Gonadotrophin hormones in flying-fox plasma during key reproductive stages

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Negative feedback from ovaries to the pituitary gland is usually achieved by oestradiol and progesterone in mammals. Counter-current exchange transfers these hormones from ovarian veins to ovaro-uterine arteries in flying-foxes (Genus *Pteropus*). As a result, information regarding the timing of ovarian activities such as ovulation cannot be achieved by measuring sex steroids in systemic plasma. The alternative approach being taken in the present study is to measure plasma concentrations of the gonadotrophins, follicle stimulating hormone (FSH) and luteinising hormone (LH), which communicate the pituitary signals to the gonads. This has not previously been attempted in any species of Megachiroptera, so reference values for both sexes of two species have been measured, to provide a basis for subsequent longitudinal investigations in individual animals during known reproductive stages.

Methods. Heterologous radioimmunoassays (RIAs) were adapted for measuring FSH and LH in plasma samples from *P. poliocephalus* and *P. scapulatus*. The assay for FSH used a polyclonal antibody (rabbit anti-ovine FSH), while the LH assay used a monoclonal antibody (mouse anti-bovine LH). Ovine hormones, oFSH and oLH, were used as standards. Plasma samples were collected by venipuncture from a cross section of captive and wild, intact and gonadectomised animals. Mean plasma concentrations of FSH and LH were compared between broad reproductive categories, by ANOVA of log transformed data.

oFSH and oLH Plasma Concentrations (ng/mL)
Mean ± SE (*n*)

FEMALES		**Folliculogenesis**		**Mating**		**Pregnancy**		***P***
P. poliocephalus	**FSH**	1.47 ± 0.61	(9)	0.53 ± 0.03	(8)	0.67 ± 0.07	(31)	0.01
	LH	2.56 ± 1.25	(7)	3.05 ± 1.72	(6)	1.77 ± 0.78	(7)	0.16
P. scapulatus	**FSH**	1.12 ± 0.31	(4)	0.87 ± 0.15	(7)	1.33 ± 0.33	(5)	0.24
	LH	1.50 ± 0.62	(5)	1.84 ± 1.05	(7)	2.09 ± 1.09	(7)	0.60
MALES		**Recrudescence**		**Mating**		**Regression**		***P***
P. poliocephalus	**FSH**	0.89 ± 0.14	(6)	0.81 ± 0.15	(13)	1.1 ± 0.22	(15)	0.73
	LH	1.48 ± 0.55	(4)	1.71 ± 0.63	(7)	1.53 ± 1.05	(9)	0.63
P. scapulatus	**FSH**	3.24 ± 1.56	(4)	1.46 ± 0.55	(9)	1.6 ± 0.86	(3)	0.54
	LH	1.80 ± 0.59	(4)	2.84 ± 1.72	(9)	2.77 ± 0.74	(3)	0.41

Results. In *P. poliocephalus* females, FSH was increased during folliculogenesis ($P < 0.01$, see Table). In *P. scapulatus* a trend toward suppression during pregnancy was weak due to small sample sizes. Plasma was available from several ovariectomised *P. poliocephalus* during the times of mating (FSH: 1.8, 2.4 ng/mL) and pregnancy (FSH: 1.03 ± 0.42, $n = 12$). In each instance these were higher than the mean in the parallel group of gonad-intact animals.

In male *P. poliocephalus* and *P. scapulatus* there were no trends in FSH or LH associated with the broad categories of testicular recrudescence, mating, and testicular regression. Removal of negative feedback by gonadectomy led to LH concentrations of 9.0 and 4.8 ng/mL in individual male *P. poliocephalus*, and 13.4 and 7.5 ng/mL in male *P. scapulatus.*

Conclusion. These preliminary data suggest that in female flying-foxes, FSH is secreted in patterns that are similar to those in other mammals. Apparent elevation of FSH during folliculogenesis suggests that FSH would be the more informative gonadotrophin to pursue in subsequent investigations into the regulation of reproduction in flying-foxes. Elevation of both gonadotrophin levels following gonadectomy confirms that pituitary hormones are under negative feedback from the gonads, as in other mammals, despite the novel vascular complex that supports the counter-current exchange of ovarian steroids.