macroscopic spleen colonies are now excluded from the sections by the low-molecular-weight cut off ($\leq$ 5000 daltons) of the fibres. In addition, a better stem cell survival shouls be obtained if fouling of the fibres by media with high protein content is reduced.

In spite of these limitations the fibre stage may be employed as an alternative to conventional cell and organ culture systems in a variety of experiments requiring a semipermeable capillary network with known characteristics in terms of structural parameters and dialytic efficiency.

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Direct measurement of the pH in the stomach of the conscious rat, using a special electrode

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Summary. The construction and use of a specially designed electrode to measure gastric pH in the conscious rat is described. Measurement of gastric hydrogen ion activity with this device is rapid and reproducible in starved rats. A dose-related increase of gastric pH was obtained after s.c. injection of the anticholinergic isopropamide.

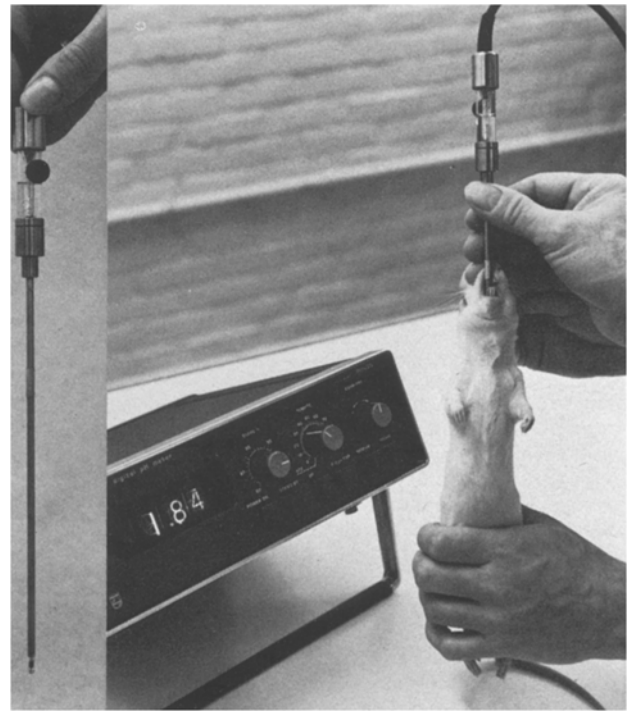
In rats gastric secretion of acid and pepsin remains relatively important in fasting conditions. The measurement of acid secretion in small laboratory animals requires surgical intervention and/or anaesthesia, which by themselves may change the rate and the concentration of acid production. The specially constructed pH electrode presented here allows frequent measurement of the hydrogen ion activity in the stomach of conscious rats.

The pH electrode is a special Philips combined item type CJP built in a stainless steel reinforced glass stem with an outer diameter of 3 mm and a total length of 19.0 cm (figure).

After some training the use of this pH electrode is rapid and easy. 1 operator holds the rat firmly by the skull skin which results in a complete relaxation of the pending animal. A second operator introduces the slender electrode through the throat and oesophagus down so far as to bring a mark on the electrode at the level of the teeth (total depth 13.5 cm in rats weighing $\pm$ 250 g). If some resistance develops, it is usually at the level of the oesophageal sphincter, which can be passed by gentle sidelong movements of the electrode stem. After introduction the pH-meter is switched on and read when the needle reaches a stable position.

A total of 127 male Wistar rats of an inbred strain were used in these experiments and the pH was recorded after a 48-h fasting period. The mean pH $\pm$ SEM in untreated animals was 1.41 $\pm$ 0.015. The distribution of these 127 pH values was normal ($\chi^2 = 2.51$; $q = 4$; $p = 0.64$). All pH readings were between 1.15 and 1.65, with 1 exception of 1.90. To 7 groups of 13 rats each (total 91), the following treatment was applied s.c.: saline (control group) and 0.0025, 0.0050, 0.010, 0.020, 0.040, and 0.080 mg/kg of the anticholinergic isopropamide[2]; 30 min later 1 ml of water (pH 4.5) was given orally by gavage to counteract excessive drying of the mucosal surfaces, and again 30 min later gastric pH was measured. The results of these experiments are summarized in the table. The lowest dose of 0.0025 mg/kg of isopropamide was inactive, whereas 0.005 mg/kg and higher doses induced a significant and dose-dependent increase in pH values. Based on the number of animals reaching a pH $\geq$ 1.75 (which was found in only 1 out of 127 control measurements) the calculated ED_{50}[3] was 0.0109 (0.00756–0.0157) mg/kg.

Anticholinergics are able to delay gastric emptying[4], and increase in pH could have been the consequence of a dilution effect of the 1-ml water load retained in the stomach after isopropamide administration. Therefore 7 rats of each treatment group were killed immediately after the pH measurement and their stomachs were removed and weighed. Moreover 7 new groups of 6 rats



pH electrode and its use in the conscious rat.

Mean (± SEM) gastric pH in 48-h starved rats, after s.c. injection of saline and different doses of isopropamide

Isopropamide (mg/kg)	n	Mean pH in rats loaded with 1 ml H_2O	Mean pH before treatment	Number of rats with pH $\geqslant$ 1.75
0 (saline)	13	1.41 ± 0.037	1.46 ± 0.032	0
0.0025	13	1.43 ± 0.052	1.47 ± 0.053	0
0.0050	13	1.55 ± 0.048*	1.37 ± 0.030	1
0.010	13	2.10 ± 0.219***	1.39 ± 0.021	7
0.020	13	2.37 ± 0.207***	1.34 ± 0.032	10
0.040	13	2.67 ± 0.210***	1.41 ± 0.040	13
0.080	13	2.90 ± 0.186***	1.40 ± 0.038	13

* $p < 0.05$; *** $p < 0.001$ according to the Mann-Withney U-test[5].

each were treated with the same dose range of isopropamide, but without loading and the pH values of this group were compared with the pH obtained in the 6 remaining rats of each original group. The results were as follows. No significant difference was found between the stomach weights of the controls and those of the animals treated with 0.0025, 0.0050 and 0.010 mg/kg of isopropamide, the respective mean weights ± SEM were in g: 1.70 ± 0.05; 1.68 ± 0.08 and 1.66 ± 0.06. Stomach weights significantly increased as compared to the controls at 0.020 mg/kg (2.24 ± 0.16 g; $p \leqslant 0.01$), at 0.040 mg/kg (2.60 ± 0.13: $p < 0.001$) and at 0.080 mg/kg (2.50 ± 0.13: $p < 0.001$) isopropamide. In spite of this, no significant differences in pH increase could be detected between the groups of rats with or without water load. Mean pH increase at 0.020 mg/kg isopropamide was +0.74 (with) and +0.76 (without), at 0.040 mg/kg the pH increase reached +1.10 and +1.01 and at 0.080 mg/kg +1.57 and +1.70 respectively.

Thus the pH electrode, described here, allows a rapid and accurate measurement of the hydrogen ion activity in the stomach lumen of the conscious rat. In our experience (a total of more than 2000 measurements), the only perturbation linked with the use of this device is a very slight irritation of the mucosa in a particular site of the glandular area, close to the greater curvature and the limiting ridge. This however does not prevent, to any extent, stable pH readings repeated over several hours in control rats. As demonstrated for the anticholinergic drug isopropamide, antisecretory activity of compounds can be detected exclusively and at low dose levels by changes in hydrogen ion activity.

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CONGRESSUS

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Stuttgart, 23/24 July 1980

This symposium is an official satellite symposium of the international congress of physiology, Budapest 1980, endorsed by IUPS. Information by J.C. Frölich, Department of Clinical Pharmacology, Fischer-Bosch-Institut, Auerbachstrasse 112, D-7000 Stuttgart/BRD.

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Information by: World biomaterials congress secretariat, Mrs E. Maurer, c/o Wiener Medizinische Akademie, Alser Strasse 4, A-1090 Wien, Austria.

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London, Ontario, 20–25 July 1980

Topics: Industrial and agricultural uses, biochemistry, genetics, taxonomy and ecology, sporulation and conjugation, cell cycle. Organizing committee: Dr G.G. Stewart, Labatt Breweries of Canada Ltd, 150 Simcoe St., London, Canada N6A 4M3.
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