Radioactive aniline clearance from canine gastric pouches for the measurement of gastric mucosal blood flow

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Clearance of various organic bases by the gastric mucosa was studied by Shore, Brodie & Hogben (1957) who showed that both aminopyrine (pKa 5·0) and aniline (pKa 5·0) are concentrated in the gastric juice. They postulated that these substances were completely removed from the blood flowing through the gastric mucosa. Jacobson, Linford & Grossman (1966) developed the technique of aminopyrine clearance as a measurement of gastric mucosal blood flow. Although aminopyrine clearance is now a widely used method, the estimation of aminopyrine is tedious. We have therefore investigated the possibility of using radioactive aniline instead of aminopyrine.

Commercially available ^{14}C aniline was estimated in plasma and gastric juice by shaking each 1 ml sample in a sealed bottle for 5 min with 10 ml diethyl ether and 0·5 ml M sodium hydroxide. Seven millilitres of the ether phase was then added to 10 ml scintillator and counted in a Packard Tri-Carb liquid scintillation counter.

Aniline clearance was studied in four dogs prepared with separated (Heidenhain) gastric pouches. A loading dose of aniline (10 mg/kg and 10 μCi) followed by a maintenance infusion [(10 mg/kg)/h and 10 μCi/h] was given intravenously. Blood samples were taken at 30 min intervals from another vein or via an indwelling arterial catheter. Gastric juice was collected from the pouch.

This dose of aniline had no effect on the gastric secretion in response to a meal or to histamine infusions. As would be expected there was detectable methaemoglobinaemia. However, the percentage of methaemoglobin, which varied in different dogs from 5 to 11 %, was well below the value of 40 % at which toxic effects are seen (Bodansky, 1951).

Gastric secretion was stimulated by infusing various doses of histamine or pentagastrin intravenously. The clearance of aniline closely followed the acid secretory response.

The theoretical basis of the assumption that aminopyrine clearance measures gastric mucosal blood flow applies equally to aniline clearance. Confirmation that aminopyrine clearance and aniline clearance are the same was obtained in experiments in which the clearances were compared in the same dog and shown to give very similar results. The advantage of aniline clearance is that the use of a radioactive substance simplifies its measurement in body fluids.

This work was supported by the Medical Research Council.

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Effect of isoprenaline on histamine induced gastric acid secretion in dogs

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Isoprenaline is a vasodilator substance and would therefore be expected to enhance