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Research Article

A COMPARATIVE HISTOLOGICAL STUDY OF MUCIN SECRETING CELLS IN GIT BY THE H&E & PAS

Manu Gupta., Rajni*., Shalik Ram Adhikari., Shilpi Jain., Hema Nagpal and Renu Mishra

Department of Anatomy, Chaudhary Charan Singh University Saraswathi Institute of Medical Sciences Nh-24, Pilkhuwa, Hapur, Uttar Pradesh

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ABSTRACT

Mucin are high molecular weight glycoproteins that have gel forming properties, which contribute to protection against microorganisms, toxins in the gut lumen & also provide lubrication & mechanical protection from the intestinal content. Mucin secreted by different mucus secreting cells mainly found in the mucosa of the gastro intestinal tract by the goblet cells or modified epithelial cells. Mucins are glycoproteins and their carbohydrate component is deeply stained with PAS for demonstrating mucous secreting cell in comparison to routine staining with H&E which gives vacuolated appearance to the cytoplasm of mucous secreting cells.

The present study does not aim to classify or comment on the nature of the classification, an attempt to explore the mucins and its special affinity to react with Schiff reagent is documented in the present study.

INTRODUCTION

The gastric mucus barrier exists as an adherent gel covering the surface of the glandular epithelium. It provides interface between the mucosal surface and the gastric lumen. Glands are epithelial cells whose function is secretion, Mucous glands are glands that secrete mucin (a glycoprotein) which when mixed with water become mucous. Mucous is a highly hydrated gel that consists of 95%water, 5% mucin and minor components such as electrolytes (Allen, 1981; Neutra and Forstner, 1987). Secretory cells in mucous gland have forthy cytoplasm & basal, flattened nuclei. The portion of the cytoplasm lying between the nucleus & the apex of the cells contains a variable number of droplets of mucinogen which in the usual histological preparation, presents a negative picture & a vacuolated appearance to a very light staining cytoplasm. Mucins are glycoproteins & their carbohydrate component is deeply stained with PAS & PAS with alcian blue are very useful for demonstrating mucous gland in comparison to routine staining with H&E. Periodic acid Schiff is a staining method used to detect glycogen in tissues. PAS technique may aid in the differential diagnosis of tumours through the detection of mucins or glycogen (Harley 1987). The reaction of periodic acid selectively oxidizes the glucose residues, create aldehyde that react with the Schiff reagent and creates a purple magenta colour.

Corresponding author:* **Rajni
Department of Anatomy, Chaudhary Charan Singh University Saraswathi Institute of Medical Sciences Nh-24, Pilkhuwa, Hapur, Uttar Pradesh

Aims & Objectives

- To study the various mucous secreting cells present in the whole GIT.
- To evaluate the role of special staining (PAS) on mucin, which cannot be demonstrated well on routine H&E staining by their empty appearance (i.e poorly stained cytoplasm).

MATERIALS AND METHODS

The material used for the study consist of the tissues of different part of GIT (Esophagus, Small Intestine, Large Intestine, Gall bladder and Appendix) from the pathology department of Subharti Medical College were taken for the present study. Material was fixed in 10% formalin. They were processed & embedded in paraffin wax. Sections of 3-5 micron thickness were cut by rotatry microtome. These sections were stained by the following techniques for demonstrating mucous gland.

- Haematoxillin And Eosin
- Periodic acid Schiff reagent

OBSERVATION & RESULTS

In observing the mucous secreting cells in GIT tissue from Esophagus, Small Intestine, Large Intestine Gall bladder & Appendix were stained by H&E and PAS & compare these microscopic slides for demonstrating mucous secreting cells.

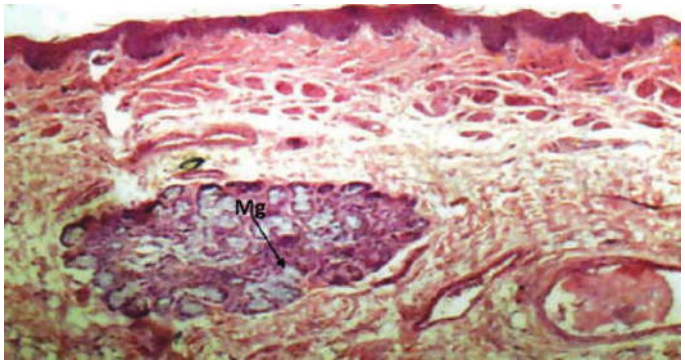
Histological Structure of the Mucous Membrane and characterisation of the mucinous contents of the Esophagus: In the esophagus the mucous acini of esophageal gland are present in the submucosa of the esophageal wall. Photomicrograph -1 of section stained with H&E show empty looking appearance of the mucous secreting cell in the acini with the peripheral placed, flattened, blue staining nucleus while staining with PAS in Photomicrograph -2 show dark magenta colour to these mucous acini. These mucous acini are found in groups in submucosa of the esophagus.

Histological Structure of the Mucous Membrane and characterisation of the mucinous contents of the Small Intestine: In small intestine, epithelium covering the surface of mucous membrane gets folds into intestinal villi which consists of goblet cells and tall columnar mucus secreting cell with a prominent brush border. In the photomicrograph-3 stained with H&E show mucus secreting cell of epithelium which shows clear cytoplasm and indent the blue staining nucleus and goblet cells gives a vacuolated appearance but goblet cell in small intestine is comparatively less in number as compared to large intestine. Staining with PAS in photomicrograph-4 gives a bright colour to the prominent striated border which is covered with thick glycocalyx coat and also goblet cell and mucous secreting cells show dark bright magenta colour.

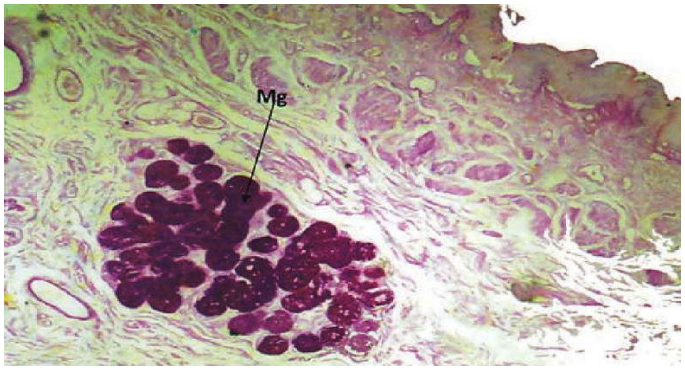
Histological Structure of the Mucous Membrane and characterisation of the mucinous contents of the Appendix: Inner lining of epithelium of the mucosa in appendix gets thrown into folds which is composed of numerous goblet cells and columnar cells. Lining epithelium is continuous into intestinal glands, some of the glands are sectioned in longitudinal , transverse and oblique plane. Photomicrograph-5 show intestinal gland of appendix in transverse plane on staining with H&E. Intestinal gland in this photomicrograph show closely aggregated mucus secreting cells with scattered and more numerous goblet cells and the mucous content is more heavily eosinophilic. In comparison to H&E photomicrograph-6 of section stained with PAS show mucus secreting cells of intestinal gland appear bright colour.

Histological Structure of the Mucous Membrane and characterisation of the mucinous contents of the Gall bladder: Gall bladder, mucosa consists of simple columnar epithelium with goblet cells and a prominent brush border like appearance due to microvilli. In photomicrograph -7 H&E staining gives vacuolated appearance to goblet cells in the lining epithelium whereas in the staining with PAS photomicrograph -8 reveals dark staining brush border because PAS imparts bright colour to the microvilli and dark staining to goblet cells of lining epithelium.

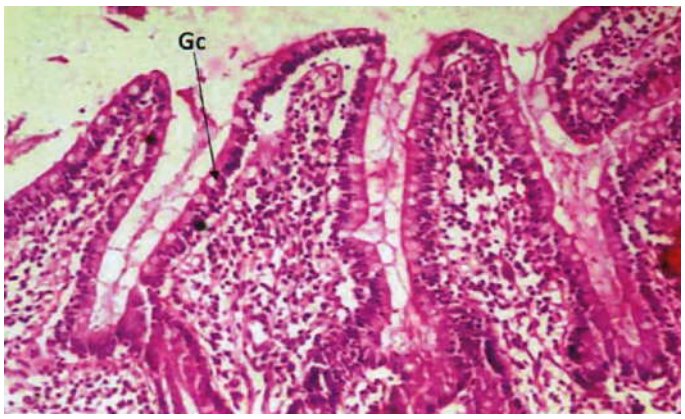
Histological Structure of the Mucous Membrane and characterisation of the mucinous contents of the Large Intestine: In Large Intestine mucous membrane thrown into mucosal folds and consists of more number of goblet cells in comparison to small intestine. In the routine H&E photomicrograph-9 reveals that vacuolated appearance of scattered and more number of goblet cells and clear or empty looking appearance of mucous secreting cells in epithelium. In Photomicrograph-10 section shows stained with special stain PAS imparts bright colour to cells of epithelium covering these surfaces.



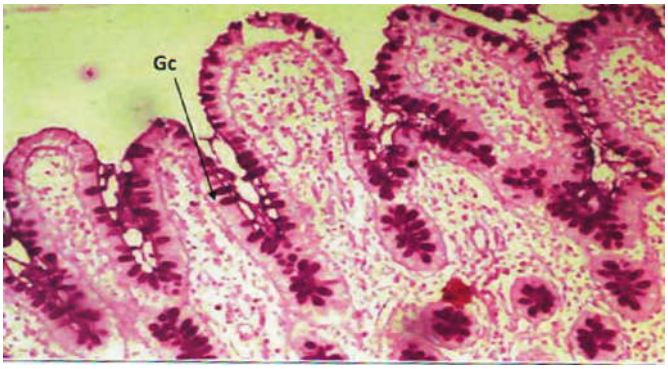
Photomicrograph 1 showing empty looking mucous gland (Mg) in the submucosa of Esophagus(4x) by H&E.



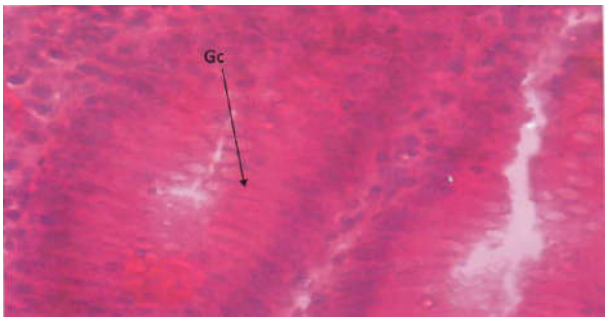
Photomicrograph 2 showing dark magenta colour mucous glands (Mg) in the submucosa of Esophagus (4x) by PAS.



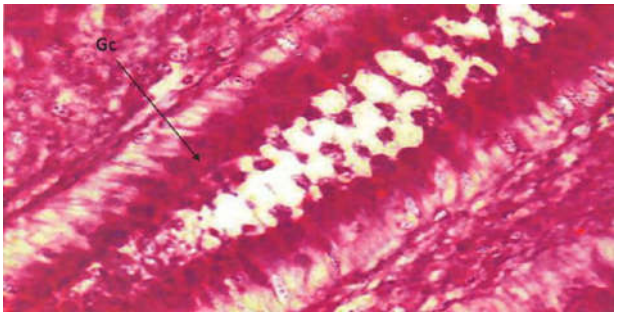
Photomicrograph 3 showing empty looking goblet cells (Gc) in the lining epithelium of Jejunum (10x) by H&E.



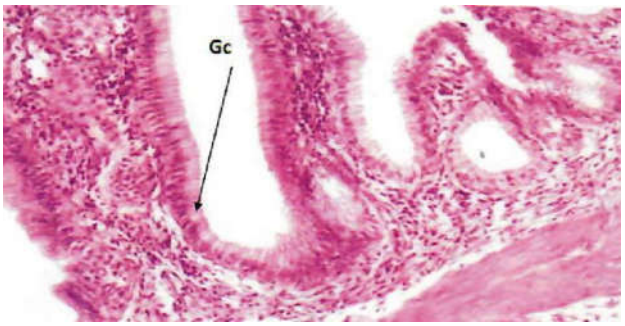
Photomicrograph 4 showing epithelium of Jejunum with dark magenta colour appearance of goblet cells by PAS staining (10x).



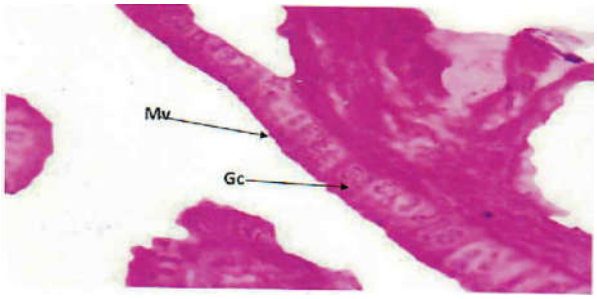
Photomicrograph-5 showing vacuolated appearance of goblet cells (Gc) in intestinal glands of Appendix by H&E (10x).



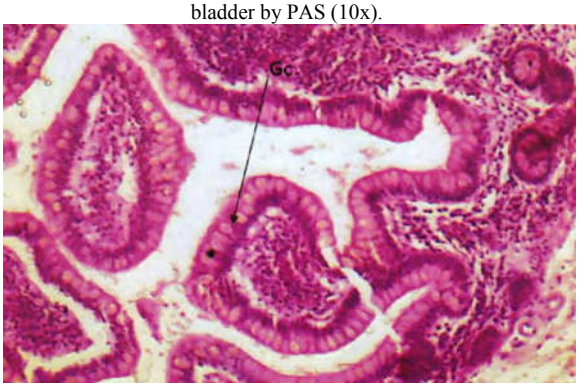
Photomicrograph-6 showing dark staining goblet cells (Gc) in intestinal glands of Appendix by PAS (10x).



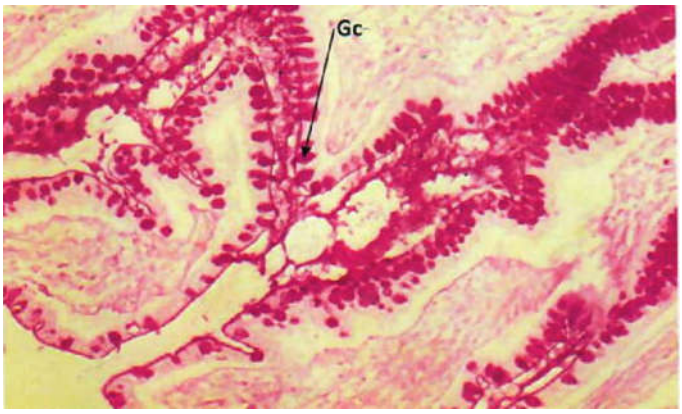
Photomicrograph-7 showing empty looking Goblet cells in epithelium of Gall bladder by H&E (10x).



Photomicrograph-8 showing dark staining to Goblet cells (Gc) of Gall bladder by PAS (10x).



Photomicrograph-9 showing empty looking increase number of Goblet cells (Gc) in the lining epithelium of large intestine by H&E (10x).



Photomicrograph-10 showing dark magenta colour to the goblet cells (Gc) in the lining epithelium of large intestine (10x).

DISCUSSION AND CONCLUSION

To compare the histology of the mucus secreting cell in the different regions of alimentary tract with the use of special histologic techniques. Mucin reflect change in their composition, functional state of the mucosa both in the healthy and diseased states (Ganga GM). The understanding of both the nature and the significance of mucin changes in foetal development may be potentially useful in the recognition of early neoplastic changes in adults. In this study efforts has been made to demonstrate the mucous secreting cell of GIT.

SushmaNaag *et.al*, in 2010 showed varied heterogenicity of mucin expression in mucous acini and change in mucin expression from benign to malignancy while in the present study we reported mucin secreted by the different cells in the GIT by the normal tissue sample through routine histological staining H&E and the PAS.

Hans P Hauber in 2009 suggests that staining of glycoproteins by periodic acid Schiff reaction may help in discriminating different forms of Intestinal Lung Diseases and in the present study PAS help in demonstrating mucous secreting cells of GIT.

Lee & Anna in 2010 hypothesized that staining with periodic acid Schiff (PAS) instead of Haematoxillin & Eosin could prove diagnostic accuracy and speed of detecting invasive signet ring adenocarcinoma while in our study mucous secreting cells in GIT accurately demonstrated by the staining of PAS.

John *et.al* in 1954, stated that the Periodic acid Schiff stain has many uses among them one is demonstration of fungi in tissue. Two cases were presented in which fungi could never be demonstrated by haematoxillin and Eosin stains but were readily found by the periodic acid Schiff method similarly while in our study mucous secreting cells only gives empty looking appearance by H&E & readily be demonstrated by PAS.

Ahmed *et al,* in 2009 documented the histology of the Alimentary tract of a common Egyptian reptilian species, Varanus niloticus or the Nilemonitor. Specimens for histological examination were collected from esophagus, stomach and small intestine of the Nile monitor and processed for paraffin embedding. Sections were stained with haematoxillin and eosin for general morphology. Periodic Acid Schiff's and Alcian blue methods were applied to detect the different types of the mucous contents of the gastro intestinal

tract. Similarly in our study H&E is used for general morphology and PAS to detect the mucin content of the GIT. In an overall view, it can be said that present study in concordance with the various studies, done on normal human GIT. Specimens from different regions reveals that special stain PAS is very useful for demonstrating mucous secreting cells presents in the GIT.

SUMMARY & CONCLUSION:

Mucin are high glycoprotein & complex carbohydrate secreted by different types of epithelial cells and the glandular tissues of the oral cavity, and the alimentary canal. Mucin reflect changes in their composition , functional state of the mucosae both in the healthy and diseased states. Therefore the understanding of both the nature and the significance of mucin changes is very useful to understand. Although the present study does not aim to classify or comment on the nature of the classification, an attempt to explore the mucins and its special affinity to react with Schiff reagent is documented in this study.

Special staining PAS acts as an adjunct to routine H&E staining which may be helpful in assessing the mucin expression very well. A large number of tumours with various stages of malignancy and histological patterns is needed for a better understanding of nature of mucins.

In different diseases the disease process causes the change in mucin expression. The future of mucin research lies in establishing a better understanding of the mucin in the GIT. Such research may throw a light on the structural changes of glycoproteins in precancerous lesions which may help in knowing the exact process of carcinogenesis.

Changes in the antigenesity of glycoproteins in different diseases will be futuristic science for immunohistochemistry and histochemistry. The genetic determinants in the expression of glycotransferase during the biosynthesis of mucins by malignant cells will be an important topic for research in the future.

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