

연산오골계 위장관의 somatostatin cell에 대한 면역조직화학적 관찰

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(1989. 11. 2 접수)

An immunohistochemical observation on the somatostatin cells in the gastrointestinal tract of the Yönsan Ogol fowl

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(Received Nov 2, 1989)

초록: 연산오골계의 위장관에 존재하는 somatostatin cell의 분포상태와 출현빈도를 알아보기 위해 면역조직화학적 방법을 이용하여 광학현미경적으로 관찰하였던 바 다음과 같은 결과를 얻었다.

Somatostatin cell은 유문부에 밀집하여 출현하였으며, 그 다음으로 선위의 복합선에서 다수가 관찰되었다. 그리고 십이지장에는 소수가, 공장과 근위에는 드물게 분포하였으며, 회장 맹장 및 직장에서는 관찰되지 않았다. 또한 somatostatin cell은 부위에 따라 그 분포양상의 차이가 인정되었다.

Key words: Ogol fowl, somatostatin cell, gastrointestinal tract, immunohistochemistry.

Introduction

Regulatory peptides and amines of the gastrointestinal tract are important in digestive function.¹ Among these, somatostatin, named for its growth hormone release-inhibiting properties, was first isolated from the hypothalamus and characterized as a tetradecapeptide.² Although somatostatin was originally extracted from the hypothalamus, somatostatin-like immunoreactivity was subsequently shown to occur not only in the rest of brain³ but also in the periphery, notably in the D-cells of the pancreatic islets⁴ and in morphologically similar cells

of the gut^{1-3,5-19} and thyroid gland.²⁰ Somatostatin inhibits the mobilization of peptide hormones, pancreatic exocrine secretion and the secretion of hydrochloric acid from the parietal cells of the gastric mucosa.³

Much of the data relating to the distribution and frequency of somatostatin cells have come from observations in the overall gastrointestinal tract in mammals^{1-3,5,6,10,11,14,18,19} and birds.^{2,7-9,12,13,15-17} The purpose of the present report was to determine the relative frequency and distribution of immunoreactive cells for somatostatin in the gut of Yönsan Ogol fowl.

Materials and Methods

Samples were taken from the 5 female adult Korean native Yönsan Ogol fowl (about 45 weeks of age, a Korean natural monument No. 265) which had normal shank and 4 toes unlike the Silkie.

The tissues were obtained from 8 parts of gastrointestinal tract as shown in Fig 1. After fixation in Bouin's fluid, the specimens were dehydrated in alcohol, cleared in xylene and embedded in paraffin.

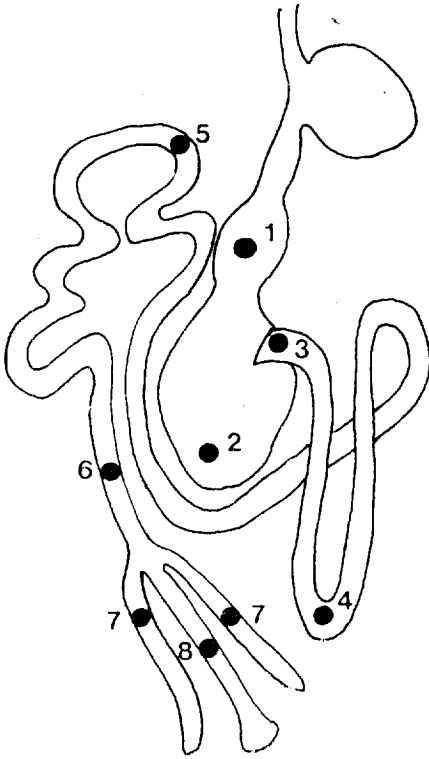


Fig 1. Sampling portions in the gastrointestinal tract of the Korean native Yönsan Ogol fowl.

- | | | |
|-------------------|------------|------------|
| 1. proventriculus | 2. gizzard | 3. pylorus |
| 4. duodenum | 5. jejunum | 6. ileum |
| 7. cecum | 8. rectum | |

The sections were made 3 or 4 μm and immunostained by the Avidin-biotin complex(ABC) method for somatostatin, and then slightly counterstained with Mayer's hematoxylin. The somatostatin (1 : 200) and the ABC kit used in the experiment were purchased from DAKO patts and Vector Lab, respectively.

To estimate the relative frequency of immunoreactive cells, 10 areas were chosen at random in one section of each sample and only cells with definitely recognizable nuclei were counted at a magnification of $\times 150$. Cells counted were expressed as the mean number of cells per mm^2 .

Results

The somatostatin cell population calculated in a unit area of different regions of the Ogol fowl gastrointestinal tract is summarized in Table 1. They were most frequently observed in the narrow zone joining the gizzard with the duodenum (pyloric region) and relatively numerous in the proventriculus (Fig 2). And they were in low numbers in the duodenum (Fig 3), displayed a random distribution in the jejunum, rare and not detected in every section in the gizzard, and were not encountered in the remainder of the intestine.

In the proventriculus, somatostatin immunoreactive cells were found to predominate in the middle third of the glandular lobules, and were scattered in the upper part, but were fewer in number in the basal part (Fig 2). They possessed long and slender processes that emerged from the body of the cell which ended in the club-like swellings (Fig 4). Occasionally they were formed strands or columns by cytoplasmic processes that coursed parallel to the long axis of the tubular glands (Fig 5). In the pyloric region, they were located mainly in the middle part of the glands, and scattered cells were

Table 1. Relative frequency of somatostatin cells in the different regions of gastrointestinal tract of the Korean native Yönsan Ogol fowl

| | Proventriculus | Gizzard | Pylorus | Duodenum | Jejunum | Ileum | Cecum | Rectum |
|------------------|----------------|---------|----------------|---------------|---------|-------|-------|--------|
| Mean cell number | 10.8 \pm 3.4 | * | 27.9 \pm 4.5 | 2.1 \pm 0.5 | * | — | — | — |

M \pm SD/ mm^2 , *: rare, —: absent.

also found in the surface epithelium and basal part of the glands. In the intestine, although somatostatin cells appeared to have a random topographic distribution, they were mainly localized in the basal part of the intestinal glands, and they tended to be spindle-shaped (Fig 3).

Discussion

In the present study, somatostatin cell population was the largest in the pyloric region and which was followed by the proventriculus. A few cells were demonstrated in the duodenum and the rare cells were seen in the jejunum and gizzard. And somatostatin cells were absent from the remainder parts of the intestine. When the regional relative frequency of somatostatin cells in the Ogol fowl were compared to those of the other aves such as chicken^{2,9} and mallard,¹² the frequency pattern of the cells in the Ogol fowl was relatively similar to that of those birds. Although the gizzard has primarily regarded as a masticatory organ with very highly developed muscular coats, at least eight types of immunoreactive cells as well as somatostatin cells^{12,15,17,21} as reported in the present study have been identified. But it could be speculated that the endocrine cells in the gizzard may not carry out significant function as those in the proventriculus and pyloric region.

Chung et al¹² and Yamada et al¹³ reported the species differences with regard to the relative distribution of the proventricular somatostatin cells in eight species of birds. In the quail, chicken, duck, kite and mallard, they were found primarily in the middle zone of the glandular lobules, in the gull peripherally, in the pigeon centrally and peri-

pherally, and in the finch they were scattered randomly. In the proventriculus of the Ogol fowl, the distribution of these cells showed similar patterns to those in the quail, chicken, duck, kite and mallard among the eight species reported. These differences can not be explained solely on the feeding habits or the species examined.⁸ The functional significance of the difference in the distribution of the immunoreactive cells in the glandular lobules is not yet clear.

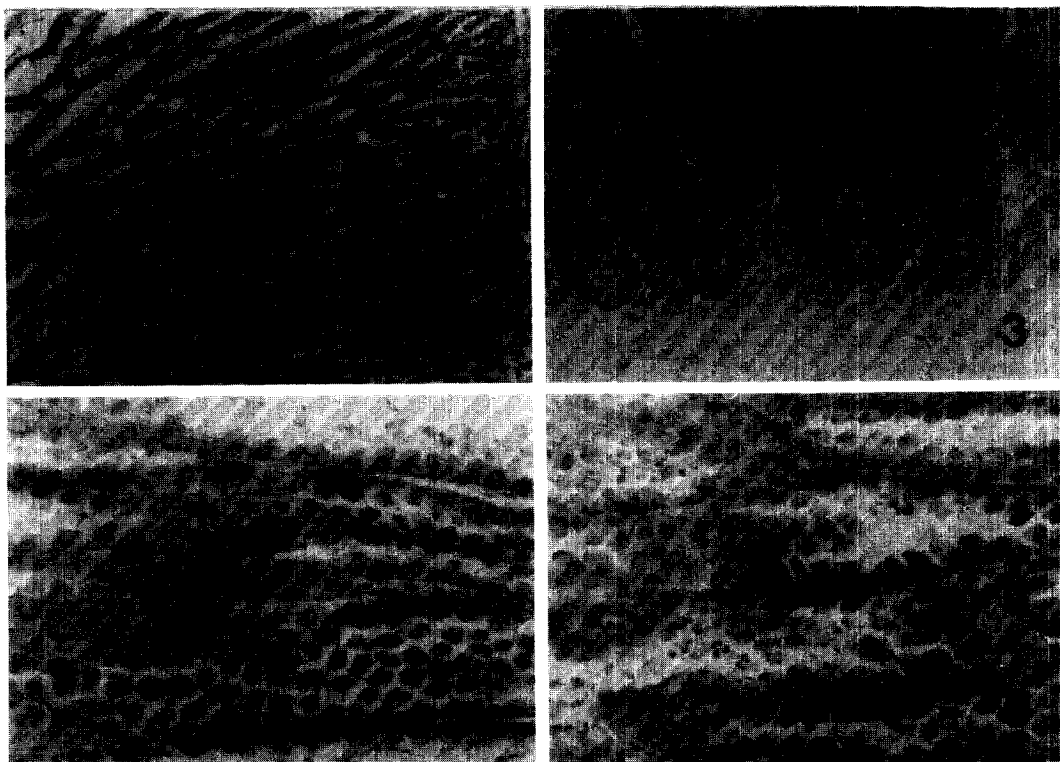
It has been known that the somatostatin cells possess long slender processes ending in club-like swellings in the some mammalian^{2,3,10,11,19} and avian gastrointestinal tracts.^{13,15} In the Ogol fowl, similar shaped cells were detected. These morphological features support the concept that the somatostatin cells may function as mechanoreceptors¹³ as well as paracrine cells by direct cell-to-cell contacts.¹⁰

Conclusion

The relative frequency and distribution of somatostatin immunoreactive cells were investigated by the immunohistochemical method in the gut of the Korean native Yönsan Ogoļ fowl.

Somatostatin cells were the most numerous in the pyloric region and the next in the proventriculus. And they were a few in the duodenum, sparse in the jejunum and gizzard, and were not detected in the ileum, cecum and rectum. Regional differences with regard to the topographical distribution of somatostatin cells were observed.

Acknowledgements: The authors thank Prof. Han SW, Department of Animal Science, College of Agriculture, Chungnam National University, Taejön Korea, for the gift of animals.



Legends for figures

- Fig 2.** Somatostatin cells in the proventriculus. The higher frequency of these cells are present mainly in the middle third of the glandular lobules. ABC method $\times 66$.
- Fig 3.** Somatostatin cells in the duodenum. Three open-type cells (arrowheads) are located in the basal part of the intestinal gland. ABC method $\times 66$.
- Fig 4.** Somatostatin cells in the proventriculus have a long cytoplasmic process (arrowhead). ABC method $\times 132$.
- Fig 5.** Somatostatin cells forming strand with their cytoplasmic processes are seen, ABC method $\times 132$.

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