HISTOLOGICAL STUDY ON THE ENTEROCHROMAFFIN TISSUE IN INTESTINAL MUCOSA OF THE ALBINO RAT

THESIS

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Presented By

NAGLAA MEDHAT ABOU-RABIA

M. B. B. Ch.

Supervised by

Prof. AHMED SAID EL-MORSY
Professor of Histology

DR. MAGDA EL-MAGHRABY
Assistant Professor of Histology

Histology Department
Faculty of Medicine
Ain Shams University

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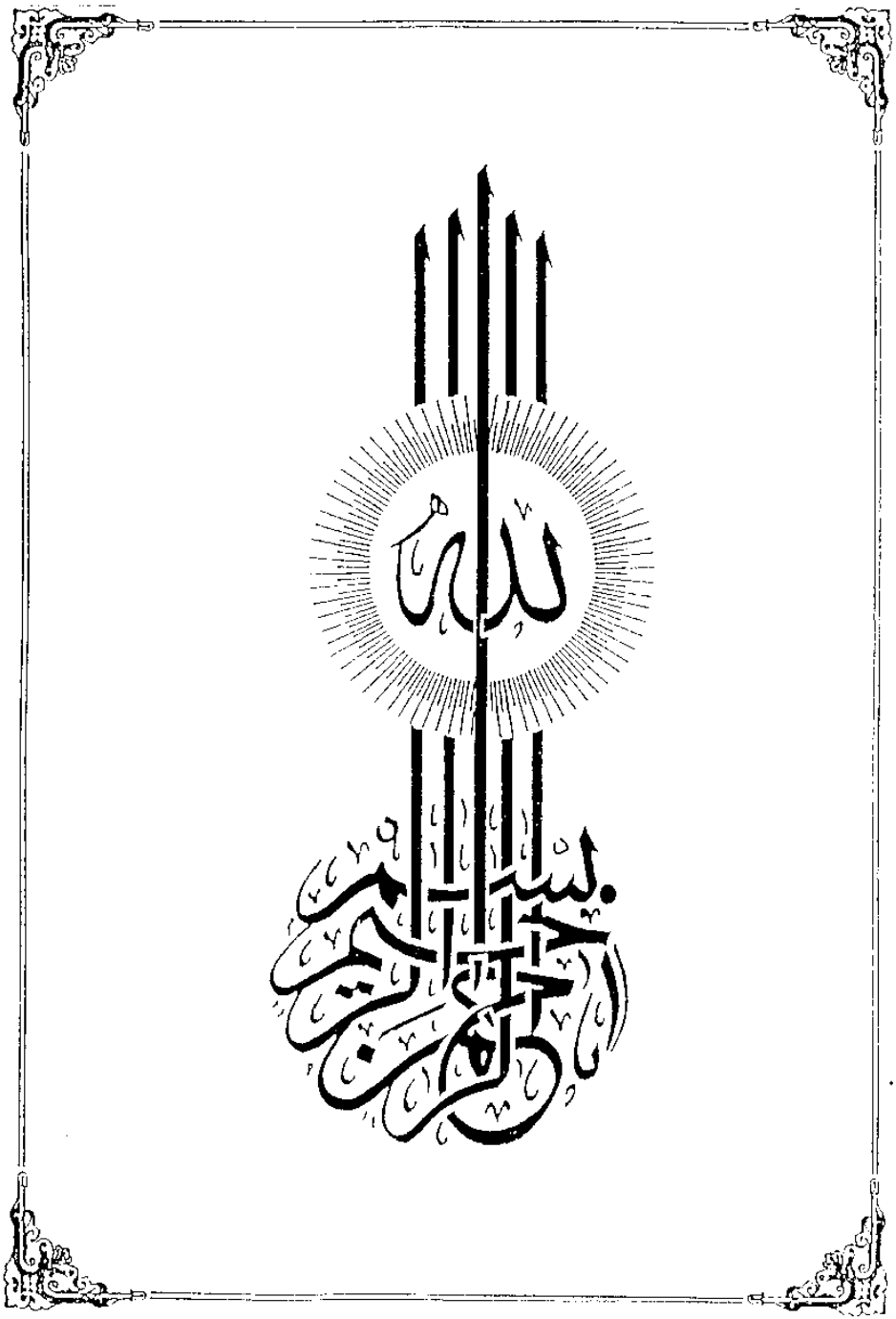

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INTRODUCTION

Among the epithelial cells of the gastro-intestinal mucosa, there are varieties of granular epithelial elements of which the morphology, origin, function and pathologic significance have been of much interest since their first description by Paneth in (1888) and Bizzozero in (1892). Later on Trautmann (1897) and others verified the investigations of Paneth (1888), and spoke of these cells as the granule cells of Paneth.

Masson (1914) while studying carcinoids, discovered similar cells and he demonstrated the reducing property of the granules to ammoniacal silver. As a consequence of a predilection for silver, he named the cells " Argentaffin cells". The term argentaffin cell should be understood as covering all cells containing dense groups of dark granules in their cytoplasm (Chang and Leblond, 1971).

Other investigators, Cordier (1933)[23], Forbus (1925), Hamperl (1927), Eros (1928) and others verified the morphologic observations of Masson (1914). But they disagreed with him, as well as among themselves, concerning the origin, function and pathologic significance of these cells.

The aim of this work is to throw some light on the morphology and distribution of argentaffin cells in the intestine of the albino rat and to discuss some of their functions.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

Argentaffin or Enterochromoffin (E.C.) cells are widely distributed throughout animal species and they are members of the epithelial lining of the gastro-intestinal mucosa. These cells are identified by the presence of enterochromaffin granules in the cytoplasm. They have been first described by Paneth (1888), and Bizzozero (1892). Later on, Trautmann (1897) and others named these cells " the granule cells of Paneth".

The Staining Characteristics:

The staining properties of these cells have been widely investigated by many authors.

Kultschitzky (1897) observed other granular cells in the intestinal mucosa, the morphology and staining properties of which were unlike that of the "granule cells of Paneth", with Ehrlich-Biondi stain (acid fuchsin, orange and methyl green), the granules of the cytoplasm were

coloured red, and therefore the designated them as "the cells with acidophil granules". He noticed that the granules always occupied the basal portion of the cells.

Schmidt (1905) found cells similar to those discovered by Kultschitzky in the crypts of Lieberkühn, and was the first to give a complete description of their morphologic characteristics. He observed that when the tissues were fixed in Muller's solution plus formaldehyde, the basal portion of the cell stained intensely yellow. Accordingly he named these cells "yellow cells". He also noticed that the nuclei of argentaffin cells were larger than the nuclei of the adjacent cells of the glands of Lieberkühn.

Ciaccio (1906) found such cells in the stomach and the duodenum in the guinea-pig and the dog. He demonstrated vacuoles in the granular portions of the cytoplasm.

Masson (1914) also examined carcinoids; and

discovered that they were composed of cells similar to those described by Kultschitzky and Schmidt. He named these cells "argentaffin cells" according to their ability of reducing ammoniacal silver solutions to metallic silver. Masson (1914) was convinced that the argentaffin cells were the same as the cells of Kultschitsky (1897), Schmidt (1905) and Ciaccio (1906).

There is a fundamental difference between the argentaffin reaction and silver impregnation methods according to Cordier (1927), Hamperl (1932), Lison (1936) and Gomori (1948). They reported that the argentaffin reaction was brought about by the reducing capacity of the tissue component itself while the silver impregnation methods needed the addition of an extraneous reducer.

Clara (1934) stated that at the time of their first appearance, the granules of argentaffin or enterochromaffin cells already show the specific histochemical features i.e. chromaffinity, argentaffinity and positive diazonium coupling reaction

which are now associated with the presence of 5 - Hydroxytryptamine.

The chromaffin reaction was considered by Lison (1936) to be a specific reaction solely exihibited by the dihydric and polyhydric phenols, aminophenols and polyamines. He reported that it has not been used for the diagnosis of carcinoid tumours and is seldom employed for the demonstration of the specific granules in intestinal cells.

Sharples (1945 a & b) observed that the Bodian (reducing) silver technique often demonstrated large numbers of argyrophile cells in the deeper layers of the stomach mucosa. Gomori (1948) stated that the majority of these cells, though scarcely recognizable by the usual (non-reducing) argentaffin techniques, were well shown by his hexamine- silver method.

Hamperl (1951 , 1952) believed that the argyrophile but non-argentaffin cells were precursors of the argyrophile and argentaffin (true

argentaffin) cells.

All the early work, leading up to the concept of formaldehyde - induced fluorescence, was centred on the granules of the Kultschitzky cells. Erös (1932) was the first to mention the yellow autofluorescence shown by the E.C. cells, when formaline fixed tissues were exposed to ultraviolet light. He ascribed the fluorescence which he noted to autofluorescent lipids.

Using the technique of masked metachromasia Solcia and Sampietro (1965) distinguished argyrophily from E.C. cells . This technique emplied acid hydrolysis of suitably fixed material followed by staining with a basic dye, which might be metachromatic or fluorochrome or both. Masked metachromasia of endocrine polypeptide (APUD) cells in basal glands resulted. The initial letters, APUD are derived from their fluorogenic properties (Amine and Amine Precursor Uptake and Decarboxylation).

Origin of Enterochromaffin Cells:

Masson (1923) believed that these cells are of entodermic origin. He demonstrated their appearance in the intestinal mucosa of man about the fourth month of foetal life. He stressed the entodermic origin as a result of two pathologic observations: He found many argentaffin cells in regenerating epithelium of chronic gastritis, and argentaffin cells were always mixed with cylindric cells in the carcinoids of the intestinal tract.

Danisch (1923, 1924) showed that the chromo-argentaffin cells originated from the celiac ganglion and migrated into the gastro-intestinal mucosa about the fourth month of fetal life. He found these cells in the submucosa in the tenth week of embryonal life. So, these cells were considered to be of nervous origin by Danisch (1924) and Chung (1934). While Kull (1925) who studied the cells in the chick embryo reported that

they originated from mesenchyme cells that had invaded the epithelium. Dias-Amado (1925), considered these cells to be of mesodermal origin as well.

Hamperl (1927) attributed the origin of the argentaffin cells to a faulty differentiation during the regeneration of the epitheluim after inflammation. Many workers who found similar cells in the pancreatic islands, suprarenal glands and hypophysis concluded that these cells belong to the Chromaffin System.

While studying obliterated appendices, Masson (1928) observed certain minute tumours known as neuromas. In the centre of these neuromas, he always demonstrated argentaffin cells.

His work proved that the existence of these neuromas depended on the presence of the argentaffin cells. When the argentaffin cells degenerated, the neuromas also degenerated. He explained the presence of periglandular argentaffin cells, by