

References

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The effects of catecholamines on the rat isolated uterus

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Mammalian uteri contain both α and β adrenoceptors, the α -receptors being excitatory and the β -receptors inhibitory. The relative dominance of the two receptors appears to be under hormonal control, since in some species, the response of the uterus to exogenous catecholamines differs in pregnant and non-pregnant animals (Marshall, 1970). The aim of this study was to determine whether or not variations in responses to catecholamines occurred during the natural oestrous cycle of the rat. The stages of the oestrous cycle were identified from vaginal smears and the effects of noradrenaline (NA), adrenaline (Adr) and isoprenaline (Iso) were studied in each stage.

Uterine horns (2–3 cm) taken from adult virgin rats were mounted in paired 10 ml organ baths, containing Tyrode's solution, aerated with 95% O_2 : 5% CO_2 and maintained at 37°C. The inhibitory effects of the catecholamines were measured as a percentage decrease in the response to concentration of acetylcholine which gave 70–80% of the maximum response.

Adr, NA and Iso were inhibitory in all 4 stages of the cycle; motor responses were never seen. The potency of the catecholamines varied with the stage of the cycle. Iso (10^{-10} – 3×10^{-7} M) produced inhibition of 80% throughout the cycle. Adr (3×10^{-10} – 3×10^{-7} M) and NA (10^{-7} – 3×10^{-5} M) produced 80% inhibition in oestrus, but only 50% inhibition in proestrus, metoestrus and dioestrus. This difference was significant statistically at the 0.02 probability level.

Two possible explanations were, firstly, that stimulation of α -excitatory receptors, present during the non-oestrus stages of the cycle, might have reduced the inhibitory effects, and secondly, that tissue uptake of some catecholamines reduced their effectiveness, and this uptake varied with the cycle stage. The first possibility was excluded since azapetine 10^{-7} M, an α -antagonist, did not increase the maximum inhibitory effect of Adr and NA, and produced only a slight and variable leftwards shift in their dose-response curves. The second possibility was investigated by examining the effects of desmethylinipramine (10^{-6} M) to block neuronal uptake and normetanephrine (10^{-6} M) to block extra-neuronal uptake. In the presence of these blockers, the inhibitory effects of Adr and NA were increased to become equal to that of Iso in all stages, suggesting that uptake of Adr and NA was responsible for the diminished sensitivity during the non-oestrus stages of the cycle. Further confirmation was obtained in experiments estimating the uptake of [3H]NA. This was significantly lower in oestrus than in the other three stages of the cycle ($P < 0.001$).

In conclusion, the response to catecholamines is qualitatively the same throughout the cycle, i.e. inhibitory, but the degree of inhibition varies, being greatest in oestrus. The variation may be attributed to uptake of some catecholamines into the uterus, which can be affected by oestrogen levels.

K.G.D. is an MRC student.

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