes. All calves were weighed at the start and conclusion of the study.

The weaning ration was 7 lbs. of alfalfa-brome hay and 3 lbs. corn silage. The hay was gradually removed and silage increased until day 18 when all calves were on 25 lbs. corn silage and 1.5 lbs. of 40% natural protein supplement. The early weaned calves were on this ration at the start of the study.

## Results and Discussion

The following blood chemistries were determined from the serum collected from each sample: cortisol, cholesterol, triglycerides, serum glutamic oxalacetic transaminase (SGOT), serum glutamic pyruvic transaminase (SGPT), lactic dehydrogenase (LDH), glucose, copper, iron and zinc. Of the parameters measured, cortisol, LDH, SGOT, white blood cell count (WBC) and body weight were changed.

**Cortisol:** The EW group had a small fluctuation but no particular pattern. The EWT group had the greatest increase with peak at 1 day (23.2 ng) and returned to initial level within 7 days. The W group had a slight increase which remained for 7 days. The WT group peaked at 2 days (20.9 ng) with high levels on days 1-7 and still above initial level at 15 days. It returned to initial level sometime between 15-21 days.

**LDH:** The trucked groups increased sharply at day 1 (650-875 I.U.). The EWT group was back to initial level at day 3. The WT group was still high at day 3 and returned to initial level sometime between day 3-7.

**SGOT:** There was a small increase in the W group but this was back to initial level on day 2. There was an increase in both trucked groups (68-90 I.U.) with EWT back to the initial level by day 2. However, WT was still high at day 3 but back to normal by day 7.

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**WBC Count:** There was a leukocytosis due to weaning (2500 WBC/cc) and a small response due to trucking (200 WBC/cc) with all values coming back to normal in 4 days. The percent neutrophils in the EWT group increased 10% on day 1 (trucking effect), while W increased 40% (weaning effect); the WT group increased 42%. All groups were back to normal in 48 hours after shipping. In the EW, EWT, and WT groups, 40% of the lymphocytes were atypical (Downy type) on day 1, thought to be a toxic effect.

**Weight Gains:** During the 42-day period, the average daily gain was 1.60 lb./day in the EW group. The EWT group gained 1.05 lb./day, the W group gained .78 lb./day, and the WT group gained .54 lb./day. The WT group weighed 44.5 lb./head less than the EW group. Figuring at today's prices of \$.75/lb., this is loss for lack of gain of \$33. The average daily gain of all the sick calves was .98 lb./day.

There was a significant shipping fever pneumonia outbreak during the test. Any calf that was slow to come to feed or had any mild disease signs was temperatured and treated. The temperatures varied from 103° to 108°F. The response to treatment was good. All sick calves were treated at least three days or until observed clinically normal before being returned to their original pens. One gram of aureomycin per head per day was fed to all but the EW (non-trucked) calves from day 7 through 16 and gradually removed from the ration by day 19. There were 52 sick calves during the first 22 days of the test. The largest number of sick calves (20) were from the EWT group. The W and WT group had 11 sick calves each. The maximum number of sick calves (12) was on day 9. The second highest (10) was on day 4, and the third highest (8) was on day 6. All but one case had developed by day 11. There was no death loss.

There was a higher incidence of sick calves in the EWT group. These calves were on a ration of 25 lbs. of corn silage and 1.5 lbs. of 40% natural protein supplement. Our conclusion was that these calves were on

the truck 24 hours and off feed and water. They were extremely hungry and thirsty when unloaded. They actually overfilled on both feed and water. The majority of the calves scoured for several days. The digestive upset was a predisposing factor in disease incidence in this group of calves. This is a common clinical observation in naturally-occurring shipping fever outbreaks.

### Summary

Our general observation on this study and a similar study conducted two years ago is as follows: Animals weaned 4 weeks prior to trucking undergo a stress period lasting 3 to 7 days. Weaning alone stresses these animals for about the same period. Concurrent weaning and trucking increases the stress period to 15-21 days. These conclusions are based upon changes observed in the cortisol, LDM, SGOT, WBC and weight change.

**The majority of the shipping fever pneumonia occurs in the first 45 days following weaning, caused by the interaction of stresses, viruses, and bacteria (2,3). In this study, we were able to show that the weaning and trucking produced the most stress and failure to gain weight. The higher cortisol the first 7 days and not returning to normal for 15-21 days may suppress the immune system of the calf. An interesting follow-up of this study would be to evaluate the responses to a known antigen in each of these groups.**

### References

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