

6-1963

## The Effects Of Prednisone On Gastric Secretion In Antrectomized Heidenhain Pouch Dogs

E. Morfin

H. Jenny

Walter H. Janke

Joseph L. Ponka

Brock E. Brush

Follow this and additional works at: <https://scholarlycommons.henryford.com/hfhmedjournal>



Part of the [Life Sciences Commons](#), [Medical Specialties Commons](#), and the [Public Health Commons](#)

---

### Recommended Citation

Morfin, E.; Jenny, H.; Janke, Walter H.; Ponka, Joseph L.; and Brush, Brock E. (1963) "The Effects Of Prednisone On Gastric Secretion In Antrectomized Heidenhain Pouch Dogs," *Henry Ford Hospital Medical Bulletin* : Vol. 11 : No. 2 , 189-193.  
Available at: <https://scholarlycommons.henryford.com/hfhmedjournal/vol11/iss2/8>

This Article is brought to you for free and open access by Henry Ford Health System Scholarly Commons. It has been accepted for inclusion in Henry Ford Hospital Medical Journal by an authorized editor of Henry Ford Health System Scholarly Commons. For more information, please contact [acabrer4@hfhs.org](mailto:acabrer4@hfhs.org).

## THE EFFECTS OF PREDNISONE ON GASTRIC SECRETION IN ANTRECTOMIZED HEIDENHAIN POUCH DOGS

E. MORFIN, H. JENNY, W. JANKE, J. L. PONKA AND B. E. BRUSH

THE WIDESPREAD use of adrenal hormones has brought, among the undesirable side-effects, complications such as the so-called "steroid associated" ulcer, which has been attributed to gastric hypersecretion caused by adrenocortical hyperactivity. Although it has been proved that ACTH, cortisone and prednisone increase the gastric acid secretion,<sup>1,4</sup> the mechanism by which this action is carried out is not completely understood. Prednisone acts independently of the parasympathetic and sympathetic systems. Chaikof and co-workers<sup>3</sup> have proved that 25 mg. of prednisone orally caused a marked increase in Heidenhain pouches (vagally-denervated) and in Pavlov pouches (vagally-innervated).

Janke, and others,<sup>4</sup> by using sympathectomized Heidenhain pouch dogs, were able to demonstrate that prednisone acts independently of the sympathetic systems. In all their experiments a significant increase in gastric secretory response was obtained, whether or not the sympathetic innervation of the stomach was intact.

The importance of the pyloric antrum in regulating the gastric secretion is well known.<sup>7-12</sup> The resection of the antrum produces an extensive reduction in the secretion of acid gastric juice in dogs prepared with Pavlov, or Heidenhain pouches. It is evident that the major stimulus responsible for the secretion of acid gastric juice is in some way related to the presence of the antrum.<sup>10,12</sup> It has been suggested,<sup>2,3,6</sup> that one way by which the adrenal hormones could act is by first affecting the antrum and causing it to produce an abnormal amount of gastrin. Our experimental work has been directed to explore this possibility and to find out if such intermediary antral mechanism exists.

In reviewing the medical literature, only two studies concerning the role of the antrum in relation to the increased gastric secretion created by the use of steroids were found. The results reported in these two studies are contradictory. Zubiran and Dragstedt<sup>2</sup> encountered a sustained significant increase in gastric acid secretion in two dogs prepared with isolated stomach pouches and antrectomy. The opposite results have been reported by McGee, L. S. and others,<sup>6</sup> who found that four of

---

From the Department of General Surgery.

five dogs in which the antrum was removed failed to show any significant increase in 24 hour acid secretions while on cortisone.

#### METHOD

Our observations have been carried out in dogs provided with Heidenhain pouches constructed from the greater curvature of the stomach in the manner described by DeVito and others<sup>7</sup> and Chaikof.<sup>3</sup> In the same surgical procedure antrectomy was performed and the continuity restored by a Billroth I type of anastomosis. Special emphasis was placed in performing a wide removal of the antrum carrying the resection into the duodenum well beyond the pylorus. A stainless steel cannula placed in the pouch and connected to a rubber bladder provided the means for collecting the gastric juice.

After the surgical procedure the animals were allowed a period of three weeks before the gastric collections were begun. In the immediate post-operative period, the usual precautions were taken and the diet increased as tolerated until the 5th day; thereafter they were placed on a regular balanced diet of: one lb. of Rival canned food, 250 cc. of milk, 5 gm. of salt and water ad libitum. Daily 24 hour gastric secretions were collected, measured and total and free acid calculated. The milliequivalent (mEq) of free HCl secreted in a 24 hour period was calculated by multiplying the volume (in liters) by the free acid concentration in clinical units.

In five of the animals (HPA: 1, 2, 3, 5, 6), the pH and chloride in the gastric juice were also determined. For 15 consecutive days control gastric secretions were collected. Following this observation period the dogs were given 25 mg. of prednisone daily orally for 15 days. Prednisone was then discontinued and the observation prolonged for another 15 days. The Prednisone was given in small amounts of milk and the dogs observed to make sure they had drunk it. The gastric juice was collected every day at 8 a.m. before the dogs were fed.

Eight healthy mongrel dogs were prepared, as previously described, and a total of twelve experiments were conducted. Each experiment had a duration of 45 days. In four animals (HPA: 1, 4, 7, 9), after a five week period of rest, the experiment was repeated in the same manner.

#### RESULTS

The effects of 25 mg. of prednisone given orally, daily for a period of 15 days are summarized in Table I. Data reported represents averages of 24 hour values.

No appreciable change in chloride values was observed and the pH varied little, except in one animal (HPA - 2). A decrease in the volume of gastric secretion averaging 20.5 c.c. was recorded in five of the preparations; in the remaining seven an increase averaging 41.5 c.c. was observed during the administration of prednisone.

It may be noted that great variations in the volume of gastric secretion were observed. From one day to the next the increase, or decrease, in volume could be up to 100 per cent. These variations in volume were observed in the periods before, during and after the administration of prednisone. The effect of prednisone on gastric acidity is recorded in Table II. In all the preparations (8 dogs) but one, (HPA - 3), an increase in total and free acid was observed while on prednisone. In those preparations in which a decrease in volume was recorded, the conversion to mEq/24 hours reflected the change.

#### SUMMARY

The role of the antrum as a mediator in the response of the stomach to the action of Prednisone is questionable. Antrectomy failed to prevent the increase in total and free acid concentration in 10 of our 12 experiments, including the cases in which the volume decreased.

PREDNISONE ON GASTRIC SECRETION

TABLE I

| * HPA | B. P.  |     |     |     |      |        | P.  |     |     |      |        |     | A. P. |     |      |    |     |     |     |     |  |
|-------|--------|-----|-----|-----|------|--------|-----|-----|-----|------|--------|-----|-------|-----|------|----|-----|-----|-----|-----|--|
|       | V.     | TA  | FA, | Cl, | pH   | V.     | TA, | FA, | Cl, | pH,  | V.     | TA, | FA,   | Cl, | pH,  | V. | TA, | FA, | Cl, | pH, |  |
| 1     | 56.26  | 118 | 92  | 154 | 1.08 | 46.86  | 121 | 105 | 154 | 1.13 | 15.06  | 127 | 109   | 151 | 1.17 |    |     |     |     |     |  |
| 1a    | 49.80  | 123 | 108 |     |      | 37.80  | 123 | 108 |     |      | 48.40  | 122 | 103   |     |      |    |     |     |     |     |  |
| 2     | 36.73  | 60  | 27  | 156 | 3.26 | 18.60  | 99  | 48  | 158 | 1.71 | 25.73  | 106 | 83    | 156 | 1.26 |    |     |     |     |     |  |
| 3     | 42.93  | 127 | 107 | 158 | 1.09 | 53.60  | 121 | 98  | 154 | 1.14 | 44.93  | 114 | 99    | 161 | 1.79 |    |     |     |     |     |  |
| 4     | 43.46  | 139 | 118 |     |      | 50.73  | 144 | 126 |     |      | 56.53  | 102 | 88    |     |      |    |     |     |     |     |  |
| 4a    | 78.06  | 124 | 111 |     |      | 87.33  | 137 | 123 |     |      | 58.80  | 118 | 104   |     |      |    |     |     |     |     |  |
| 5     | 101.66 | 115 | 100 | 155 | 1.13 | 50.06  | 119 | 102 | 161 | 1.21 | 64.86  | 94  | 79    | 160 | 1.34 |    |     |     |     |     |  |
| 6     | 28.86  | 80  | 53  | 153 | 1.53 | 17.06  | 98  | 73  | 158 | 1.29 | 18.71  | 77  | 55    | 159 | 1.60 |    |     |     |     |     |  |
| 7     | 46.66  | 117 | 98  |     |      | 74.46  | 153 | 137 |     |      | 65.13  | 117 | 105   |     |      |    |     |     |     |     |  |
| 7a    | 125.40 | 136 | 124 |     |      | 289.86 | 153 | 141 |     |      | 250.   | 145 | 134   |     |      |    |     |     |     |     |  |
| 9     | 83.93  | 135 | 107 |     |      | 187    | 160 | 140 |     |      | 136.40 | 125 | 107   |     |      |    |     |     |     |     |  |
| 9a    | 122.85 | 122 | 105 |     |      | 141.50 | 133 | 118 |     |      | 127.21 | 125 | 110   |     |      |    |     |     |     |     |  |

\*a Repeated experiment  
 BP Before Prednisone  
 P Prednisone  
 AP After Prednisone

V Volume in C.C.  
 TA Total Acid  
 FA Free Acid  
 Cl Chloride

TABLE II  
 GASTRIC SECRETORY RESPONSE OF THE CANINE HEINDENHAIN POUCH TO 25 MG' OF PREDNISONE DAILY

| *     | TA  |     |     | FA - Cl. U. |     |     | mEq/24 hrs. |       | %Change |
|-------|-----|-----|-----|-------------|-----|-----|-------------|-------|---------|
|       | BP  | P   | AP  | BP          | P   | AP  | BP          | P     |         |
| HPA 1 | 118 | 121 | 127 | 92          | 105 | 109 | 5.24        | 4.93  | - 5     |
| 1a    | 123 | 123 | 122 | 108         | 108 | 103 | 5.40        | 4.10  | -24     |
| 2     | 60  | 99  | 106 | 27          | 48  | 83  | .99         | .91   | -.08    |
| 3     | 127 | 121 | 114 | 107         | 98  | 99  | 4.60        | 5.29  | +15     |
| 4     | 139 | 144 | 102 | 118         | 126 | 88  | 5.19        | 6.24  | +20     |
| 4a    | 124 | 137 | 118 | 111         | 123 | 104 | 8.76        | 10.70 | +22     |
| 5     | 115 | 119 | 94  | 100         | 102 | 79  | 10.2        | 5.10  | -50     |
| 6     | 80  | 98  | 77  | 53          | 73  | 55  | 1.48        | 1.24  | -16     |
| 7     | 117 | 153 | 117 | 98          | 137 | 105 | 4.60        | 10.13 | +55     |
| 7a    | 136 | 153 | 145 | 124         | 141 | 134 | 15.50       | 40.74 | +162    |
| 9     | 135 | 160 | 125 | 107         | 140 | 107 | 8.98        | 26.18 | +191    |
| 9a    | 122 | 133 | 125 | 105         | 118 | 110 | 12.91       | 16.63 | +28     |

Cl. U. Clinical Units  
 \*a Repeated Experiment

TA Total Acid  
 FA Free Acid

## PREDNISONE ON GASTRIC SECRETION

### REFERENCES

1. Zubiran, J. M., Kark, A. E., and Dragstedt, L. R.: Effect of ACTH on gastric secretion in experimental animals, *Gastroenterology* 21:276, 1952.
2. Zubiran, J. M., Kark, A. E., Montalbetti, A. J., Morel, C. V. L., and Dragstedt, L. R.: Peptic ulcer and the adrenal stress syndrome, *A.M.A. Arch. Surg.* 65:809, 1952.
3. Chaikof, L., Janke, W. H., Pesaros, P. C., Ponka, J. L., and Brush, B. E.: Effects of prednisone and corticotropin on gastric secretion; experiments on Heidenhain pouch dogs, *Arch. Surg.* 83:32, 1961.
4. Janke, W. H., Pesaros, P. C., Ponka, J. L., and Brush, B. E.: Effects of prednisone on gastric secretion in sympathectomized Heidenhain pouch dogs, *Henry Ford Hosp. Med. Bull.* 10:439, 1962.
5. Clarke, S. D., Neill, D. W., and Welborn, R. B.: Effects of corticotrophin and corticoids on secretion from denervated gastric pouches in dogs, *Gut* 1:36, 1960.
5. McGee, L. S., Blackburn, J., Lance, E. M., and Scott, H. W.: Secretory response of the denervated gastric pouch to prolonged massive cortisone administration, *S. Forum* 9:440, 1958.
7. Devito, R., Jones, T. W., Martinis, A. J., Nyhus, L. M., and Harkins, H. N.: Modification of gastric mechanism by antroneurolysis, *S. Forum* 9:423, 1958.
8. Dragstedt, L. R.: Physiology of the gastric antrum, *A.M.A. Arch. Surg.* 75:552, 1957.
9. Jordan, P. H., and Sand, B. F.: Study of the gastric antrum as an inhibitor of gastric juice production, *Surgery* 42:40, 1957.
10. Woodward, E. R., and Nyhus, L. M.: Vagal antral mechanisms in gastric secretion, *Am. J. Med.* 29:732, 1960.
11. Davenport, H. W.: Physiology of the digestive tract, Chicago, Year Book Publishers, 1961, pp. 85-112.
12. Woodward, E. R., and Dragstedt, L. R.: Role of the pyloric antrum in regulation of gastric secretion, *Physiol. Rev.* 40:490, 1960.

