Effect of photoperiod on endocrine testing results in normal horses and those with pituitary pars intermedia dysfunction in southern Australia

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Introduction
Diagnosis of pituitary pars intermedia dysfunction (PPID) in horses frequently requires measurement of hormone concentrations in peripheral blood and interpretation via application of cut-off values. Studies performed in the northern hemisphere have documented seasonal influences on dexamethasone suppression test (DST) results and plasma ACTH concentrations, with increases during autumn, and the use of seasonally-adjusted reference intervals for the diagnosis of PPID has been recommended. Recently, studies of horses performed in Townsville, Brisbane and Perth indicate seasonal effects on ACTH concentrations occur in Australia and that geographical location may influence results. The influence of season on plasma ACTH concentration in horses in southern Australia has not been reported previously.

Materials and Methods
This study examined the seasonal influence on plasma ACTH concentration and the DST in horses and ponies in southern New South Wales. Clinically normal animals (non-PPID group, n=14) and animals with PPID (PPID group, n=7) were included. Blood samples were collected monthly for analysis of ACTH concentrations, and DST were performed seasonally. General linear models and logistic regression were used to determine factors that influence plasma ACTH concentrations and DST results, respectively. Significance was set at P<0.05. Using the ACTH results for the non-PPID group, upper 95% reference limits with 90% confidence intervals (CI) were calculated to estimate reference intervals for two distinct periods: February-April and May-January. This study was approved by the Animal Care and Ethics Committee, Charles Sturt University (Approval #11/048).

Results
Plasma concentrations of ACTH in horses and ponies were influenced by season, with significantly greater values in late summer and autumn, in both clinically normal animals and animals with PPID (P<0.001). Ponies more likely to have a higher ACTH concentration each month compared to horses (P=0.025). No significant effect of sex on ACTH concentration was found. The upper CI limits for the upper 95% reference limits for plasma ACTH concentration were 61 pg/ml (February-April) and 49 pg/ml (May-January). While season did not have a significant effect on DST results, false positive DST results occurred in two healthy horses during autumn and in the PPID group, 2-4 false negative DST results occurred in each season.

Relevance to Australian clinical equine practice
The results of this study indicate that seasonal influences require consideration during interpretation of ACTH measurements and support the need for seasonally-adjusted reference intervals for plasma ACTH concentration that are dependent on geographical location. The variable diagnostic accuracy of the DST may result in errors in interpretation and this method should not be used in preference to measurement of endogenous ACTH concentration for the diagnosis of PPID.