

## Venous Blood Gas in Holstein steers fed diets with different concentrate to lucerne hay ratios

Alireza Vakili, Mohsen Danesh Mesgaran, Alireza Heravi Moussavi, Reza Valizadeh

Ferdowsi University (Excellence centre for Animal Science), Mashhad, Iran

Email: [al\\_va52@stu-mail.um.ac.ir](mailto:al_va52@stu-mail.um.ac.ir)

**Introduction** An arterial or venous blood gas is a clinical tool for determining pulmonary and metabolic status. Arterial Blood Gas (ABG) or Venous Blood Gas (VBG) methods provide a direct measurement of partial blood pressures of carbon dioxide (PaCO<sub>2</sub>) and oxygen (PaO<sub>2</sub>), hydrogen ion activity (pH), total hemoglobin (Hbtot), oxyhemoglobin saturation (HbO<sub>2</sub>) and bicarbonate ion concentration (HCO<sub>3</sub><sup>-</sup>). Most blood tests are done on a sample of blood taken from a vein due to: 1-Collecting blood from an artery is more painful than collecting it from a vein because the arteries are deeper and have more nerves, 2- Artery may be inaccessible due to periarterial tissues (overlying muscle, connective tissue, or fat). In ruminants, feeding diets high in grain and other highly fermentable carbohydrates increases the risk of ruminal and blood acidosis. Although ruminal pH varies considerably within a day, cows possess a highly developed system to maintain ruminal pH within a physiological range. However, if the acid production from fermentation is more than the system can buffer, ruminal pH compensation fails and it may drop drastically (Marie Krause & Oetzel, 2005). The importance of arterial or venous blood gas measurements in the diagnosis of ruminal acidosis is prevented some health problems such as ruminal parakeratosis, erosion and ulceration of the ruminal epithelium (Garry, 2002), laminitis, sole abscesses and sole ulcer (Nocek, 1997). The objective of the present experiment was to investigate the effect of diets providing different concentrate: lucerne hay ratios on venous blood gas in Holstein steers.

**Materials and methods** Four Holstein steers (300 ± 15 kg, body weight) were adapted to experimental diets for one week. Steers fed 7 kg of DM of diets differing in concentrate (155 g CP kg<sup>-1</sup> of DM; 30% maize, 34% barley, 8% soybean meal, 5% sugar beet pulp, 10% wheat bran, 12% cottonseed meal, 0.3% CaCO<sub>3</sub>, 0.5% mineral and vitamin premix, 0.2% salt ) to lucerne hay (155 g CP kg<sup>-1</sup> of DM ) ratios as 60:40, 70:30, 80:20, and 90:10 in a 4×4 Latin square design (28 days of each period). Steers were housed in individual pens, and fed the experimental diets as total mixed ration twice daily at 0800 and 2000 h. Animal had access to drinking water at the all time. At day 25 of each period of the experiment, blood samples were taken from Jugular vein after 4 h morning feeding. Samples were analyzed for VBG by Automatic blood gas system (AVL 995, Switzerland). Data were analyzed using the GLM procedure of SAS (y = Mean + Treatment + Animal + Period + residual) and the means compared by the Duncan test (P < 0.05).

**Results** Venous blood gas values are shown in the Table 1. Results indicated that the blood pH and VBG values were not significantly influenced by the diets. However, blood pH decreased from 7.41 (T1) to 7.37 (T4). When level of concentrate was increased.

**Table 1** Venous blood gases in Holstein steers fed diets differing in concentrate: lucerne hay ratios

Item	Concentrate: lucerne hay ratio <sup>1</sup>				Treatment effect	
	60:40	70:30	80:20	90:10	SEM <sup>2</sup>	P
Blood pH	7.41	7.39	7.40	7.37	0.02	0.24
Paco <sub>2</sub> (mmHg)	53.80	61.58	56.55	57.13	3.94	0.6
Pao <sub>2</sub> (mmHg)	41.73	40.13	41.35	43.15	2.87	0.9
Hco <sub>3</sub> <sup>-</sup> (mEq/lit)	32.38	34.80	33.58	31.85	1.49	0.54
O <sub>2</sub> saturation (%)	71.20	65.58	71.33	68.35	4.66	0.79

1: Values were reported as the mean of four sampling periods.

2: When the difference between means is greater than two times the SEM, it is considered as significant (P < 0.05).

3: SEM= Standard Error of Mean

**Conclusions** The results of the present study demonstrated that the increasing of concentrate in the diets of Holstein steers did not significantly affect blood pH. Results of the present study indicated that blood HCO<sub>3</sub><sup>-</sup> (mEq/lit) and PaCO<sub>2</sub> (mmHg) did not significantly changed when steers fed high concentrate diets. Therefore, it was concluded that the increasing of concentrate from 60 to 90 percent could not cause a mixed metabolic acidosis in steers.

### References

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