J. Expt. & Clin. Anat. 3(2): 28-30 (2004).

JECA

Comparative Study On The Effects Of Urethane Anaesthesia And Pithing On Gastric Acid Secretion In Common African Toads (Bufo regularis)

R.O. NNELI

Department of Physiology, College of Medicine, University of Nigeria, Enugu Campus

ABSTRACT

The pattern of gastric acid secretion under urethane anaesthesia and pithing In common African toads were investigated using the continuous method of Recording acid secretion. Histamine was administered intramuscularly under Urethane induction and pithing to study their effects on gastric secretion. After an overnight fast, the animals were anaesthetized with urethane or pithing was inducted depending on the study. The results showed that urethane provoked acid secretion while pithing inhibited it ($p < 0.05$). Histamine produced an increase in acid output under urethane but not in pithing ($p > 0.05$). It is concluded that urethane increased acid secretion while pithing suppressed it, and that both the vagal and histaminic pathways were involved in the acid secretory pattern observed for urethane anaesthesia and pithing in this study.

Keywords: Common African toads, gastric acid secretion (GAS), acid output, urethane anaesthesia, pithing.

The pattern of gastric acid secretion in common African toads has been reported (1). Urethane or ethyl carbamate commonly used as an anaesthetic agent in routine laboratory investigations has been shown by (3) to suppress gastric acid secretion in rats. Its usage in routine studies was shown to have caused hyperglycaemia in rats, rabbits, and cats(4). Hyperglycaemia, a condition in diabetes and adrenal insufficiency has been reported to suppress gastric acidity (5,6,7,8,9). The process of pithing has been employed as a common laboratory technique for paralyzing the amphibians or destroying their central nervous system (10). In spite of the wide usage of pithing, there is a paucity in the literature on its effect on gastric acid secretion in toads. Also, there is little or no information on the effect of urethane on gastric acid secretion in toads. Thus, this study has as its objective to determine the pattern.

MATERIALS AND METHODS

Two sets of experiments were carried out namely: measurement of gastric acid secretion under (i) urethane anaesthesia and (ii) pithing. Toads of both sexes and weighing between 30g and 175g were employed. In this study, 5 animals were prepared for each of the studies and gastric acid secretion was measured by the modified continuous method of (11). After an overnight fast, the toads were anaesthetized with 25% urethane solution at a dose of 1.25ml/100g body weight given intraperitoneally (urethane induction). Pithing process was done by piercing through the foramen magnum with a fine seeker to destroy it as described by (12). A vehicle injection of distilled water given at a dose of 1.25ml/100g body weight i.p served as the control for urethane induction while the sham-operated pithing served as a control for the pithing experiment. oesophageal and pyloric cannulae were inserted in position for the perfusion and collection of stomach effluent. The stomach was continuously perfuse with normal saline (pH 7.00) and the perfusate collected a 15 minute intervals. These samples were titrated against 0.01M NaoH using phenolphthalein as indicator to determine the acid output in mMol per 15 minute. Histamine given at a dose of 3.6mg/Kg body weight intramuscularly to determine acid secretion under urethane and pithing induction. The effects of blockers, atropine given as atropine sulphate (19mg/kg bwt) (13), and cimetidine, an H2 receptor antagonist (10mg/kg bwt) (13) were studied on gastric acid secretion in urethane and pithing inductions respectively. Statistical analysis were done using graph pad software for student's t-test, standard error of means while a p level of equal to or less than 0.05 was considered statistically significant. The results are in mean % $\pm$ SEM.

RESULTS

The results of the effects of urethane anaesthesia is shown in figure 1. the basal acid output 6% $\pm$ 0.25 (SEM) mMol/15 min. (vehicle injection) while acid output for urethane induction after 2 hours 15 minutes was 13.1 % $\pm$ .143 (SEM) mMol/15 min. this represents a two-and-half folds increase ($p < 0.05$). the effect of pithing on acid output is shown in figure 2.

the mean acid output for the sham-operated group was 9.2% ± 0.14 (SEM) mMol/15 min. while for pithing, it was 6.7% ± 0.31 (SEM) mMol/15 min. this represents a 35% reduction over the sham-operated studies ($p > 0.05$). the effect of histamine on urethane induction and pithing on acid ouput is shown in figure 3. histamine on acid secretion (urethane) gave 14.0% ± 1.26 (SEM) mMol/15 min. and basal acid output was 11.1 % ± 0.84 (SEM) mMol/15 min., a 27% increase ($p < 0.05$). histamine on pithing gave 6.4% + 0.43 (SEM) and basal, 6.7 % +0.45 (SEM) mMol/ 15 min. ($p < 0.05$). atropine on acid output (urethane and pithing) is shown in figure 4. atropine reduced acid output in urethane induction from 9.9% ± 0.25 to 7.3 % ± 0.22, a 35. 6% inhibition ($p < 0.05$). it has no effect on pithing. Cimetidine effect on acid output in urethane and pithing is shown in figure 5. cimeidine suppressed acid secretion under urethane by 41.8 % that is, from 6.6% ± 0.16 to 4.7% ± 0.15 ($p < 0.05$) while it has no action on pithing.

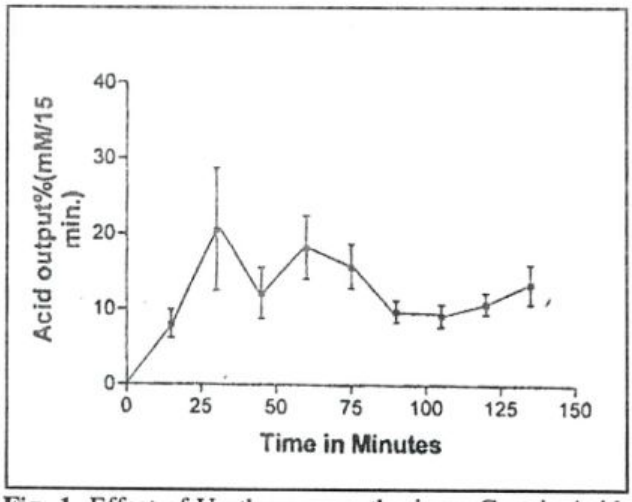

Fig. 1 Effect of Urethane anaesthesia on Gastric Acid Secretion in toads

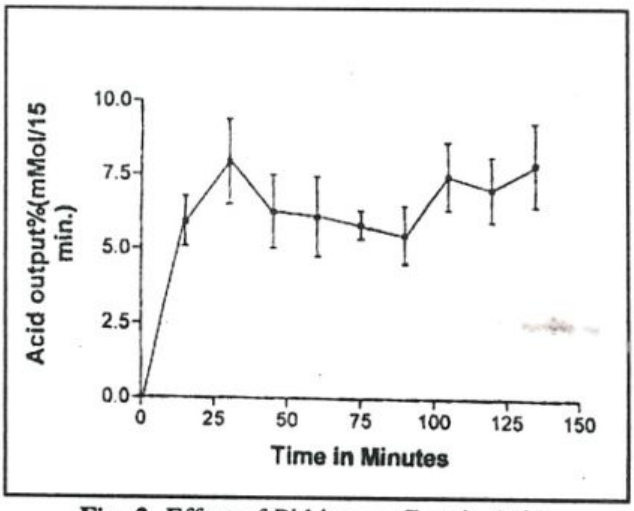

Fig. 2 Effect of Pithing on Gastric Acid Secretion in toads

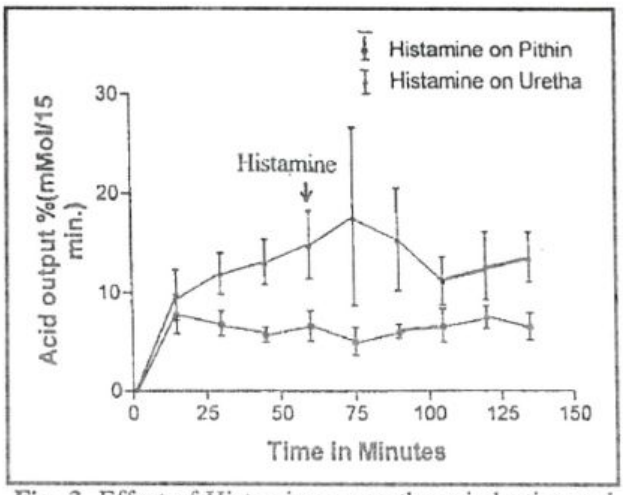

Fig. 3 Effect of Histamine on urethane induction and Pithing on Acid Secretion in toads

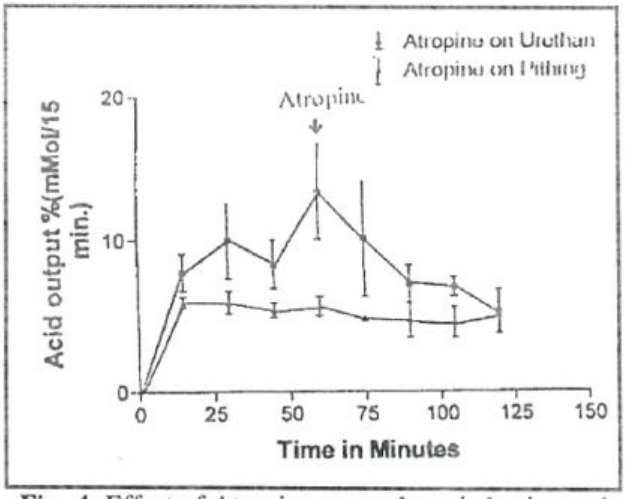

Fig. 4 Effect of Atropine on urethane induction and Pithing

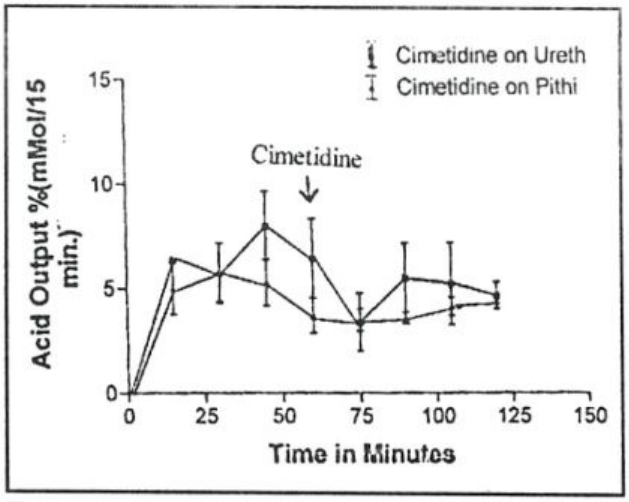

Fig. 5 Effect of Cimetidine on urethane induction and Pithing on Acid Secretion in toads

DISCUSSION

Urethane induction on gastric acid secretion in toads produced an increased acid output which was contrary to previous reports of suppression in other animals (3). The histaminic effect agreed with stimulation of acid secretion reported by (14). Pithing,

a central nervous system paralysis decreased acid output in toads thus suggesting the importance of the brain and spinal cord in the mechanism of acid secretion (15, 16). Histamine, a chemostimulator of gastric acid secretion provoked acid secretion under urethane-induced acid output and thus supports the observations of (1,3,17,18). The involvement of vagal (cholinergic) stimulation via action of atropine on acid output induced by urethane shown by inhibition corroborates (19) while the suppressive effect of cimetidine on urethane-induced acid secretion suggests the involvement of histaminic H-2 receptor on the mechanism of urethane-induced acid output and agreed with the previous study that the H-2 receptor is an important pathways for acid secretion (20). It is concluded that urethane provoked acid secretion via cholinergic and histaminic pathways and hisamine remains a major stimulator of maximal acid output while pithing suppressed acid secretion via removal of nervous signals. Urethane induced gastric acid secretion in toads while pithing inhibited it.

REFERENCES

Alada ARA; Oyebola DDO (1990) Gastric acid secretion in common African toads (Bufo Regularis). Nig. J. Physiol. Sc. 6(1): 77.

Magi C.A et al (1986) Suitability of urethane anaesthesia for physiological, pharmacological investigation in various systems.

Part 1: General considerations. Experientia 42(2): 109 114.

Borrella LE; Herr F (1971). Continuous secretion of gastric acid in the conscious unanaesthetized and anaesthetized rats. Gastroenterol 61(3): 345 356.

Reinhert H (1964) Urethane hyperglcycaemia and hypothalamic activation. Nature 204: 889-891.

Bowen BA; Aaron AH (1926) Gastric secretion in diabetes mellitus. Arch. Int. Med. 37: 674-684.

Kyle J; Welbourne RB (1956) The influence of adenohypophysis and adrenal cortex on gastric secretion in the rat. Brit. J. Surg. 46: 241-247.

Moor JG (1989) The effect of hyperglycaemia on human gastric secretion. J. Gastroenterol 64(5): 1106-110.

Hinton BT (1982) Hyperglycaemia in urethane anaesthetized rats: involvement of the adrenal gland. Lab. Anim Sci. 32(3): 251-252.

Oyebola DDO; Alada ARA; Bolarinwa AF (1993) The early effects of adrenalectomy on gastric acid secretion in rats in Nig. J. Physiol Sc. 9 (1&2): 29-30.

Hyman L.H (1943) Process of pithing in: A laboratory manual of Elementary Zoology. The University of Chicago Press; Appendix: Practical suggestions No. 2p. 170.

Ghosh MN; Schild H.O (1958) Continuous recording of gastric acid secretion in rats. Brit. J. Pharmacol. 13: 58-61.

Stephenson E.M (1949) The keeping of amphibians for laboratory purpose. In: UFAW Handbook on the care and management of laboratory Animals ed. Alastar N. Wordy. Bailleriere Tindall and Cox, London. P. 249.

Ekelund M; Hakanson R; Vallgren R (1987) Effects of cimetidine, atropine and pirenzepine on basal and stimulated gastric acid secretion in the rat. Eur. J. Pharmacol. 138(2): 225-232.

Garrick T; Goto Y; Buack S; Guth P. (1987) Cimetidine and ranitidine protect against cold restraint-induced ulceration in rat by suppressing gastric acid secretion. Dig. Dis. Sci. 32(1): 1261-1267.

Lenz HJ (1987) Interaction between the brain and gastrointestinal tract. Z-Gastroenterol. 25 suppl. 1: 61-71.

Tach Y; Stephens Rl; Ishikawa T. (1989) Central nervous system action of TRH to influence gastrointestinal function and ulceration. Ann N.Y. Acad. Sc. 553: 269-285.

Card W, Marks IN (1960) The relationship between the acid output of the stomach following maximal histamine stimulation and the parietal cell mass. Clin. Sc. 19: 147-163.

Code CF (1965) Histamine and gastric secretion: A later look 1955-1965. Fed Proc. 24: 1211-1321.

Konturek SJ (1982) Cholinergic control of gastric acid in man. Scand. J. Gastroenterol. 14: 1-6.

Ward AS; Gallespie IE; Passaro EP jr; Grossman MI (1963) Comparison of histalog and histamine as stimulants for maximal gastric acid secretion in human subjects and in dogs. Gastroenterol. 44: 620-626.