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Histological and Histochemical investigation of the Brunner Glands in Wild Brown Rats

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***Abstract*— The objective of this study was to assess the histological characteristics of submucosal Brunner glands and their distribution within the wild rat duodenum. Six healthy brown rats were obtained from the Baghdad animal market. Six experimental animals were captured from orchards in the Middle Euphrates region, the experimental animals were put to sleep using xylazine and ketamine. After being cut up, these samples were taken from different parts of the duodenum and kept in 10% formalin. Following standard histological processing procedures, five µm fragments were created and stained with (Hematoxylin & Eosin and AB 2.5 pH) stain in order to identify neutral mucin. The objects under examination were then viewed under a light microscope and photographs were taken. Among the numerous glands seen in wild brown rats were intestinal glands based on mucus. Within the submucosa, the glands were composed of closely spaced acini. These glands were arranged in dense acinar clusters, particularly near the pancreatic duct. The mucous type glands were the most obvious, but the mixed type was also seen adhering inside the duct that leads to the pancreas. Additionally, sections demonstrated how glands extended from the to the (sub-mucosa) and were each exhausted by a solitary excretory conduit. Furthermore, after entering the smooth muscle layer of the muscularis, the individual gland ducts gradually enlarge, exposing the enormous pyramid-shaped cells that make up the glandular components.**

***Keywords* — Histochemical study, Brunner glands, Wild Rat.**

INTRODUCTION

The intestinal tract is essential for many vital functions, such as elimination of waste, defense support, absorption of nutrients, and nourishment decomposition (1,2). The duodenum, a particular section of the intestinal tract, is primarily in charge of the enzymatic breakdown of nutrients. Furthermore, the pancreatic duct due to result of hormones secreted by the pancreas, allowing pancreatic juice as well as bile to pass into the intestine (3, 4). Because they generate mucus that improves the effectiveness of enzymes that break down food, the submucosal glands of the duodenum are essential for absorbing nutrients in animals. These glands are located in the proximal submucosa of duodenum (5). Because of the protective qualities of the mucus that is generated, the duodenum is less vulnerable to the acidic chyme than other parts of the intestinal tract (6). By ensuring that the chyme gets neutralized before it enters the jejunum, this procedure guards against potential damage to the rest of the small intestine (7). These glands responsible to secreted mucous by acini due to their tubular-alveolar design. To release whatever is inside into the intestinal lumen, the ducts of these glands typically travel through the lamina muscularis and reach the deepest parts of the Lieberkühn crypts. Mammals in general have these kinds of glands, which are located in the duodenum's submucosa (8, 9). These glands in different species grow and change in dimensions as they progress through the developmental stages from infancy to becoming an adult. These glands eventually come together to form a dense cluster as they grow. In other species of rats, the submucosal-glands appeared as coiled pattern after birth (10). Both of them alkaline and acidifying mucins are generated by epithelial cells. Sulfate concentration is a characteristic of sulfomucins, also known as while sialic acid, on the other hand, is a characteristic of sialomucins.

There are two types of acid mucins. In order satisfy daily dietary requirements, the gut's ability to absorb nutrients is greatly improved by the molecular process that results in the establishment of projections that resemble fingers called villi and crypts (11, 12). In addition to providing protection against invasive and dangerous microorganisms that are commonly found in the adult gut, the various cell types that comprise the villi are crucial for facilitating the digestion and utilization of vital nutrients. It is critical to examine the evidence for the theory that the overall variation of the gut mucosa is regulated by an intricate network of linked signaling passageways (13, 14).

One feature of digestive tract mucosal layer that frequently results in the generation of undeveloped cells is its rapid and continuous renewal. Enterocytes cells such as goblet cells, and Paneth cells are among the specific cells with cellular characteristics (15, 16). Studies of glandular discharges have demonstrated that they include barely any digesting nutrients, are fewer alkaline than pancreatic secretions, and possess a dense consistency due to their amino acid content (17).

According to some theories, the main function of these glands is to protect the mucosal wall of the proximal duodenum by releasing acidic and possibly aggressive materials via the stomach (18). Few studies have been published on the histology of this type of glands in Iraqi wild rats Thus, Characterizing the histological features and their distribution throughout the wild rats' digestive tract was the aim of this investigation.

MATERIALS AND MTHODS

The present study includes (6) adult wild rats were acquired From the orchards located in the Middle Euphrates region. On average, the rats weighed around 280 g. The animals were placed in the animal house at the Faculty of Veterinary Medical Sciences at Kerbala University for a (Mahmood et al.) days in order to acclimate them. In order to dissect each animal, the duodenum was cut right before it passed through the next segment of the small intestine., which separated the situation from the pyloric sphincter. Following their preservation in 10% formalin, the samples were cut into multiple (5) µm sections and processed using standard histology methods. Hematoxylin and Eosin was subsequently applied to the tissue sections, and neutral mucin was found using (AB stain, 2.5 ph). A light microscope remained used for evaluating each colored section. The camera with digital sensors (FL61H26و china) that was attached to the magnifying lens took the pictures. The goal of the objective lens was selected according to the software using a photographic micrometer for measurements (19).

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RESULT AND DISCUSSION

In wild rats, Brunner glands have been identified in the submucosa of the upper duodenum. Its discovery of multiple branches tubules led to its classification as a compound tubular organ. The dimensions and number of the glands fluctuate, but they were typically more widespread in the early parts of the duodenum compared to the later parts. The proximal part of the submucosa of the duodenum contains Brunner glands immediately following the pylorus in the stomach. These glands are easily identified and frequently seen together because they were larger than other intestinal tract glands. Since their ducts open at the base of the villi and they spread from the mucosa to the submucosa, their discharge may mix with anything inside the GI tract. Only one drainage duct drains each of Brunner's glands separately. Following entering the smooth muscle layer of the muscularis, particular gland ducts gradually enlarge. The secretory units are pyramid-shaped, enormous cells. Every kind of animal that has been observed thus far, with the exception of horses and rabbits, has producing units that generate mucous cells (Figure 1,2).

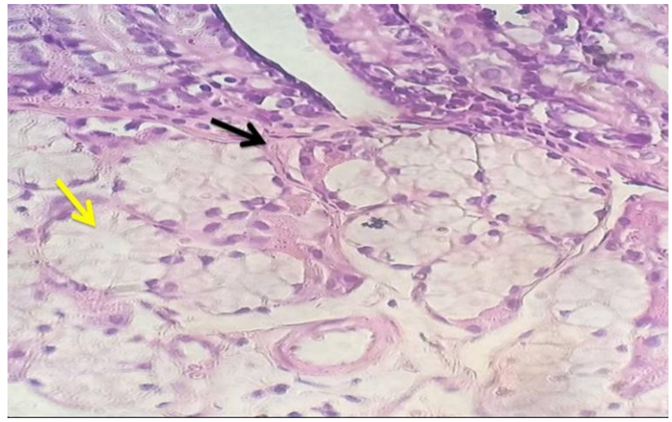

Figure 1. Duodenum of wild rat show The dispersion of Brunner's glands in the submucosa is depicted as clusters in the duodenum of wild rats (yellow arrow). Thin layers of muscularis laminae (black arrow) separated these glands from the mucosa.stain with H&E.400 x.

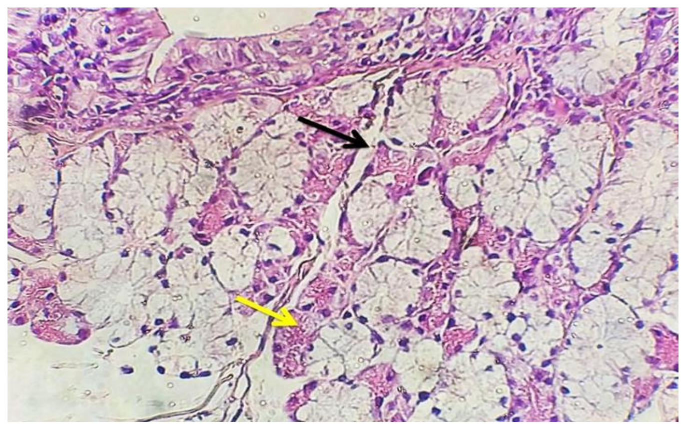

Figure 2. The mixed types of glands were visible in wild rats (yellow arrow). Simple squamous epithelia (black arrow) lined the longitudinal duct that these glands drained.stain with H&E.400 X

These outcomes are consistent with those originally reported by (20), who asserted that species-specific differences existed in the Brunner. The type of cell may have a more serous appearance, with a circular or round nucleus in the basic cytoplasm, or it may resemble a mucous cell, as that term is commonly identified, with a similar nucleus located basally close to the cell's bottom membrane and most of the elevated cytoplasm filled with mucous substances. Someone gland ducts, which are surrounded by simple squamous epithelia, pierce the muscularis mucosae's smooth muscle layer and frequently attach to the concealed intestinal glands' bottoms. Brunner's gland drainage cells progressively get more prominent as they get closer to the intestinal glands (Figure 3).

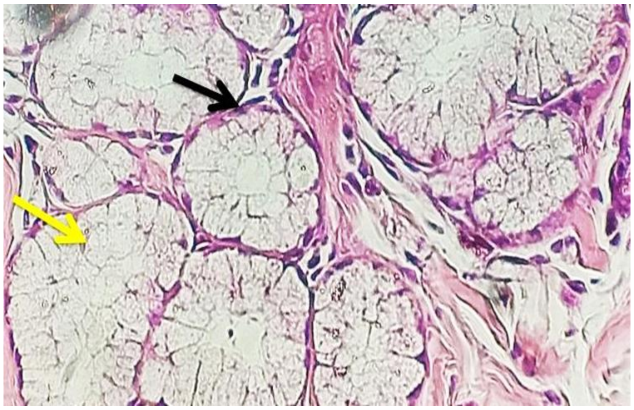

Figure 3. The cells that produce mucous in the duodenum of wild rats contain the greatest number of these cells (yellow arrow). Stellate-type (black arrow) characteristics are indicative of cells with myoepithelial characteristics. stain with H&E.400 X.

According to the current study, myoepithelial cells are very numerous and can be identified by the numerous long processes that connect the laminae that lie underneath the cells of the epithelium, as well as their star-like form. They usually reside in the (propria lamina), which covers the structures that consist of intestinal glands (Figure 4). This study partially supports the findings of (21), which found that such cells were situated among the glands' cells of epithelium and the basement membrane. They facilitate the general operation of glands by contracting to help expel glandular secretions into the ducts.

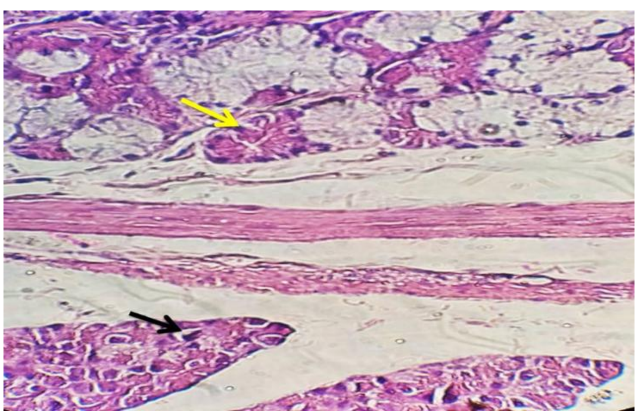

Figure 4. Wild rats' duodenum reveals mixed cells close to the pancreatic duct (yellow arrow). 400x H&E stain.

Every wild rat's Brunner's glands showed a notable positive relationship with AB stain, displaying an arrangement of combined acini and neutral mucin, which gives the glands their purple shape (Figure 5). Furthermore, compared to mucus glands, which had pale cells with a comparatively wider lumen, serous glands had larger cells with centralized nuclei and a smaller luminal. These results partially support (22), who claims that hormones generated by the duodenum cause the duct that goes to the pancreas to release bile and digestive juice. Additionally, compared to the rest of the small intestine, the duodenum is much less sensitive to acidity due to the mucus secreted by glands (23).

Figure 5. Photographic of (Brunner glands) exhibit an aggressive coloring reaction (yellow arrow) and a limited quantity fiber (black arrow) of collagen (H&E stain .400 X magnification.

Finally, histological details of the arrangement in the Wild Brown Rat were documented in this study. Additionally, the outcome of the present investigation, when compared to earlier articles, revealed a developmental variability associated with dietary habits, which have significant effects on gland number, distribution, and organization.

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