The influence of the oestrous cycle and of acute 17β oestradiol upon pressor responses in the pithed rat to noradrenaline, angiotensin and stimulation of spinal sympathetic outflow

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It has been suggested that oestrogens may alter vascular responsiveness to neurohypophyseal hormones and catecholamines (Altura 1975) and modify noradrenaline release from sympathetic nerves (Haigh, Lloyd & Pickford 1965).

In the present study the effect of the stage of the oestrous cycle and of acute injection of oestrogen was investigated upon the pressor responses of the pithed rat preparation (Gillespie & Muir 1967) to intravenous noradrenaline and angiotensin and to stimulation of the spinal sympathetic outflow.

Cycling female Wistar rats were used at oestrus and dioestrus as determined by vaginal smear. Control responses to noradrenaline, angiotensin and stimulation at supramaximal voltage. 1 ms pulse width and variable frequency were selected to give an approximately 50% increase of the resting systolic pressure. There was no significant difference between the resting systolic pressure at oestrus, dioestrus or after 17β oestradiol. An interval of 5 min was allowed between responses and a cycle comprised one response to each of the three stimuli applied consecutively. Each experiment involved six cycles. 17β oestradiol (10 ng/kg or 100 ng/kg) was given intravenously following two control cycles to the three stimuli. The lower concentration was repeated after a further two cycles.

Pressor responses to noradrenaline, angiotensin and stimulation were similar in oestrous and dioestrous animals. Neither concentrations significantly altered responses to noradrenaline or angiotensin compared with responses at either oestrus or dioestrus. Responses to noradrenaline, but not to angiotensin, were significantly greater in the presence of 17β oestradiol (10 ng/kg) than those in the presence of 100 ng/kg and during the fifth cycle they were 56.3 ± 4.4% ($n = 5$) and 42.0 ± 3.2% ($n = 5$) ($P < 0.05$) of resting systolic pressure respectively.

Responses to stimulation were significantly increased by 17β oestradiol (10 ng/kg) when compared with responses in dioestrus animals, and during the fifth cycle they were 82.8 ± 10.6% ($\eta = 5$) and 57.2 ± 4.1% ($\eta = 5$) ($P < 0.05$) of resting systolic pressure respectively. Furthermore 17β oestradiol (100 ng/kg) caused a significant reduction of responses to stimulation compared with responses in oestrous animals and during the fifth cycle they were 45.8 ± 5.6% ($n = 5$) and 63.0 ± 0.9% ($n = 5$) ($P < 0.05$) of resting systolic pressure respectively. In addition there was a significant difference between responses in the presence of 17β oestradiol (10 ng/kg) compared with those in the presence of 17β oestradiol (100 ng/kg) ($P < 0.05$).

Thus the pressor responses to noradrenaline and stimulation, but not to angiotensin, were significantly greater following 17β oestradiol (10 ng/kg) compared with those following 17β oestradiol (100 ng/kg). Responses to stimulation but not to noradrenaline were increased by 17β oestradiol (10 ng/kg) and decreased by 17β oestradiol (100 ng/kg) compared to responses in dioestrus and oestrus animals respectively. This may be consistent with both a pre- and post-synaptic action of oestradiol upon the innervation of the vascular smooth muscle.

References

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