

## LOCALISATION AND DISTRIBUTION OF ENDOCRINOENTERIC CELLS IN THE STOMACH OF PIGS DEVELOPING OESOPHAGOGASTRIC ULCER

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*The morphology, distribution and behaviour of entire endocrinogastric cell populations were studied in healthy pigs and in pigs developing an experimentally induced oesophagogastric ulcer. Polymorphic endocrine cells were interpolated between other glandular cells and distributed scattered along fundic and pyloric glands. In relation to the control animals, the endocrine cell count in ulcerous pigs was decreased in the pyloric but increased in the fundic mucosa. It is hard to determine which type of endocrine cells pertaining to the total Grimelius-positive population affects the cell count in this pathological condition decisively, before additional immunocytochemical evaluation.*

*Key words: endocrine cell, ulcer, oesophagogastric ulcer*

### INTRODUCTION

Although it has been the subject of concentrated efforts over many years, the aetiopathogenesis of oesophagogastric ulcers in swine is not yet fully understood (Muggenburg et al., 1964, 1967; Huber and Wallin, 1980; Embaye et al., 1990). Even though it develops in a part of the stomach whose morphology and functions differ from other gastric mucosa, porcine oesophagogastric ulcer is similar to peptic ulcers in humans and other animals. Studies in recent years have been directed towards an evaluation of the role and share the endocrine system of the gastrointestinal mucosa may play in the aetiopathogenesis of human ulcers (Katic, 1979; Kanareiceva et al., 1980; Mateeva and Morozov, 1989; Sukhodolo et al., 1990; Zverkov et al., 1990). Our decision to investigate the localisation, distribution and behaviour of the overall endocrine cells population in the stomach of swine with experimentally induced ulcers is based on the fact that the available literature lacks data on similar approaches to the aetiology and pathogenesis of porcine oesophagogastric ulcers.

### MATERIALS AND METHODS

Stomach tissues from 12 pigs were examined. Six pigs developed experimentally induced oesophageal ulcers and the other six were used as the control. All pigs originated from a farm raising Yorkshire breeding pigs, and



were 10 weeks of age and 15-19,5 kg body weight. For 21 days, the experimental group received a 0,055 mg i. m. daily dose of reserprine per kg body weight. For the experiment, a Serpasil preparation was used, containing 2,5 mg of pure preserpine per ml of solution. The control pigs were given 1 ml of normal saline daily. After 21 days, all animals were sacrificed and the material for histopathology and histochemistry was taken at the postmortem examination. Parts of the fundus and the pylorus were excised and fixed in 10% buffered formalin, Bouins fixative and 2.5% glutaraldehyde. After being processed routinely, paraffin tissue sections were stained with HE and by the Grimelius technique. Pending electron microscopy, glutaraldehyde-fixed samples of stomach tissues were maintained in  $\text{OsO}_4$ , embedded in epoxide and stained with uranium acetate. The stereological calculation of endocrine cells was made for a  $1 \text{ mm}^2$  area. The results were evaluated statistically by using Student's t-test or analyses of variance plus Tukey's test for tissue samples or group means, respectively.

#### RESULTS AND DISCUSSION

##### *Distribution of endocrine cells in the fundic mucosa of healthy pigs*

Morphologically different endocrinoenteric cells were seen in the sections of fundic mucosa along the whole length of gastric glands: large, round cells with dark brown to red granules completely concealing the nucleus; rounded cells with marginally located dark granules and a central nucleus; fusiform cells paler than the former variety; ellipsoid cells with markedly dark opposing ends; and, triangular cells with brown to black granules (Figure 1 a+b). All endocrine cells were squeezed in between other glandular elements and were mostly situated adjacent to the basal membrane. The majority of these cells was concentrated in the fundus and corpus of the gastric glands. On electron microscopy, dark granules differing in shape and direction, but most often rounded,

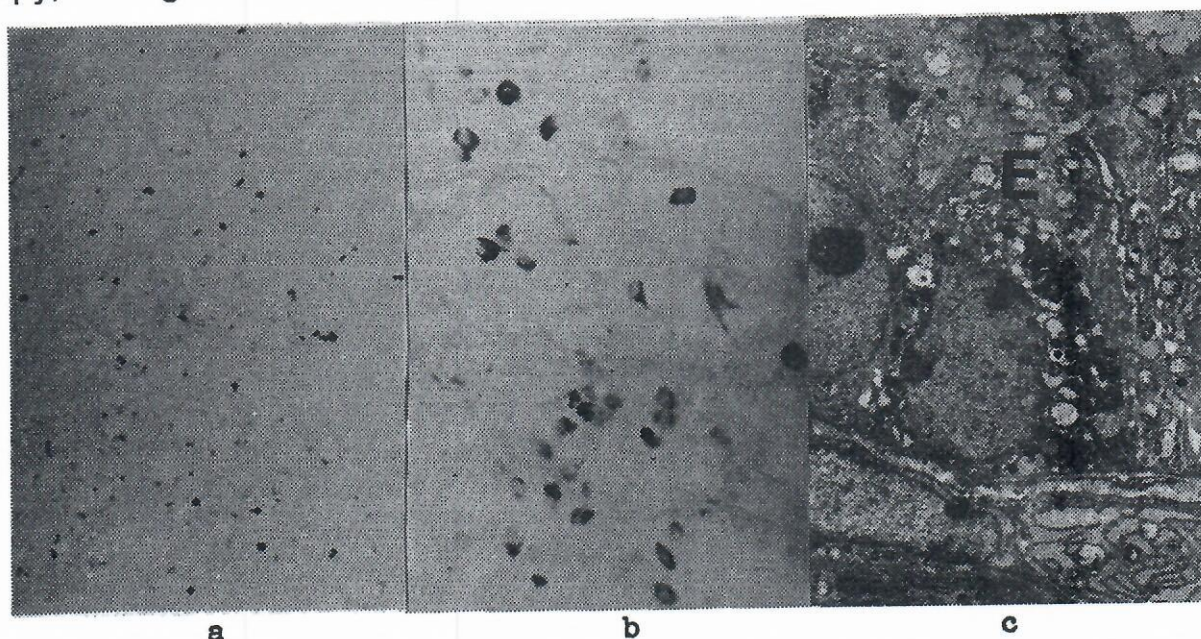


Figure 1 Diffusely distributed endocrine cells in the fundic mucosa, Grimelius, 100x (a); polymorphic cells with granules in the cytoplasm, Grimelius, 400 x (b); ultrastructure of the endocrine cell, 1 600 x (c).



were noted in a relatively light cytoplasm (Figure 1c) The number of endocrine cells counted on a  $1\text{mm}^2$  area averaged 25, 85, over a 22.14–28.28 range.

*Distribution of endocrine cells in the pyloric mucosa of healthy pigs*

The cellular elements were seen densely distributed within the distant third of the pyloric glands. Round and ellipsoid cells with distinct granules were predominant and sometimes completely filled the cytoplasm. Comparatively often, the granules were fewer in number or concentrated at the opposite ends of cells (Figure 2 a+b). One  $\text{mm}^2$  of pyloric mucosa had 38.28 endocrine cells on average (Figure 5) over a 34.75—41.59 range. Statistical evaluation revealed significantly fewer endocrine cells in the fundus than in the pylorus ( $p < 0.001$ ).

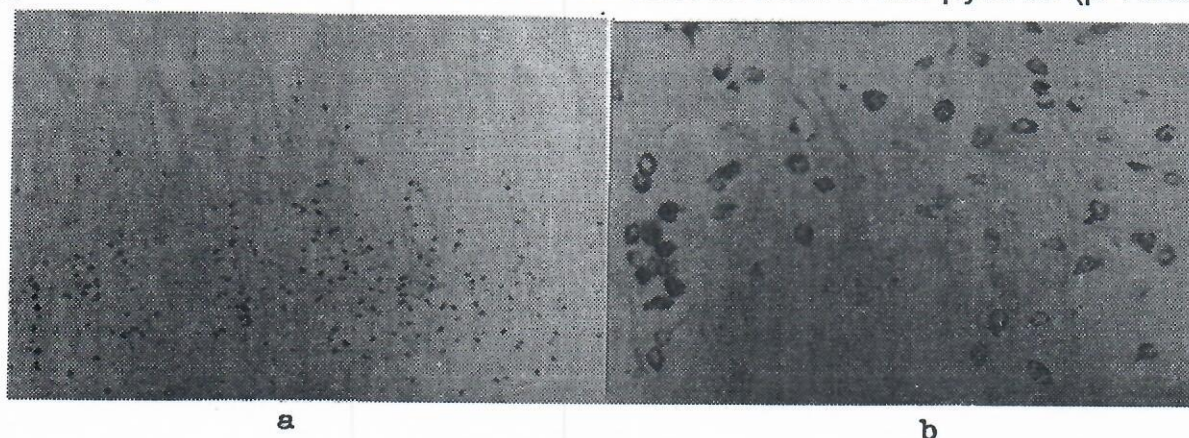


Figure 2. Densely distributed polymorphic endocrine cells in the pyloric mucosa, Grimelius, 100x (a); with granules in the cytoplasm, Grimelius, 400x (b).

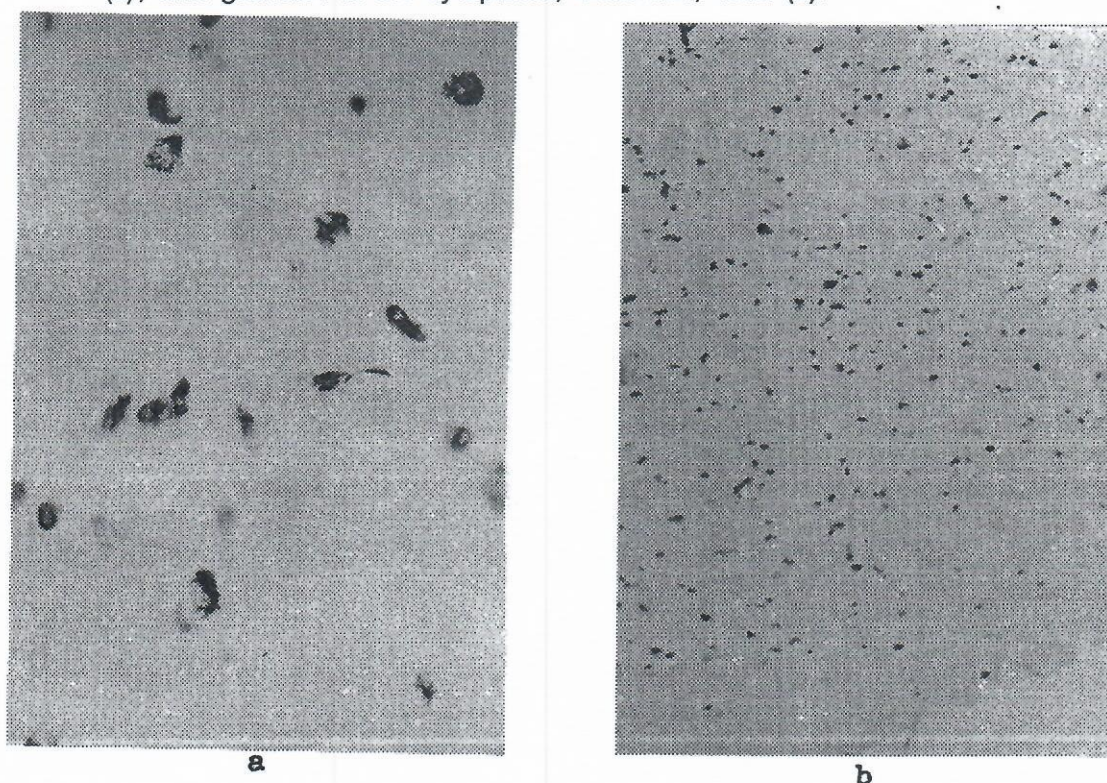


Figure 3. Diffusely distributed endocrine cells with pale to black granules in the cytoplasm, Grimelius, 400x (a), situated in the fundic mucosa, Grimelius, 100x (b).



*Distribution of endocrine cells in the fundic mucosa of pigs with experimentally induced ulcers*

Polymorphic, densely distributed cells were seen distinctly against a golden yellow background of a series of sections of the stomach fundic region (Figure 3 a+b). The cytoplasm of these cells housed light brown to black granules. On morphometry, 30.47 endocrinoenteric cells were counted on 1

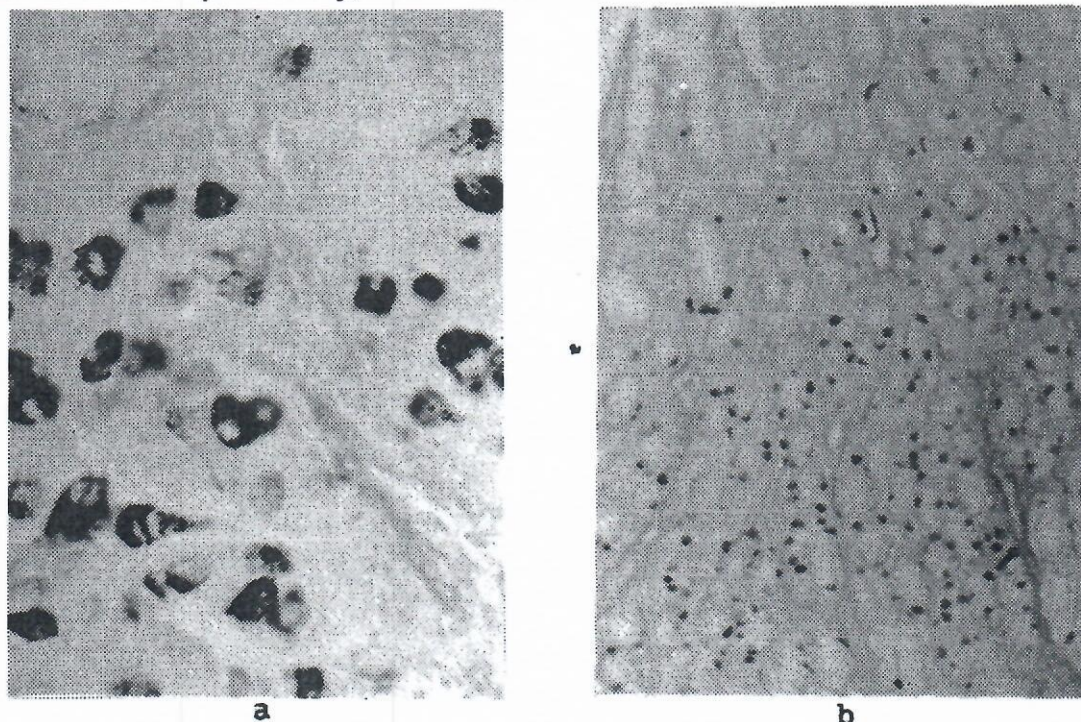


Figure 4. Polymorphic cells with dark brown to black granules in the cytoplasm, Grimelius, 400x (a); situated in the pyloric mucosa, Grimelius 100x (b).

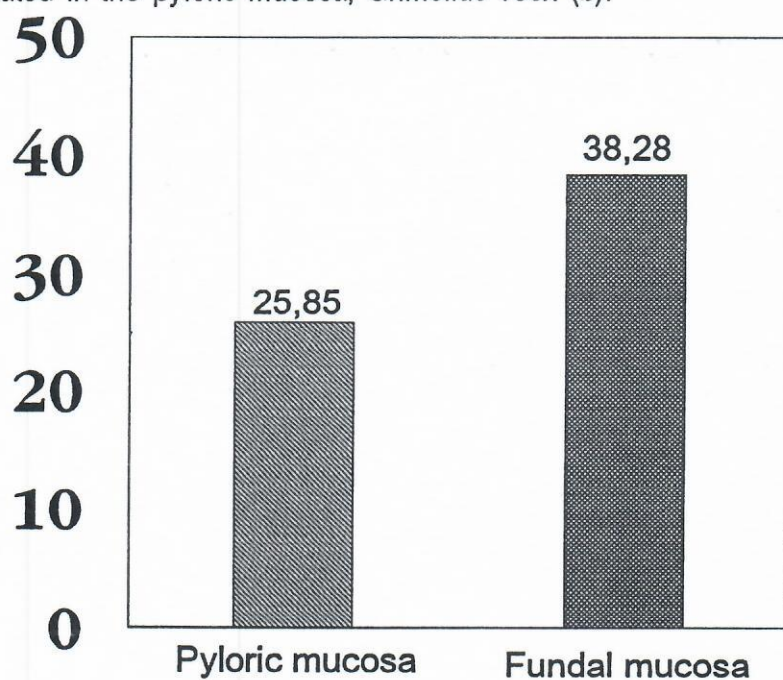


Figure 5. The mean numbers of endocrine cells in the fundic and pyloric gastric mucosa of healthy pig.



mm<sup>2</sup> of fundic mucosa on average, ranging from 25.38—41.42 cells (Figure 6). Although statistically insignificant (p), such an elevated endocrine cells count in the fundic mucosa has been considered typical for the duodenal peptic ulcer in humans (Vassalo et al., 1971; Katic, 1979).

*Distribution of endocrine cells in the pyloric mucosa of pigs with experimentally induced ulcer.*

The medial zone of the pyloric lamina propria exhibited polymorphic endocrine cells with dark brown to black granules in the cytoplasm (Figure 4 a+b). A 1 mm<sup>2</sup> cell count of 27.04, over a 19.50 — 36.55 range, was significantly less ( $p < 0.001$ ) than the control.

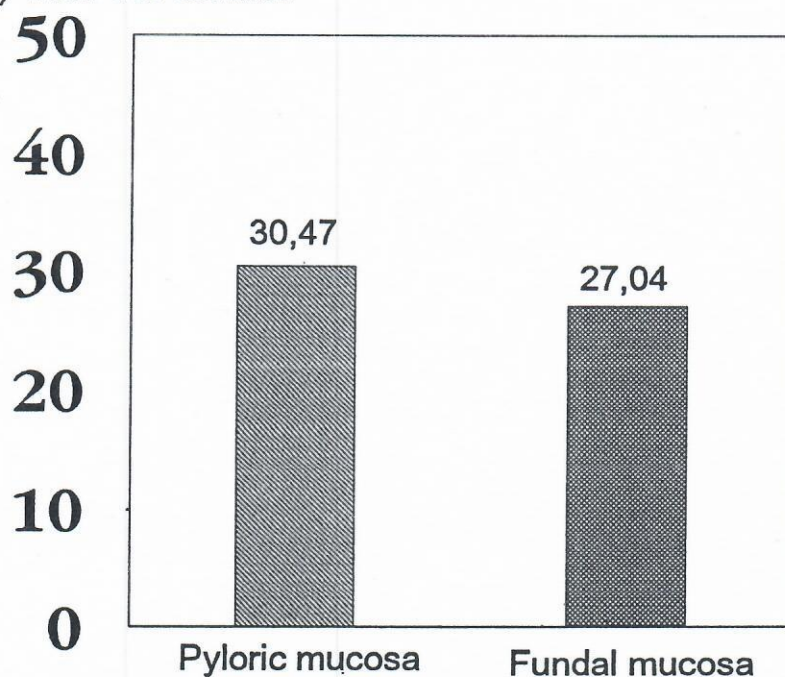


Figure 6. The mean numbers of endocrine cells in the fundic and pyloric gastric mucosa of pigs with experimentally induced ulcers.

In relation to the control, the endocrinoenteric cell count was reduced in the pyloric but elevated in the fundic mucosa of the oesophageal portion of pig stomach, after experimentally induced lesions. This difference certainly suggests a role for endocrinoenteric cells in the pathogenesis of oesophagogastric ulcer. It is hard to tell, however, which type of endocrine cell pertaining to the Grimelius—positive population may affect the changes of their proportions and counts in this pathological condition. A decisive answer will be possible only after additional immunocytochemical studies.

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#### LOKALIZACIJA I DISTRIBUCIJA ENDOKRINIH ĆELIJA U ŽELUCU SVINJA SA EZOFAGOGASTRIČNIM ULKUSOM

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#### SADRŽAJ

U radu su ispitivani morfolologija, distribucija i ponašanje ukupne populacije endokrinih ćelija u želudcu zdravih i svinja sa eksperimentalno izazvanim ezofagogastričnim ulkusom. Ustanovljene su endokrine ćelije polimorfnog oblika umetnute između drugih žlezdanih ćelija, difuzno rasute duž fundusnih i piloričnih žlezdica. U svinja sa ezofagogastričnim ulkusom broj endokrinih ćelija je smanjen u pilorusu, a povećan u fundusu u odnosu na kontrolnu grupu. Koja vrsta endokrinih ćelija iz ukupne populacije Grimelius pozitivnih utiče na promenu broja, pri ovom patološkom stanju, teško je reći. Decidan odgovor moguće je dati tek, posle dopunskih imunocitoheмиjskih ispitivanja.