

POST NATAL DEVELOPMENT OF RECTUM OF  
ALBINO RAT WITH REFERENCE TO THE  
EFFECT OF INDOMETHACIN INJECTION

THESIS

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*TO MY FATHER AND*

*THE SPIRIT OF MY MOTHER*



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**PART I**

**POST NATAL DEVELOPMENT OF**

**RECTUM IN ALBINO RAT**

**INTRODUCTION AND  
AIM OF THE WORK**

## INTRODUCTION AND AIM OF THE WORK

Reviewing the literature, it was found that the mucosa of the large intestine was investigated in man (Lumb, 1960; Donnellan, 1965) and in mouse (Green, 1966; Chang and Leblond, 1971; Nabeyama, 1975).

Moreover, postnatal development of the hindgut was extensively studied in different species; in the rat (Helander, 1973; Eastwood and Trier, 1974; Maskens, 1978) and in the mouse (Cheng and Bjerknes, 1985; Lashin, 1988). Recent investigations were also performed on the postnatal development of colo-rectal mucosa of rat (Maskens, 1981; Easa, 1989).

From the available literature, it became evident that little attention was paid to the postnatal development of the rectum, thus it became the aim of this work to study the developmental changes in the different coats of the rat's rectum during the postnatal period.

# REVIEW OF LITERATURE

## REVIEW OF LITERATURE

### (A) GROSS ANATOMY OF COLON AND RECTUM

Green (1966) observed that, the digestive tube of the mouse extended from pharynx to anus. The parts within the body cavity were supported by dorsal mesenteries continuous with the lining of the body cavity in which blood and lymph vessels as well as nerves were carried. He also observed that, the large intestine started by the caecum which was an elongated blind sac in the lower abdominal cavity. Its two openings for the ileum and colon were close together. Green (1966) also mentioned that, the mouse had no appendix and the colon was not coiled, it consisted of an ascending section from caecum to the level of pylorus, a short transverse section, and a descending section extending posteriorly to the border of the body cavity. The descending colon often appeared beaded because of fecal pellets distending its walls. One or more nodules of lymphatic tissue were usually present but not antimesenteric as in small intestine. The rectum was outside the body cavity and was short thick passageway from colon to anus.

Weisbroth, Flatt and Kraus (1974) studied the rabbit gastrointestinal tract. They mentioned that, the caecum

was very large, thin walled, coiled and it terminated in the thick walled light coloured vermiform process or caecum-appendix. The caecum was characterized by a spirally arranged construction related to internal folding of the mucosa (spiral valve). The authors also mentioned that, the first part of the colon was replaced by or structured like the caecum and constituted the ampulla caecalis coli. The colon was characterized by sacculations or haustra and by the presence of tenia coli. The colon was continued through the pelvis as the rectum terminating in the anus.

Baker, Lindsey and Weisbroth (1979) studied the anatomy of laboratory rat. They mentioned that, the caecum was large, thin walled blind pouch which was shaped somewhat like a comma and was lightly constricted about its middle. In the rat, it differed from that found in many other rodents as it was devoid of internal septa. They also stated that, the colon began from the caecum and ran cranially as the ascending colon, crossed the duodenum and then proceeded laterally toward the left side of the body as the transverse colon. The transverse colon extended only for a short distance before turning caudally as the descending colon to form the rectum in the pelvic region. The rectum was then continued caudally with the anus which opened externally.

Chiasson (1980) mentioned that, the rectum of the white rat was the straight terminal portion of the colon and the anus was the very short termination of the alimentary canal.

Williams and Warwick (1980) stated that, the human large intestine extended from the end of ileum to the anus and was divided into caecum (including the vermiform appendix), the colon, the rectum and anal canal. The rectum was continuous with the sigmoid colon at the level of 3<sup>rd</sup> sacral vertebra, the junction being indicated by the lower end of the sigmoid mesocolon. From its origin it descended, following the concavity of the sacrum and coccyx, forming an antero-posterior curve known as the sacral flexure of the rectum. It thus passed at first downwards and backwards, then downwards, and finally downwards and forwards to become continuous with the anal canal by passing through the pelvic diaphragm. In addition to its antero-posterior curve, the rectum deviated from the midline in the form of three lateral curves; the upper one was convex to the right, the middle one (which was the most prominent) bulged to the left, and the lower one was convex to the right; the beginning and end of the rectum were in the median plane. The rectum was about 12 cm long and its upper part had the same diameter as the sigmoid colon but its lower

part was dilated to form the rectal ampulla. The rectum differed from the sigmoid colon in that it had no sacculations, appendices epiploicae or mesentery, while the tenia coli blended about 5 cm above the junction of the rectum and sigmoid colon to form wide muscular bands which descended, one in the anterior and the other in the posterior wall of the rectum. The authors added that, at the empty state of the rectum, the mucous membrane of its lower part presented a number of longitudinal folds which were effaced by distention of the rectum. Beside these, there were permanent transverse or horizontal folds of a semi-lunar shape, which were most marked when the rectum was distended.

## (B) THE HISTOLOGY OF COLON AND RECTUM

Lumb (1960) stated that, the mucosa of human large intestine did not form folds except in the rectum. Being devoid of villi, it had a smooth surface. The crypts of Lieberkuhn were straight tubules and in the rectum attained a length of 7.0 mm. These glands were remarkably symmetrical in normal rectal mucosa and lay parallel and very close to each other. He added that, the free surface between the openings of the gland was lined by a simple columnar epithelium with a thin striated border and by occasional goblet cells. There were more goblet cells at the top than at the bottom of the glands. Except an occasional argentaffin cells, undifferentiated epithelial cells that show mitosis lined the bottom of the crypts. The lamina propria in healthy rectum was scanty. It contained a stroma of argylophilic fibres similar to that of lymphatic tissue and became condensed to reticular basement membrane at the epithelium covered surface. Close to the fibres, lay cells that had oval pale nuclei which might become macrophages, and could take up pigment. Among the meshes of this framework, there was a moderate number of free cells, most of which were lymphocytes and plasma cells with occasional eosinophils and polymorphnuclear leucocytes.

Martin (1961) studied the goblet cell pattern in the large intestine in different species, and also in different segments of the same species. In the rat, he found that the crypt length was a little greater in the distal colon than in the caecum and proximal colon. In the caecum, he found that goblets were numerous and mostly well filled in the fundus and lowest one third of the crypts; above this level, they became less numerous and a little smaller, and towards the crypt openings very few were seen. The average size of mucin globule decreased towards the opening of the crypt. He noticed that, although the goblets stained equally well with mucicarmine, those of the fundus and lower one third of the crypts were distinguished from the remainder in giving weak PAS reaction. The author noticed in the proximal colon that, the goblets were numerous, closely packed, and well distended with mucin in the fundus and lower half of the crypt. In the upper half of the crypts, the goblets were much less numerous but longer and more oval in shape. Although all goblets stained equally well with mucicarmine, the closely packed goblets of the fundus and deeper half of the crypts were distinguished from the remainder in giving weak PAS reaction. In the distal colon, he noticed that, the goblet cell pattern differed from that of caecum and proximal colon; in the fundus and deeper one third of the crypts, the goblets were not well