

Responses to stimulation of the peripheral end of the right splanchnic nerve in the conscious calf¹

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Summary. The ratio at which adrenaline and noradrenaline are released from the adrenal medulla in response to stimulation of the splanchnic nerve has been established in the conscious calf. The proportion of adrenaline:noradrenaline was closely similar to that in which the 2 amines are stored in the gland and released in response to other stimuli in conscious, but not anaesthetized, calves.

Adrenaline is the predominant catecholamine that is released from the adrenal medulla in response to hypoglycaemia, 2-deoxyglucose or hypoxia in calves 3-5 weeks after birth²⁻⁶. In contrast, proportionately more noradrenaline is released in response to various stimuli, including splanchnic nerve stimulation, intra-arterial acetylcholine and asphyxia, in anaesthetized calves of the same age^{7,8}. The experiments described here were designed to resolve this anomaly by measuring the amounts of the 2 amines that are released in response to splanchnic nerve stimulation in conscious calves at this age.

Methods. Preparatory surgery was carried out 12-24 h

before each experiment. Narrow-bore polyethylene catheters were inserted into the aorta via the saphenous arteries and an 'adrenal clamp' was implanted, as described previously⁹, to enable subsequent collection of the whole of the effluent blood from the right adrenal gland as required. In addition the right splanchnic nerve was cut below the diaphragm and the peripheral end was enclosed within a fluid electrode, constructed of silver wire and silicone rubber which effectively eliminated spread of stimulus to other structures. Adrenal blood flow was estimated gravimetrically and catecholamines were measured by a modification of the trihydroxyindole method.

Results and discussion. In each experiment the splanchnic nerve was stimulated at either 4.0 or 10.0 Hz (10 V, 1 msec pulse-width) for 10 min. Stimulation at either frequency produced a rapid rise in aortic blood pressure which was associated with bradycardia and accompanied by a substantial increase in right adrenal blood flow (figure 1). In spite of these pronounced cardiovascular changes no behavioural responses to splanchnic nerve stimulation were ever observed. Under resting conditions the output of catecholamine from the adrenal medulla was barely detectable but substantial amounts were promptly released in response to splanchnic nerve stimulation. During stimulation proportionately greater amounts of adrenaline than noradrenaline were invariably released and the difference was statistically significant ($p < 0.01$) at the end of each period of stimulation (figure 2). The precise proportions in which the 2 amines were secreted changed slightly during stimulation (from 57.4% to 67.6% adrenaline at 4 Hz and from 61.8% to 70.0% adrenaline at 10 Hz). However, the percentage of adrenaline that was secreted during the final 2-min period, at either frequency (67.6% at 4 Hz; 70.0% at 10.0 Hz), was closely similar to the percentage that is found in the gland at this age (67%)⁷, and also correlated well with the proportion released in conscious calves in response to intense hypoxia⁴ and hypoglycaemia³, although not to hypercapnia⁵.

The fact that quite different proportions of the 2 amines are released in response to splanchnic nerve stimulation, at the same frequency, in anaesthetized calves of the same age⁷, indicates that anaesthetics exert a profound effect on the release of catecholamines from the adrenal medulla.

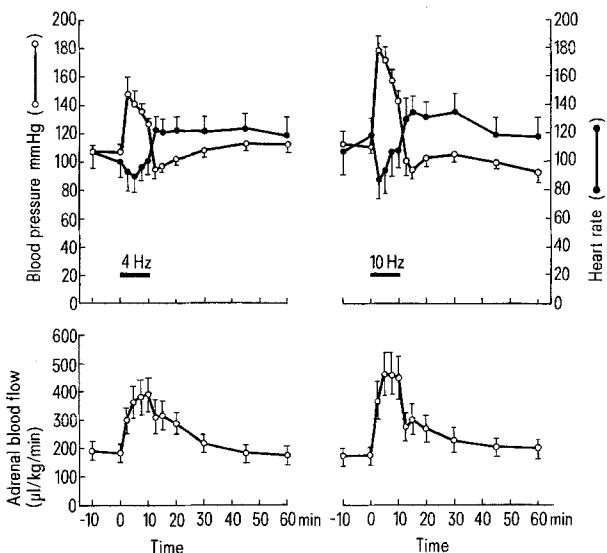


Fig. 1. Changes in mean aortic blood pressure, heart rate and right adrenal blood flow in response to stimulation of the peripheral end of the right splanchnic nerve in 3-5-week-old calves ($n = 6$). Vertical bars: SE of each mean value. Horizontal bars: duration of stimulus.

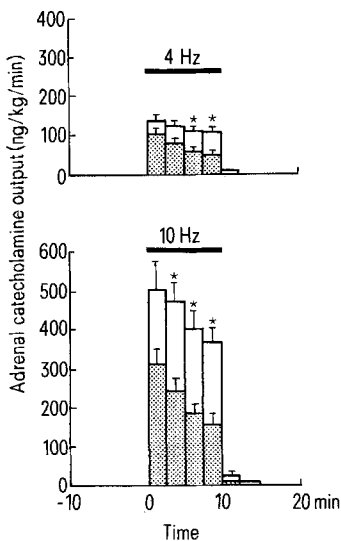


Fig. 2. Output of adrenaline (open histograms) and noradrenaline (closed histograms) from the right adrenal gland in response to stimulation of the peripheral end of the right splanchnic nerve at either 4.0 or 10.0 Hz for 10 min. Vertical bars: SE of each mean value. Horizontal bar: duration of stimulus. *where p exceeds 0.01 in respect of the difference between adrenaline and noradrenaline outputs.

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