

Effects of capsaicin on stress-induced duodenal injury

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Abstract

AIM: To determine whether capsaicin could protect against stress-induced duodenal ulceration.

METHODS: Fasted Sprague-Dawley rats were restrained in rigid plastic tubes and immersed in a water bath at 24 °C for 4 h. Thereafter, rats were killed, duodenum opened and discrete ulcers counted and aggregated area of ulceration (mm²) measured. Duodenal tissues were fixed in 10% formalin for histological examination. Duodenal CGRP content was measured by RIA after tissue extraction. All test drugs were given intragastrically. The following 4 groups of rats were subjected to water-restraint stress: (1) Control: saline or vehicle (1 mL solution: ethanol 10%, Tween 80 10%, saline 80% v/v/v), (2) Acute capsaicin administration (1.3 mg/kg), (3) Acute administration of CGRP 14 µg/kg, (4) Afferent sensory denervation caused by high dose of capsaicin (total 125 mg, sc) administered 2 wk prior to experiment. Data for each group represented the result of 6-8 experiments. Statistical evaluation and comparison of the data were performed by Student's *t* test and analysis of variance by Duncan's test.

RESULTS: Water immersion restraint stress caused severe duodenal ulceration with hemorrhage. Discrete duodenal ulcers numbered 3.6 ± 0.5 , and aggregated area of ulceration measured 5.1 ± 0.6 mm². Acute capsaicin pretreatment significantly reduced the number (1.6 ± 0.2) and area (2.0 ± 0.3 mm²) of duodenal ulcers ($P < 0.01$). Similarly, CGRP p retreatment significantly inhibited the number (1.4 ± 0.2) and area (1.7 ± 0.3 mm²) of duodenal ulceration. In contrast, denervation of sensory afferent nerves by chronic capsaicin treatment caused significant increase in ulcer number and area of ulceration as compared to control rats: 5.0 ± 0.4 and 7.6 ± 0.8 mm² ($P < 0.05$). Histological examination of the duodenum from animals subjected to stress confirmed macroscopic assessment of duodenal ulceration of mucosa, accompanied by acute hemorrhage. Duodenal CGRP content was reduced significantly in stressed animals when compared to non-stressed rats: 20.5 ± 2.9 pmol/g vs 31.6 ± 3.5 pmol/g ($P < 0.05$). Acute capsaicin pretreatment prevented reduction in duodenal CGRP content (29.8 ± 2.5 pmol/g) ($P > 0.1$ vs control). In contrast, chronic capsaicin treatment caused significant decrease in CGRP content to 5.8 ± 0.8 pmol/g ($P < 0.001$ vs control).

CONCLUSION: (1) Water immersion restraint stress caused duodenal ulceration. (2) Capsaicin and CGRP treatment protected against stress-induced duodenal ulceration. (3) Sensory denervation by capsaicin significantly altered the degree of duodenal ulceration in rats subjected to water immersion restraint stress.

These results validate this model of stress for development of duodenal ulceration and suggest those sensory afferent nerves and CGRP play a role in protecting the duodenal mucosa against stress injury.

Key words: Capsaicin; Stress ulcer; Duodenal ulcer; Rats; Disease models, animal

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