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In the rat, the activities of dorsal horn convergent neurons – i.e. those receiving both noxious and non-noxious cutaneous inputs – can be depressed by widespread noxious somatic stimuli and by certain visceral stimuli such as intraperitoneal injections of bradykinin (Le Bars *et al.* 1979). These effects have been termed diffuse noxious inhibitory controls (d.n.i.c.). The objects of the present experiments were to determine whether d.n.i.c. can also be produced by more natural visceral stimuli such as distension of abdominal viscera, and to compare any effects so produced with those produced by noxious somatic stimuli.

Extracellular recordings were made from lumbar dorsal horn convergent neurones in urethane ($1.5\ g\ kg^{-1}$) anaesthetized rats. The effects of somatic and visceral conditioning stimuli were tested on the responses of these neurons to repeated electrical stimulation within their receptive fields on the ipsilateral hindpaw. The conditioning stimuli were: noxious pinch or heat (52 °C) applied to the nose, tail or paws, and inflation of the urinary bladder on an intracolonic balloon by using pressures of 50 or 100 mmHg (1 mmHg $\approx$ 133 Pa) respectively; these pressures were the largest which could safely be applied without producing haemorrhage from the bladder or rupture of the colon.

Thirty-one convergent neurons were studied in the fashion described above and the majority of these (90.3%) had their activities depressed by both somatic and visceral conditioning stimuli. A further two convergent neurons that were excited by one or other of the conditioning stimuli were excluded from the study. The somatic conditioning stimuli depressed the activities of all 31 neurons in a similar fashion to that described by Le Bars *et al.* (1979): these effects were most marked against the long latency ('C-fibre') responses of the neurons and generally outlasted the conditioning period by several minutes. The activities of 28 of the neurons were similarly depressed by one or both of the visceral stimuli although these effects were generally weaker than those obtained with the somatic stimuli, e.g. the visceral stimuli produced mean reductions of 40–55% in the number of long latency responses, whereas the corresponding figures for the somatic stimuli were 80–85%.

Thus, it would appear that d.n.i.c. can be triggered by large distensions of single abdominal viscera but that such stimuli evoke rather weaker effects than do noxious somatic stimuli. In view of the present results, it is of interest to note that in other experiments in this laboratory, it has been found that some neurons in the medullary nucleus raphe magnus (n.r.m.) are excited both by widespread noxious somatic stimuli and by inflation of the bladder (B. Lumb, this meeting) and that n.r.m. has been implicated in d.n.i.c. (Dickenson *et al.* 1980).

References

Dickenson, A. H., Le Bars, D. & Besson, J. M. 1980 *Neurosci. Lett. Suppl.* **5**, S375.
Le Bars, D., Dickenson, A. H. & Besson, J. M. 1979 *Pain* **6**, 283–304.