

## Seasonal Changes in ACTH Secretion

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A study of normal ponies in Pennsylvania first indicated that plasma ACTH concentrations vary at different times of the year and that caution should be exercised when interpreting autumnal results (Donaldson et al., 2005). Subsequently a few further studies confirmed this finding and work performed at The Liphook Equine Hospital Laboratory resulted in what are still the only published and validated equine ACTH reference intervals for every month of the year (Copas and Durham, 2012). This study further indicated that autumnal testing of ACTH should actually be targetted rather than avoided. Copas and Durham (2012) established that samples collected between August and October differed significantly from the rest of the year and therefore presented a 2-tier reference interval (figure 1).

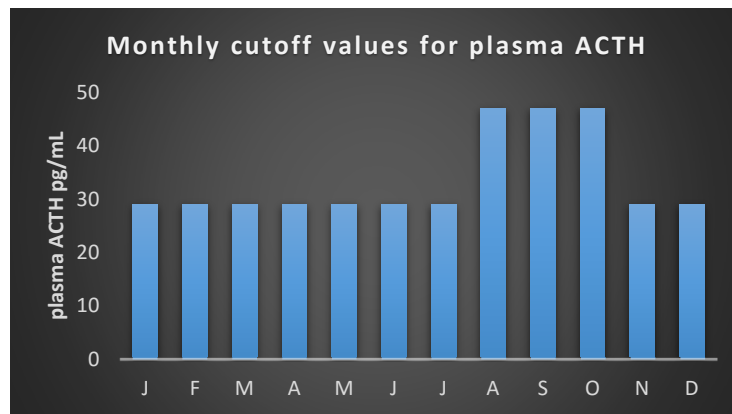


Figure 1. ACTH cutoff values for every month of the year (Copas and Durham, 2012).

Although scientifically valid, practical problems with application of these monthly cutoff values are apparent. Firstly, the cutoff values represent a mean for the 2 periods of November to July and August to September and it is possible that there may be further variability within these 2 periods; and, secondly, the published cutoff values create a problem at the transition between “seasons” such that it would appear that the values jump suddenly overnight between 29 and 47 pg/mL, which is clearly biologically implausible.

Further work has since been performed at the Liphook Equine Hospital Laboratory precisely detailing weekly ACTH variability in >35,000 horses and ponies enabling very accurate modelling of the seasonal pattern of ACTH secretion (Durham 2014). This work indicated the probable trigger for the seasonal rise in ACTH was the summer solstice (June 21<sup>st</sup>) with an increase in ACTH following shortly afterwards, and certainly well before the August increase detected by Copas and Durham (2012). Peak ACTH secretion was reached in the last week of September/first week of October before a decline back to basal levels by late November.

By combining the data from the known monthly cutoff values (Copas and Durham, 2012) with the more accurately modelled weekly pattern (Durham 2014) enabled development of weekly cutoff values which will now be applied by the Liphook Equine Hospital Laboratory going forwards (figure 2).

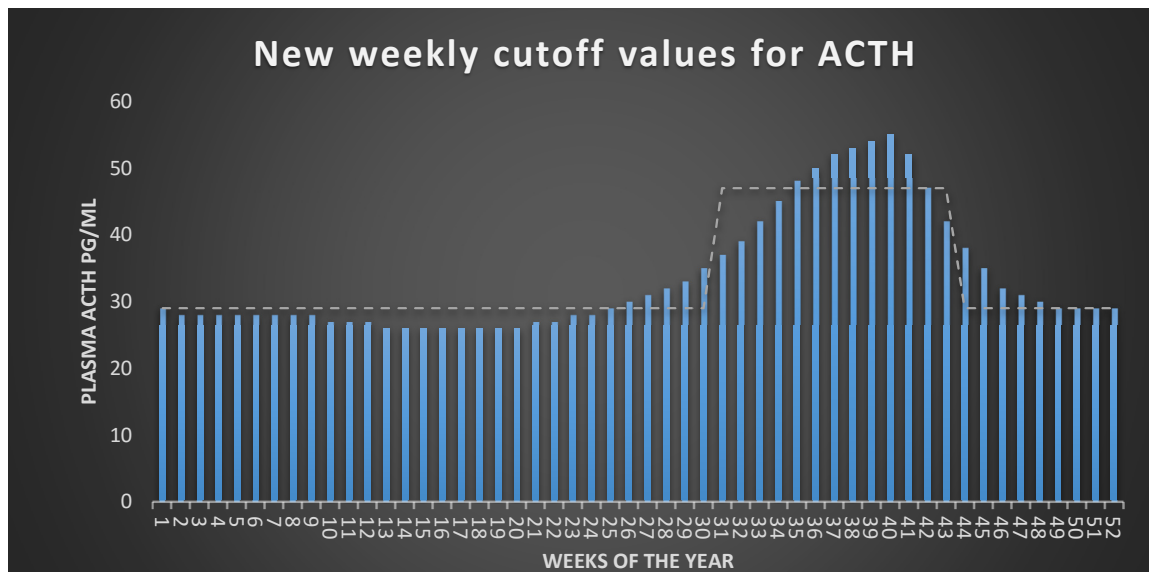


Figure 2. Bars represent ACTH cutoff values for every week of the year (Durham 2016, unpublished data) with the dashed line indicating previously used monthly cutoff values (Copas and Durham, 2012).

## References

Copas, V.E., Durham, A.E., 2012. Circannual variation in plasma adrenocorticotrophic hormone concentrations in the UK in normal horses and ponies, and those with pituitary pars intermedia dysfunction. *Equine Vet J* 44, 440-443.

Donaldson, M.T., McDonnell, S.M., Schanbacher, B.J., Lamb, S.V., McFarlane, D., Beech, J., 2005. Variation in plasma adrenocorticotrophic hormone concentration and dexamethasone suppression test results with season, age, and sex in healthy ponies and horses. *J Vet Intern Med* 19, 217-222.

Durham, A.E., 2014. Further Observations of Seasonality of Pars Intermedia Secretory Function in 30,000 Horses and Ponies. *Proceedings of Dorothy Russell Havemeyer Foundation Equine Geriatric Workshop II, 3rd Equine Endocrine Summit*. Middleburg (Virginia); November 17-20, 2014. Available at: <https://sites.tufts.edu/equineendogroup/files/2013/10/Equine-Geriatric-Workshop-II-DRH-2014.pdf>