

Effect of chronic diseases on cortisol levels in hair of dairy goats in intensive system



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INTRODUCTION

Stress is a condition that occurs when an individual perceives the demands of a situation that exceeds its physiological resources and can increase the vulnerability of the organism to certain diseases by exerting an immuno-suppressive effect; which is mainly manifested in pathologies that are directly linked to immunological mechanisms (Schneiderman *et al.*, 2005). The presence of diseases in production animals is an indicator of welfare loss and leads to economic consequences due to the negative effect on productive and reproductive parameters (Licitra *et al.*, 2021). There is increasing research on chronic stress and its impact on animal welfare in various productive species such as pigs, sheep, dairy and beef cattle (Heimburge *et al.*, 2019). Hair cortisol measurements in animals can contribute to stress management and animal welfare by assessing individual resilience to stressors (Ghassemi Nejad *et al.*, 2019). The effect of diseases on chronic stress in goats is unknown.

OBJETIVE

To determine the effect of chronic infectious diseases (Small Ruminant Lentivirus, *Mycobacterium avium* subsp. *paratuberculosis*, *Brucella* spp, *Leptospira* spp and *Gammaherpesvirus* types 1 and 2) in dairy goats on hair cortisol concentrations.

MATERIALS AND METHODS

The present study was conducted in an intensive system, located in Querétaro, Mexico. 60 dairy goats, clinically healthy, multiparous and older than 4 years, were used. Blood samples of hair BP were collected before pregnant (BP), 7, 80 and 150 d lactation. Luminex Multiplex technique for the determination of Small Ruminant Lentivirus (p16 and gp38 antigen), *Mycobacterium avium* subsp. *paratuberculosis* (PPA3 antigen) and *Brucella* spp (native Hapten antigen). Microscopic Agglutination technique was performed to determine serovars of *Leptospira* spp (Autumnalis, Bratislava, Canicola, Gryppotyphosa, Hardjo, Icterohaemorrhagiae, Pomona, Pyrogenes, Serdjo and Tarassovi). Immunohistochemistry and viral isolation tests for caprine *Gammaherpesvirus* type 1 (CpGHV) and ovine *Gammaherpesvirus* type 2 (OvGHV) were performed. Hair cortisol determination was performed by enzyme-linked immunosorbent assay (ELISA) using the commercial kit DetectX® Cortisol from Arbor Assays (K003-H1/H5). Statistical package SAS® (v 9) was used for the analysis of the data obtained. Proc Univariate for descriptive statistics. Analysis of variance with repeated measurements over time (proc MIXED) to evaluate cortisol concentrations with respect to the number of diseases and by productive stage.

RESULTS

Table 1. Seroprevalences of etiologic agents causing chronic diseases in housed dairy goats (n=60).

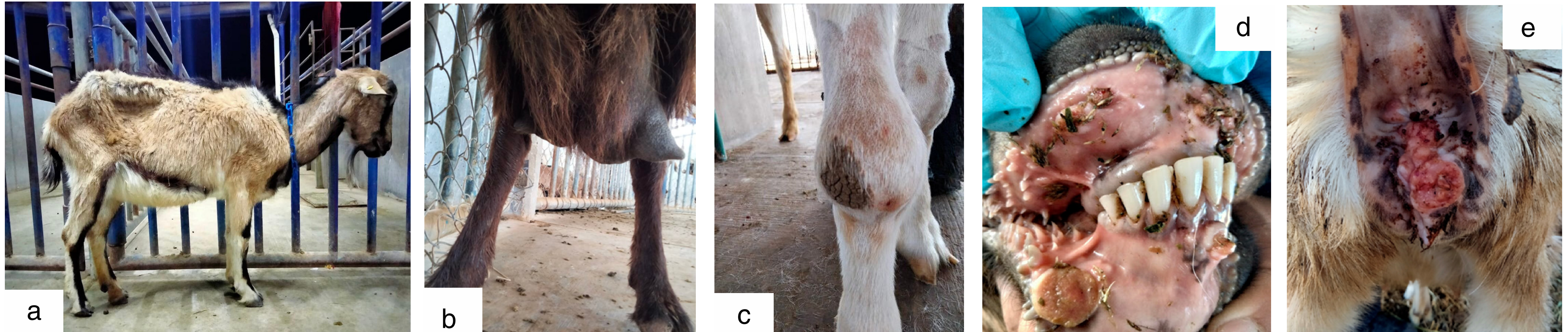
Etiology	Frecuency	Seroprevalence (%)
Small Ruminant Lentivirus	43	71.66 •
<i>Mycobacterium avium</i> subsp. <i>paratuberculosis</i>	3	5
<i>Brucella</i> spp.	0	0
<i>Leptospira</i> spp. *	24	40 •
CpGHV - 1 and OvGHV- 2	27	45 •

* Serial double microscopic agglutination. Cut-off point dilution 1:100 was considered positive.

Table 2. Seroprevalence of chronic diseases in dairy goats in housed dairy goats (n=60).

Diseases number	Frecuency	Seroprevalence (%)
0	5	8.33
1	20	33.33 •
2	29	48.33 •
3	6	10

The most frequently observed pathogenic serovars of *Leptospira* spp. in dairy goats were Icterohaemorrhagiae (9/24), Harjo (6/24), Canicola (4/24).



a. Adult goat with low body condition seropositive to *Mycobacterium avium* subsp. *paratuberculosis*, b and c. Udder asymmetry and carpal joint arthritis in goats seropositive to small ruminant lentivirus, d. Severe ulcerative stomatitis associated with ovine *Gammaherpesvirus* type 2 and e. Severe ulcerative vulvovaginitis associated with caprine *Gammaherpesvirus* type 1.

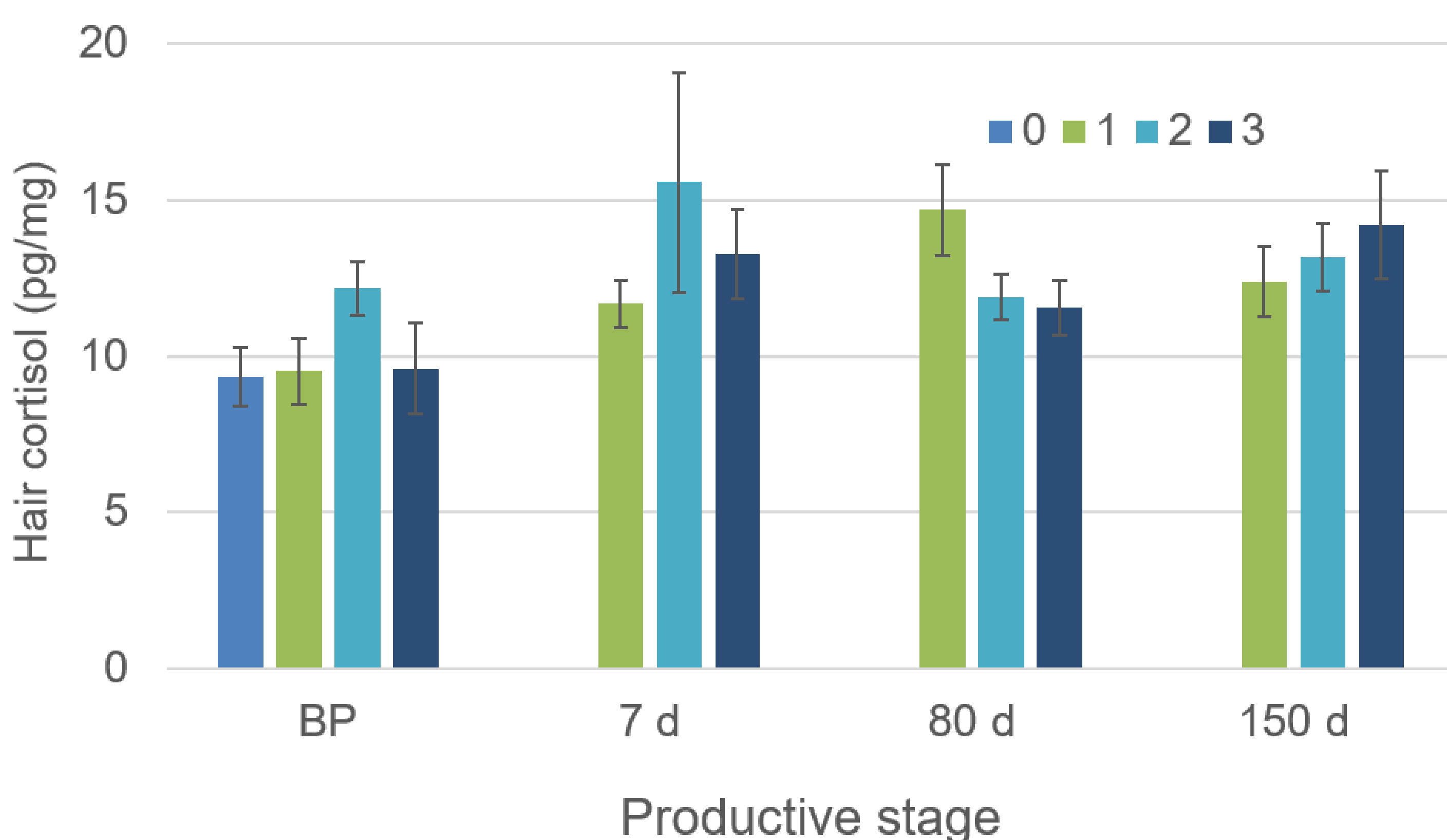


Figure 1. Hair cortisol concentrations (pg/mg) of dairy goats with different number of diseases and productive stage. BP: before pregnant, 7 d, 80 d, 150 d of lactation. No significant differences $P > 0.05$ were observed.

DISCUSION AND CONCLUSION

Research in healthy and sick cows (clinical and subclinical endometritis, mastitis and lameness) studied the effect of health status on hair cortisol concentrations (Comin *et al.*, 2013 and Burnett *et al.*, 2015) found elevated hair cortisol concentrations in animals with clinical manifestations as opposed to subclinical and healthy animals; which, disagrees with our study where cortisol concentrations were not influenced by the presence of diseases, since most of the animals had subclinical presentation. Although in our study we did not find significant differences by number of diseases, we detected some clinical manifestations of disease that could be related to pain, such as arthritis, mammary asymmetry and hardening, stomatitis and vulvovaginitis related to pathogens studied. The goats in this study may have had an adaptive effect to disease-induced stress as a protective process by not maintaining permanently high cortisol levels in daily life. Because no differences were detected between hair cortisol concentrations and disease.

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