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## Lamina propria macrophages of intestine of Guinea Pig

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**Abstract :** The macrophages of lamina propria were commonly found both in the small and the large intestine of guinea pigs, mice, rats, and in human duodenum. The frequency of macrophage occurrence was highest in the lamina propria of villous apices of the small intestine and beneath the lining epithelium of the large intestine. In the cytoplasm of lamina propria macrophages localized in those regions. Feulgen-positive (DNA-containing) granules could be observed particularly in the guinea pig intestine. Lamina propria containing the highest accumulation of macrophages i.e. at the apices of villi of the small intestine and beneath the lining epithelium of the large intestine. Labeled nuclei of macrophages were observed scarcely and much less frequently than were labeled cytoplasmic granules. It is suggested that the lamina propria macrophages may play a role in the phagocytosis of some migrating cells of the intestinal mucosa, most probably of the sheath-fibroblasts and/or intraepithelial lymphocytes.

**Keywords :** Lamina propria, Guinea Pig, macrophages

### INTRODUCTION

Lamina propria macrophages (LPM) have been described both in the small and large intestine of human beings and rodents.<sup>1,2</sup> It was found that LPM are granular cells occurring most frequently in the lamina propria close to the intestinal lumen. The latter finding together with the tendency to occurrence of LPM in the close neighborhood of plasma cells, led to the conclusion that LPM are the first, or perhaps the second line of defense against intestinal bacteria and their toxins.<sup>3,4</sup>

While studying cell proliferation in the guinea pig it was found that in the cytoplasm of LPM localized beneath the lining epithelium numerous Feulgen-positive DNA containing granules. In the LPM situated in the deeper layers of mucosa, e.g., at the level of crypt bottoms, the Feulgen-positive granules could scarcely be observed. Therefore, it was hypothesized that LPM may play a role

in phagocytosis of nuclear material originating from migrating cells of the intestinal mucosa.<sup>5,6</sup>

### MATERIALS AND METHODS

The studies were conducted in 16 guinea pigs, weighing 230 to 300 g. Three days before and throughout the experiment the animals were kept on standard laboratory diet and received water ad libitum. The guinea pigs were injected intraperitoneally at 10:00 to 11:00 AM. With 0.5 pCi of [6-<sup>3</sup>H] thymidine [<sup>3</sup>H]TDR, 1, 2, 3, 4, 5, 6, and 7 days after the injection. Specimens, each 4 cm long, of duodenum, middle, jejunum, middle ileum, and ascending colon were excised. Those used for autoradiography. Sections 1 µm thick as well as ultrathin sections, were stained, the former in toluidine blue, the latter in lead citrate and uranyl acetate. Additionally the appearance and the reaction for acid phosphatase of macrophages of both the small and large intestine of the mice rats. The Granular cells of lamina propria of either the small or large intestine were identified.

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**RESULTS AND DISCUSSIONS**

LPM was found both in the small and the large intestine of guinea pigs duodenum. They were observed as granular cells occurring most frequently in the apical regions of the villi of the small intestine, and beneath the lining epithelium of the colon. Both in small and large intestine of the guinea pig the frequency of LPM occurrence was higher than in those of mice, rats, and human duodenum.<sup>7,8</sup> The guinea pig LPM was also larger and was heavily loaded with granules. The LPM could be particularly well observed in 1- $\mu$ m thick sections, although in 5- $\mu$ m thick paraffin sections of intestine they could also be seen. The LPM had the cytoplasm loaded with lysosomes, residual bodies, and phagosomes. In some phagosomes dark deposits could be seen. LPM were also found to stain intensively for acid phosphatase by the Gomori method

Autoradiographs of the intestine of guinea pigs killed 1/2 hr after injection revealed that the label could be found in the crypts, in nuclei of both epithelial cells and intraepithelial lymphocytes, in the sheath-fibroblasts surrounding the crypt and in some unidentified connective tissue cells throughout the lamina propria. Careful examination of epithelial cells and sheath-fibroblasts in the villi as well as of LPM situated in various parts of lamina propria showed no labeling at all. One and 2 days after injection the labeled epithelial cells and sheath-fibroblasts could be seen at the level of the crypts and up to one-half of the villus length, whereas LPM remained unlabeled. Three and 4 days after injection most labeled epithelial cells were observed in the apical region of the villi of the small intestine and in the lining epithelium of the colon. At that time after injection, in LPM situated in the apices of the villi of the small intestine and beneath the lining epithelium of the colon, whereas in these very cells the nuclei remained unlabeled. Labeled nuclei of LPM were rarely observed, although their occurrence seemed to be more frequent at 7 days than at 3 to 4 days after injection.

It is noteworthy that LPM localized in deeper parts of the mucosa, e.g., at the level of the crypt or at the base of the villi showed no labeling of their cytoplasmic granules at any time after injection. Five days after injection labeling of LPM cytoplasm occurred less frequently and 7 days after it ceased, although at that time, Feulgen-positive granules of LPM cytoplasm as well as some slightly labelled epithelial cells could still be found.

The results of the present investigation indicate that in lamina propria of both the small and the large intestine of guinea pigs the granular cells identified as macrophages. The macrophages are most frequently localized in the upper parts of the villi in the small intestine and beneath the lining epithelium in the large one. These findings are in agreement with the earlier data published by Trier *et al.*<sup>9</sup>, Deane<sup>3</sup>, and Donnellan<sup>10</sup>. The present study may reveal, therefore, the ultimate fate of at least some of these cells in small and large intestine of the guinea pig.

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