

# YEAST CULTURE EQUINE RESEARCH REPORT 1993-1

## EFFECT OF YEAST CULTURE SUPPLEMENTATION ON EXERCISING HORSES

### Summary

Eight conditioned Quarter Horse mares were used in a 2-period crossover design to assess the effect of dietary yeast culture supplementation on blood lactate (LA), hemoglobin (Hb) concentration, packed cell volume (PCV) and heart rate (HR). In the first period, horses were adapted to either a control (CT) or a yeast culture (YC) supplemented diet (CT + 114 g YC/d) for 18 d. HR increased during exercise ( $P < .05$ ) but there was no treatment effect. Blood LA concentrations, Hb and PCV also increased with exercise ( $P < .05$ ) but LA and PCV showed no effect ( $P > .2$ ) of YC supplementation. There was a trend towards higher Hb concentration in the YC supplemented horses than in the CT horses during the exercise ( $P = .18$ ). During recovery, PCV in the YC supplemented horses tended to be higher than in CT horses ( $P = .19$ ), however, there was no effect of YC supplementation on Hb, HR or LA ( $P > .2$ ). The anaerobic component of an exercise test is frequently estimated by LA levels. In this study, LA levels were  $120 \pm 36$  mg/dl for the CT horses and  $109 \pm 26$  mg/dl for YC horses indicating the exercise test used had a large anaerobic component. However, LA levels were not different between groups suggesting oxygen availability was not affected by YC despite the trend ( $P = .18$ ) towards higher Hb levels.

### Materials and methods

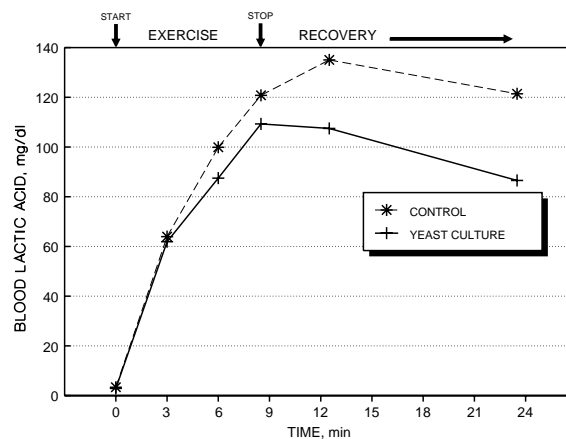
Eight conditioned Quarter Horse mares were used in a two-period crossover design. All horses received 4.5 kg of alfalfa hay and 4.5 kg of a mixed concentrate (45% corn, 45% oats, 5% wheat bran) daily. In Period 1, four horses (YC treatment) received 114 g/d of a commercially available yeast culture product (Diamond V Mills, Cedar Rapids, Iowa) as a top dressing. The other four horses received no supplement (control treatment). In Period 2, the treatments were reversed. During each 18-day period, the horses were exercised 3 times per week on an inclined motorized treadmill (Anamill, Sandusky, OH). At the end of each period an exercise test was performed. Body weight on the day of the exercise test averaged 541.6 kg for the horses

receiving the control treatment and 541.3 kg for horses receiving the YC treatment. The exercise test was conducted on an 11% grade at 4.5 m/s for 8.5 minutes. During the test the horses carried 18 kg of lead weight which was removed at the end of exercise. Blood samples were obtained via an indwelling jugular catheter at 0, 3, 6 and 8.5 minutes of exercise and at 5 and 15 minutes of standing recovery. Heart rate was determined during the last 30 seconds of each sampling period using a hard-wire electrocardiogram.

Packed cell volume and hemoglobin concentration were determined on whole blood collected in tubes containing EDTA as an anticoagulant. Hemoglobin concentration was assayed using the cyanomethemoglobin method (Sigma Chemical Co., St. Louis, Missouri). Blood for lactate determinations was immediately deproteinized in chilled 7% perchloric acid. The supernatant was subsequently analyzed by enzymatic methods for lactate (Sigma Chemical Co., St. Louis, Missouri). Amino acid analysis was conducted on plasma using a Beckman Amino Acid Auto Analyzer (Beckman Inst., Palo Alto, California).

Data were analyzed using analysis of variance for repeated measures (SAS, 1985).

Figure 1. Effect of Yeast Culture on blood lactic acid.



**Table 1. Effect of Yeast Culture on blood parameters of exercising horses.**

Item	Rest	During exercise, min			Post exercise, min	
		3	6	8.5	5	15
<b>Heart rate, bpm</b>						
Control		199.9	215.9	228.5	111.3	95.8
YC		202.7	212.8	219.3	110.5	92.6
<b>Blood urea</b>						
Control	3.4	3.7	3.1	3.7	3.4	3.5
YC	3.8	4.6	3.8	3.5	3.5	4.0
<b>Plasma glutamate</b>						
Control	42.0	52.3	56.6	61.2	58.0	54.3
YC	45.0	53.0	58.3	64.7	58.4	63.0
<b>Plasma alanine</b>						
Control	55.9	88.9	121.1	147.1	149.3	164.8
YC	59.3	92.3	122.8	153.7	150.0	163.2
<b>Plasma valine</b>						
Control	100.4	118.2	117.3	117.5	114.6	114.8
YC	103.0	116.4	117.2	119.2	112.4	114.3
<b>Plasma isoleucine</b>						
Control	32.2	40.3	40.4	40.5	40.1	39.9
YC	33.2	38.7	39.8	40.3	39.2	38.8
<b>Plasma leucine</b>						
Control	60.8	77.9	79.0	80	80	78.7
YC	62.7	75.9	78.0	81.0	77.4	77.6

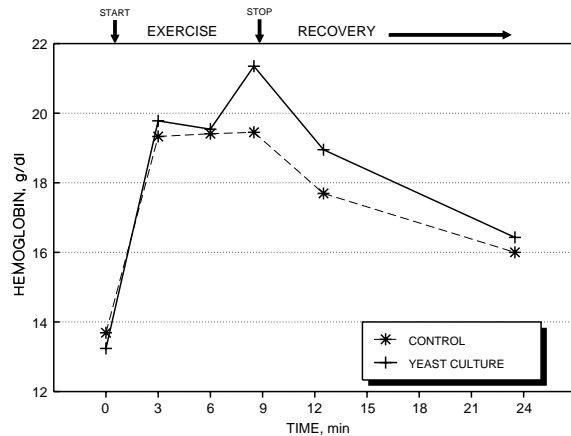
## Results

Blood lactate concentration increased ( $P < .01$ ) during exercise (Figure 1), however there was no effect of YC supplementation ( $P > .5$ ). Peak lactate levels occurred at the end of exercise or in the initial portion of recovery and were in excess of 100 mg/100 ml in both groups. During recovery there was a nonsignificant trend ( $P = .13$ ) towards lower lactate concentrations in the horses receiving yeast culture.

As expected, hemoglobin concentration increased during exercise (Figure 2). Hemoglobin concentrations appeared numerically higher in the YC treatment but the effect was not significant ( $P > .15$ ). During recovery hemoglobin concentration decreased, however there was not treatment effect of YC. Packed cell volume also increased during exercise (Table 1). However, no significant differences were observed between treatments ( $P > .3$ ) during exercise or recovery ( $P > .15$ ). As expected, heart rate increased during exercise and decreased during recovery; however, there were no significant treatment effects.

In addition, there were no treatment effects on plasma urea concentration. Plasma alanine and glutamine

**Figure 2. Effect of Yeast Culture on blood hemoglobin.**



concentrations increased ( $P < .01$ ) as a result of exercise; but the response to exercise was not affected by treatment ( $P > .15$ ). Plasma glutamine did tend to be higher at the end of recovery in the YC treatment ( $P < .07$ ). Concentrations of branched chain amino acids increased during the first 3 minutes of exercise, and then remained elevated. The concentrations of leucine, isoleucine and valine were not affected by YC supplementation ( $P > .1$ ).

## Discussion

In a previous research yeast culture supplementation resulted in decreased lactate concentration and heart rate. However, in that study peak lactate levels were relatively low, suggesting that the work test was mostly aerobic. In this study, the horses performed a shorter but more intense work bout that elevated lactate levels above 100 mg/dl. In this experiment YC supplementation had no significant effect on blood lactate accumulation or heart rate during exercise. The absence of a significant effect of YC on lactate and heart rate was consistent with the responses of PCV levels between treatments during exercise suggest that YC did not alter oxygen delivery or utilization. Other research has shown that YC supplementation increased both hemoglobin and PCV in moderately exercised horses. In that study, the adaptation period was longer than in this study, which may have influenced the outcome. Red blood cell turnover time is about 90 days; therefore, in order to detect the maximum benefit of any supplement on red blood cell characteristics, the test period should probably extend over at least 90 days.

## Research source

Biel, M., L. Lawrence, J. Novakofski, K. Kline, D. McLaren, L. Moser and D. Powell. 1990. J. Anim. Sci. 68(Suppl. 1): 375 (Abstr.).