

## H<sup>+</sup> Output in Male and Female Rats as Affected by Old Age

<sup>1</sup>Yadollah Bahrami and <sup>2</sup>Saeid Chekani-Azar

<sup>1</sup>Young Researchers Club, Islamic Azad University, Khorasgan Branch, Iran

<sup>2</sup>Young Researchers Club, Islamic Azad University, Shabestar Branch, Shabestar, Iran

**Abstract:** An experiment was conducted to valuate the H<sup>+</sup> output in rats stomachs in male and females after 2 and 8 weeks feeding period with a modified standard rodent diet. A total of 56 *Albino strain* rats (28 per sex, 20 day-old) were reared underwent a bring rein terms of lighting (half time of day) and temperature ( $23 \pm 2^{\circ}\text{C}$ ) during trial. Starting experiments was in 8:00 AM, as animals deprived from feed only, 18 hours before starting trial. By anesthetize rats with Sodium thiopental and insert a silicon tube in stomach via duodenum, the amounts of acids were collected and measured with an automatic acid titration (TTT 80), with Na OH 0.1 N to pH=7. When significant differences ( $P < 0.05$ ) were detected, the mean values were compared post-hoc by using the student t- test. Also, the correlation coefficients were calculated. Results from this study did not showed significant difference in secretion content of the basis gastric acid. In both male and female, the basal acid amount was correlated with age ( $R=0.4$ ,  $P<0.0$ ) and stomach weight ( $R=0.44$ ,  $P<0.01$ ) and the stomach/body weight was bigger in female ( $P<0.05$ ) than males, but means of the body and stomach weight were more in male ( $P<0.05$ ). Old age significantly increased the amount of basis gastric acid secretion in males. With regard to absence of significant difference in the mean of basal acid output between male and female rats in spite of significant differences in their body weights, selecting one of both sexes from both ages was proposed for different studies on gastric acid secretion.

**Key words:** Sex • Basal gastric acid • Stomach weight • Age • *Albino strain* rat

### INTRODUCTION

It has been shown that the basal gastric secretion had altered in amount with time. Gastric acid (H<sup>+</sup>) secretions result from the interplay of neuro-hormonal factors with stimulatory and inhibitory actions on oxyntic glands. H<sup>+</sup> secretion was activated by the ingestion of food and the presence of nutrients in the upper galvanized iron (GI) lumen. H<sup>+</sup> secretion is consist two part of basis and activated form such that the basis H<sup>+</sup> secretion was occur in absence of outer or gastric-intestinal stimulators. Amount of basis H<sup>+</sup> have notably difference between different animals in sex or strain [1]. In humans, secretion of basal gastric acid and maximum amount was higher in men than women and the secretion output was measured 2.5 to 10 millimole/h [2] while its amount in rats were variable between 10 to 70 micromole/h [3, 4]. Factors like measurement method and time of daily acid secretion, used anesthetics types, sex, weight and age of animals can be effective in alteration of gastric acid output. Therefore, with consider to gastric acid secretion

difference in rats and possibility of problems in different experiments, an experiment was conducted to assess effects of age and sex on basal gastric acid secretion in rats of *Albino strain*.

### MATERIALS AND METHODS

Each 28 male and 28 female *Albino* rats ( $n = 56$ , 30 day-old) were weighed, tail painted and randomly assigned to rodent cages with free access to a modified rodent diet (Pars Co. Karaj) and water during a 8-wk experimental period as followed an environmentally controlled atmosphere (temperature  $23 \pm 2^{\circ}\text{C}$ , 45% relative humidity). Rats were reared underwent a bring rein terms of light:dark (half time of day) cycle. Starting experiments was in 8:00 AM, as animals deprived from feed only, 18 hours before starting trial. After 4 and 8 week feeding, by anesthetize rats with Sodium thiopental and insert a silicon tube in stomach via duodenum, the amounts of acids were collected and measured with an automatic acid titrator (TTT 80), with Na OH 0.1 N to pH=7.

Table 1: Effect of sex and age on body and stomach weights and basis acid secretion

Sex / Age	Body weight (gr)	Stomach weight (gr)	Body / stomach weight	Basis acid secretion (micromole/15 minute)
4-week-old				
Male	232 ± 11.5*	1.9 ± 0.1	0.72*	5.25 ± 0.11
Female	209 ± 8.5	1.7 ± 0.1	0.78	5.29 ± 0.14
8-week-old				
Male	257 ± 10.7*†	2.2 ± 0.2	0.75	6.45 ± 0.09*†
Female	225 ± 9.7	2.0 ± 0.1	0.77	5.59 ± 0.11

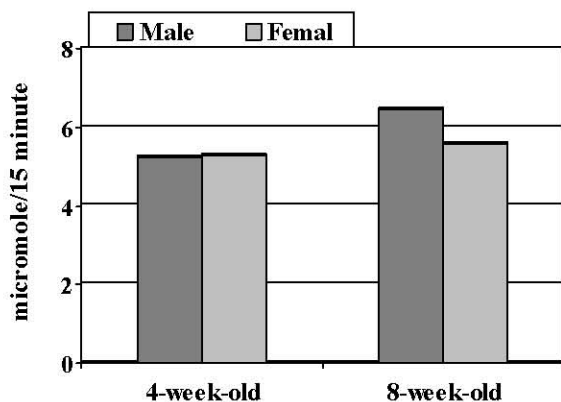


Fig. 1: The basis gastric acid secretion (micromole/15 minute) in male and female rats in 4 and 8 week-old. Values of figures are correspondent to those shown in Table 1. \* $P < 0.05$  compared with sex; † $P < 0.05$  compared with age.

To measurement of the basal secretion, the gastric acid output were collected in three time of 15 minutes of interval and the mean for each three time intervals was calculated. When significant differences ( $P < 0.05$ ) were detected, the mean values were compared post-hoc by using the student t-test. Also, the correlation coefficients were calculated.

## RESULTS

Findings from the presented study did not show significant differences for means of basal acid secretion content in male and female rats (Table 1). The significant different was observed when correlation coefficient of results, compared for sex and age.

<sup>1</sup>Values are expressed as the mean±SD. \* $P < 0.05$  compared with sex; † $P < 0.05$  compared with age.

In general, amount of basis gastric acid secretion in females were higher than males, but the effect of raise of ages in rats was significant in males as increased the basal gastric acid secretion (Figure 1). In both male and female, the basal acid amount was correlated with age ( $R=0.4$ ,  $P<0.01$ ) and stomach weight ( $R=0.44$ ,  $P<0.01$ ) and the

stomach / body weight was bigger in female ( $P<0.05$ ) than males, but Means of the body and stomach weight were more in male ( $P<0.05$ ).

## DISCUSSION

The presented results, indicated that basal gastric acid secretion is not different in sexes, but with increasing age, it could altered, especially in males. Other findings from researchers [5, 7] are in agreement with our findings. Lam *et al.* [2] reported that amount of acid secretion from stomach parietal cells in male rats is higher in compared to females and it can increased with raising age. This result has been observed in different animals and human [1, 3]. In our trial,  $H^+$  output in females were not significantly higher than males, but with increasing age, the amount of acid secretion significantly increased only in males. This result can be occurring because of difference in sex hormones types which can alter with age [8]. Boorman *et al.* [6] reported that in the stomach / body weight ratio is higher in females than males because of aggregation of cellule cromafini in stomach, with no significant differences in  $H^+$  output between both sexes of rats in spite of low effect of sex hormones on basal acid secretion. The findings of Haruma *et al.* [9] were in contrast with our results and they reported that the sex had no effect on the amount of gastrin, a hormone which stimulates the secretion of gastric juices, in fasting time. It has been demonstrated that the amount of gastric basal acid secretion in rats was similar in both sex of male and female, but simulated secretion was significantly higher in males rats [10, 11].

It can be concluded that the  $H^+$  output between revealed no sex difference, but it increased with advancing of age, especially in male rats. Therefore selecting rats with one sex and one ages in a particular group, was recommended for accomplishment of studies linked to gastric acid secretion, as well as in most investigations, choosing younger male rats from view point of nutritional and physiological criteria is recommended. Notwithstanding the fact that, the

presented study to estimate gastric juice secretion or H<sup>+</sup> output is not novelty work but many efforts need for achievement to an assurance in selecting the same sex and age rats for nutritional and physiological studies.

#### ACKNOWLEDGMENTS

The support of Young Researchers Club and Islamic Azad University, Khorasgan Branch is gratefully acknowledged. We would like to thank Dr. Mahdi Hammadani from Faculty of Veterinary Medicine, Tabriz Islamic Azad University, Tabriz, Iran, for directing to us with his experiences in research.

#### REFERENCES

1. West, J.B., 1990. Physiological basis of Medical Practice. 12th ed. London: Williams & Wilkins. 650-62.
2. Lam, W.F., A.A.M. Masclee, E.S.M. Muller and B.H.W. Lamers, 1997. Effect of hyperglycemia on gastric acid secretion during the gastric phase of digestion. *Am. J. Physiol.*, 272: 1116-21.
3. Salim, A.S., 1998. Gastric diversion: a method for H<sup>+</sup> output estimation in the rat. *Digestion*. 39: 47-51.
4. Baydoun, R. and J.C. Dunbar, 1997. Impaired insulin but normal pentagastrin effect on gastric acid secretion in diabetic rats: a role for nitric oxide. *Diabetes Res Clin Pract.* 38: 1-8.
5. Adeniyi, K.O., M.O. Olowookorun, 1989. Influence of sex on gastric acid secretion and parietal cell mass in the rat. *Acta. Physiol. Hung.*, 74: 63-7
6. Boorman, G.A., S.L. Eustis, M.R. Elwell, C.A. Jr. Montgomery and W.F. MacKenzie, 1990. Pathology of Fischer rat reference and atlas. First ed. London: Academic Press Inc., pp: 25-30.
7. Baron, J.H., 1997. Sex, gonads, sex hormones and histamine-stimulated gastric acid secretion and serum pentagastrin. *Inflamm Res.*, 46: 260-4.
8. Lynn, R.B., M.S. Kreider and R.R. Miselis, 1991. Tyrotropin-releasing hormone immunoreactive projections to the dorsal motor nucleus and nucleus of solitary tract of rat. *J. Comp. Neurol.*, 311: 277-88.
9. Haruma, K., H. Kawaguchi, M. Yoshihara, S. Okamoto, K. Sumii, S. Kishimoto and G. Kajiyama, 1994. Relationship between *Helicobacter Pylori* infection and gastric acid secretion in young healthy subjects. *J. Clin. Gastroenterol.*, 19: 20-2.
10. Girma, K., I. Janczewska, B. Romell, R. Seensalu, A. Sandin, E. Wilander and G. Nilsson, 1997. Twenty-four-hour basal and repetitive pentagastrin-stimulated gastric acid secretion in normal and sham-operated rats. *Scand. J. Gastroenterol.*, 32P: 669-75.
11. Modlin, I. and G. Sachs, 1998. Acid related Diseases; Biology and Treatment. Schnetztor-Verlag GmbH Konstanz, Konstanz.