

Decrease of plasmatic aldosterone of growing half-bred zebu calves

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Abstract

Coppo, J.A.: *Decrease of plasmatic aldosterone of growing half-bred zebu calves.* Rev. vet. 15: 2, 82–84, 2004. It was suggested that the growth delay of early-weaned calf would be attributed to stress. In this case, plasmatic increases of aldosterone concentration should have occurred. To prove this hypothesis, values of this hormone were determined in 120 half-bred zebu calves (2 months old, 50% each sex). Sixty of them were weaned at 60–70 days post-partum (lot W), while the rest continued nursing (lot U). Using a repeated measures design, aldosterone was evaluated by radioimmunoassay on days 0 (early weaning), 7, 14, 21, 28, 60, 90 and 120 (traditional weaning). Concentrations were 348 ± 12 and 351 ± 13 pg/ml on day 0, as well as 288 ± 11 and 291 ± 14 pg/ml on day 120, in U and W, respectively. This falling tendency was statistically significant ($p < 0.05$) and it is attributed to the ontogeny. However, in each sampling date, significant differences between lots were not registered, moving away the possibility of stress.

Key words: calf, aldosterone, growing, weaning, stress.

Resumen

Coppo, J.A.: *Disminución de aldosterona plasmática durante el crecimiento de terneros cruza cebú.* Rev. vet. 15: 2, 82–84, 2004. Se ha propuesto que el retraso del desarrollo del ternero precozmente destetado se debería al estrés producido por dicha maniobra. En tal caso, deberían evidenciarse incrementos plasmáticos de la concentración de aldosterona. Para probar tal hipótesis, se determinaron los valores de dicha hormona en 120 terneros cruza cebú de 2 meses de edad, 50% de cada sexo. Sesenta fueron destetados a los 60–70 días de vida (lote W) y los restantes permanecieron en amamantamiento al pie de madre (lote U). Bajo un diseño de medidas repetidas, aldosterona fue evaluada por radioinmunoanálisis a los días 0 (destete precoz), 7, 14, 21, 28, 60, 90 y 120 (destete convencional). En el día 0 las concentraciones fueron de 348 ± 12 y 351 ± 13 pg/ml, en tanto que en el día 120 fueron de 288 ± 11 y 291 ± 14 pg/ml en U y W respectivamente. Esta tendencia decreciente fue estadísticamente significativa ($p < 0,05$) y se atribuye a la ontogenia. Sin embargo, en cada fecha de muestreo, no se registraron diferencias significativas entre lotes, alejando la posibilidad de existencia de estrés.

Palabras clave: ternero, aldosterona, crecimiento, destete, estrés.

INTRODUCTION

Calf internal environment suffers large physiologic changes from suckling to ruminant stage⁷. Data about aldosterone reference values during growing of half-bred zebu calves are scarce; this cattle is the most important in the subtropical area of Argentina. In the argentine breeding extensive system of meat livestock, calves are weaned at 180 days old. Some years ago, the practice of early weaning was implemented (age: 60 days), which produces profit for their mothers (nutri-

tional improvement and rapid return to reproductive activity). However, this practice affects calves growth rate; in day 180 they show significant loss weight compared to nursing animals. This phenomenon is attributed to the stress caused by early weaning⁵. Aldosterone is involved in the stress process when sympathetic alarms activate the hypothalamus–pituitary–adrenal axis².

Because of the possibility that early weaning is able to cause stress and increase aldosterone levels, the aim of this work was to verify eventual changes of the hormone plasmatic concentrations during growth (60 to 180 days) of early weaned half-bred zebu calves, versus

Table 1. Aldosterone evolution (pg/ml) in plasma of unweaned (U) and early weaned (W) calves.

day	mean \pm standard deviation		Wilk-Shapiro (U+W)	95% CI		range (U + W)	signif. (p)
	U	W		U	W		
0	348 \pm 12	351 \pm 13	0.996	345–351	347–354	320–382	NS
7	347 \pm 11	349 \pm 11	0.997	344–350	346–352	319–377	NS
14	334 \pm 9	333 \pm 8	0.996	332–337	331–336	313–357	NS
21	336 \pm 11	333 \pm 12	0.995	332–339	330–337	298–363	NS
28	328 \pm 11	326 \pm 11	0.974	325–331	323–329	304–349	NS
60	309 \pm 12	313 \pm 11	0.995	306–313	310–316	281–339	NS
90	297 \pm 9	295 \pm 12	0.992	295–300	292–297	269–322	NS
120	288 \pm 11	291 \pm 14	0.995	285–291	287–294	261–323	NS

CI: confidence interval, signif.: significance, NS: no significant.

nursing controls. This would allow to obtain aldosterone reference intervals for this race calves, as well as to verify ontogenic changes for this hormone between 2 and 6 months of life.

MATERIAL AND METHODS

One hundred and twenty nursing half-bred zebu calves (60–70 days old and 60–90 kg weight), 50% females and 50% castrated males, were used. They were randomly divided in early weaned (W) and unweaned (U) groups of 60 animals each. Group U continued suckling, while those of group W were weaned on day 0 and fed with a commercial balanced diet. The collection of jugular blood samples began in day 0 for both groups and then in day 7, 14, 21, 28, 60, 90 and 120. Aldosterone was determined by RIA, in a gamma counter ANSR–Abbot, reagents DPC Lab. Descriptive statistics and analysis of variance (Anova) for repeated measures was calculated using *Statistica* software (version 1999) including significance of time and treatment effects.

RESULTS AND DISCUSSION

Results are shown in Table 1. Differences between U and W calves in each date of sampling were not significant. No significant differences between sex was revealed by covariance analysis.

Aldosterone levels of 533 ± 159 pg/ml have been reported in newborn European calves; this concentration declines to 246 ± 56 pg/ml in the eighth day of life¹⁰, suggesting an ontogenic decrease. In this assay, our means were lightly higher than the last level; this difference may be attributed to breed (Indian breed) and geographical area (subtropical climate).

In both lots, the mineralocorticoid showed a decreasing tendency, directly proportional to the growth state. The time effect was significant (aldosterone declined in both lots, $p < 0.05$) but the treatment effect was no significant (differences between U and W animals were not detected). This fact would allow to think that stress was absent in early weaned calves; stress increases the plasmatic aldosterone levels in different animals^{1, 4}. In stressed horses, aldosterone values in-

crease in day 1 and remain elevated during 5 days⁹. In human endurance stress, aldosterone increase may cause sodium depletion¹². In rats, the basal value of this hormone (smaller than 300 pg/ml), rises up to 1000 pg/ml in the acute immobilization stress^{6, 8}. During stress, the episodic pulsation of corticosteroids secretion (circadian rhythm) is interrupted, and hormones will remain increased during more prolonged periods².

Early weaning provokes a shock in young goats, with abnormal behaviors and reduced growth. Together with nutritional requirements, there are behavioral requirements which have not been well investigated in ruminants¹¹.

In conclusion, half-bred zebu calves growth was characterized by a decrease of aldosterone level, which was not affected by early weaning. Therefore, is unlikely that this practice can produce stress in these strong and rustic calves. In previous works on this kind of calves, it was demonstrated that early weaning was unable to increase other stress indicators, such as cortisol, glucose, fructosamine, leukocytes and neutrophils. Decreases of calcium, γ -globulins, lymphocytes and eosinophils neither was verified. On the other hand, several nutritional markers were affected, therefore the smaller weight gains in calves submitted to early weaning, would be related with the composition and digestibility of the supplied balanced food, rather than stress³. The provision of required nutrients is an ethical duty of the farmer¹¹.

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