

# Role of Mucin Histochemistry in Gastric Mucosal Lesions

Dinisha Einstien<sup>1</sup>, A Prathiba<sup>1</sup>, B O Parijatham<sup>2</sup>, K Maheswari<sup>3</sup>

<sup>1</sup>Assistant Professor, Department of Pathology, A.C.S. Medical College & Hospital, Chennai, Tamil Nadu, India, <sup>2</sup>Professor, Department of Pathology, Shree Balaji Medical College & Hospital, Chennai, Tamil Nadu, India, <sup>3</sup>Senior Technician, Mass Diagnostic Center, Chennai, Tamil Nadu, India

## Abstract

**Introduction:** Intestinal metaplasia (IM) refers to the progressive replacement of the gastric mucosa by epithelium having the characteristics of the intestinal mucosa. IM has been observed in various gastric lesions.

**Aims and Objectives:** To determine the mucin histochemistry of various gastric mucosal lesions and the possible relationship of various epithelial mucins with gastric tumors.

**Materials and Methods:** This study was conducted on 105 endoscopic gastric biopsy specimens and 15 gastrectomy specimens. The sections were stained with routine haematoxylin and eosin stain and histochemical stains for mucin such as Alcian blue (AB) pH 2.5/periodic acid-Schiff (PAS) and AB pH 1.0/PAS to detect neutral mucins and acidic mucins. Sections were further stained with aldehyde fuchsin/AB pH 2.5, for subtyping of IM.

**Results:** We observed that the normal glands stained predominantly for neutral mucin, whereas in chronic inflammation, there was a predominance of mixture of acidic and neutral mucins. The cases of IM stained predominantly for sialomucin, while sulfomucin positivity was seen mostly in carcinoma.

**Conclusion:** We conclude that mucin histochemistry helps in identifying the specific subtype of mucin secretion in various gastric mucosal lesions and subsequent typing of IM.

**Key words:** Alcian blue, Aldehyde fuchsin, Intestinal metaplasia, Mucin, Sialomucin, Sulfomucin

## INTRODUCTION

Intestinal metaplasia (IM) refers to the progressive replacement of the gastric mucosa by epithelium having the light and electronic microscopic features of intestinal epithelium of either small or large bowel type. Based on the cell differentiation and mucin secretion, three types of IM can be recognized in the stomach, i.e., Type 1, Type 2, and Type 3.<sup>1</sup> IM has been observed in various gastric lesions such as gastric cancer, gastric ulcer, and atrophic gastritis. Demonstration of different mucins in gastrointestinal tract (GIT) carcinomas may assist in

their classification and predicting prognosis and behavior of the tumor.<sup>2</sup>

## Aims and Objectives

To determine the mucin histochemistry of various gastric mucosal lesions and the possible relationship of various epithelial mucins with gastric tumors.

## MATERIALS AND METHODS

This study was conducted on 105 endoscopic gastric biopsy specimens and 15 gastrectomy specimens at Shree Balaji Medical College and Hospital, Chennai, from September 2012 to February 2015. All the sections were stained with routine haematoxylin and eosin (H and E) stain, and histochemical stains for mucin such as Alcian blue (AB) pH 2.5/periodic acid-Schiff (PAS) and AB pH 1.0/PAS to detect neutral mucins, acidic mucins – sialomucins, and sulfomucins. Sections were

Access this article online



www.ijss-sn.com

**Month of Submission :** 09-2016  
**Month of Peer Review :** 10-2016  
**Month of Acceptance :** 10-2016  
**Month of Publishing :** 11-2016

**Corresponding Author:** Dr. Dinisha Einstien, No.3/23, United Colony, Medavakkam, Chennai - 600 100, Tamil Nadu, India.  
Phone: +91-9791104297. E-mail: dr.dinieins@gmail.com

further stained with aldehyde fuchsin (AF)/AB pH 2.5, for subtyping of IM.

## OBSERVATIONS AND RESULTS

In this study, the distribution of cases was as in Table 1: In this study, 42 cases (35%) of IM were observed out of 120 cases. Out of the 103 benign cases, IM was observed in 31 cases (30.1%) - 14 cases of chronic gastric ulcer, 5 cases of chronic gastritis, 8 cases of gastric polyp, and 4 cases of dysplasia. Among the 17 malignant cases, IM was observed in 11 cases (64.7%) - 3 cases of well differentiated adenocarcinoma, 7 moderately differentiated adenocarcinomas, and 1 case of poorly differentiated adenocarcinoma.

### Mucin Histochemistry in IM

In normal gastric mucosa, neutral mucins were predominant. The surface epithelium, pits, pyloric glands, cardiac glands, and mucous glands (mucous neck cells) were neutral mucin (PAS) positive.

Among the 29 benign lesions with IM, the goblet cells in 10 cases of chronic gastric ulcer, 3 cases of gastritis, and 3 cases of hyperplastic polyps showed sialomucin (PAS/AB 2.5 pH) positivity (Figures 1-3). 4 cases of gastric ulcer, 2 cases of chronic gastritis, 4 cases of polyps (2 hyperplastic polyps, 1 Peutz-Jeghers polyps, and 1 fundic gland polyps), and 2 cases of dysplasia showed strong sialomucin positivity in goblet cells, along with PAS positivity (PAS/AB 2.5 pH) in adjacent columnar epithelium.

Among the 11 cases of adenocarcinoma with IM, 1 case of well differentiated adenocarcinoma (Figure 4) and 3 cases of moderately differentiated adenocarcinoma showed strong sialomucin positivity in goblet cells, along with PAS positivity in adjacent columnar epithelium. Goblet cell sialomucin positivity was seen in all the cases of IM was associated with gastric adenocarcinoma.

**Table 1: Histopathological diagnosis wise distribution of gastric mucosal lesions**

Histopathological diagnosis	Number of cases (%)
Chronic gastric ulcer	55 (45.83)
Chronic gastritis	27 (22.5)
Gastric polyp	14 (11.67)
Xanthelasma	1 (0.83)
Dysplasia	6 (5.00)
WDADC	3 (2.50)
MDADC	9 (7.50)
PDADC	3 (2.50)
Squamous cell carcinoma	1 (0.83)
Neuroendocrine carcinoma	1 (0.83)
Total	120

WDADC: Well differentiated adenocarcinoma, MDADC: Moderately differentiated adenocarcinoma, PDADC: Poorly differentiated adenocarcinoma

Sulfomucin positive columnar cells (PAS/AB 1.0 pH and AF/AB 2.5 pH) were seen in 1 adenomatous polyp, 2 cases of dysplasia (Figure 5), 1 case of well differentiated adenocarcinoma, 4 cases of moderately differentiated adenocarcinoma (Figure 6), and 1 case of poorly differentiated adenocarcinoma. Weak sulfomucin positivity was seen in one case of well differentiated adenocarcinoma.

Type I (complete) IM was observed in 16 cases (38.1%), which showed sialomucin positivity in goblet cells. Type II (incomplete) IM was seen in 17 cases (40.47%), which showed strong sialomucin positivity and sulfomucin weak positivity in goblet cells, with PAS positivity of neutral mucin in adjacent columnar epithelium. Type III (incomplete) IM was seen in 9 cases (21.43%), showing sulfomucin positive columnar cells. One case of well differentiated adenocarcinoma showed weak sulfomucin positivity, but the adjacent areas showed Type II IM.

## DISCUSSION

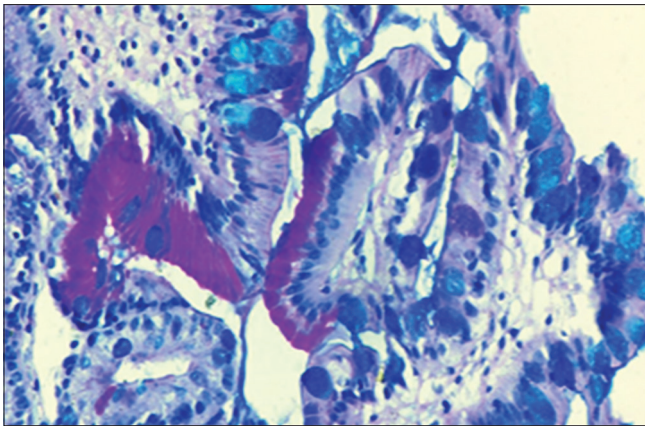
The distribution and amount of mucins varies in different regions of the GIT. The mucosa of the stomach has been found to have some qualitative as well as quantitative changes in the non-neoplastic and neoplastic lesions compared to normal mucosa by mucin histochemistry.<sup>3</sup> Neutral mucins present in normal mucosa gradually decrease during the initial development of IM, while sialomucins appear and become predominant. In more advanced stages, sulfomucins appear and may become predominant.<sup>4</sup> O-acetyl sialomucin presence provides tumor cells several attributes, which contributes to tumor progression and metastasis. Simultaneous assessment of clinicopathological and mucin characteristics at the time of initial diagnosis can provide a beneficial role in individual therapeutic strategies.<sup>5</sup> This study was therefore undertaken to study the role of mucin histochemistry in gastric mucosal lesions.

In this study, 105 cases of endoscopic biopsy and 15 gastrectomy specimens sections were stained with H and E and AB/PAS at pH 2.5, AB/PAS at pH 1.0 to identify the various types of mucins, and with AF/AB to subtype IM.

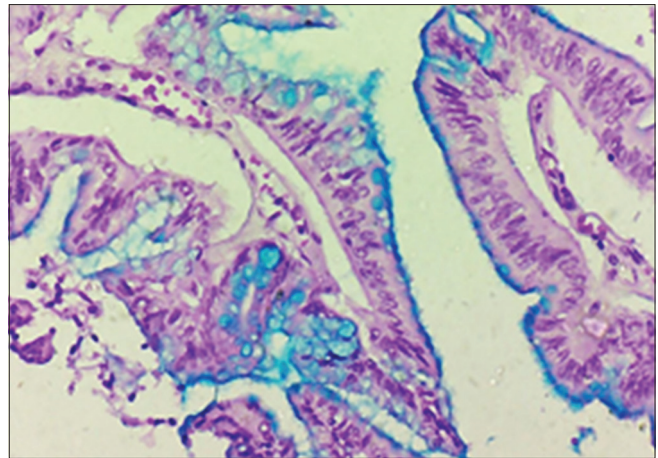
We observed that the normal glands stained predominantly for neutral mucin, whereas in chronic inflammation, there was a predominance of mixture of acid and neutral mucin. The cases of IM stained predominantly for sialomucin, while sulfomucin positivity was seen mostly in carcinoma.

The goblet cells in complete IM (Type 1), secrete sialomucins. In incomplete IM (Type 2), columnar

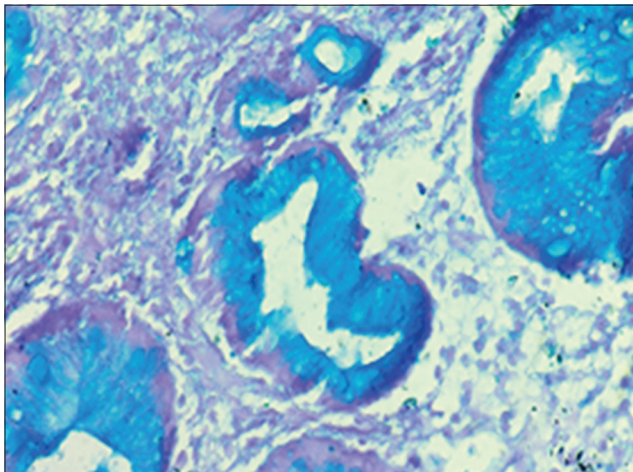




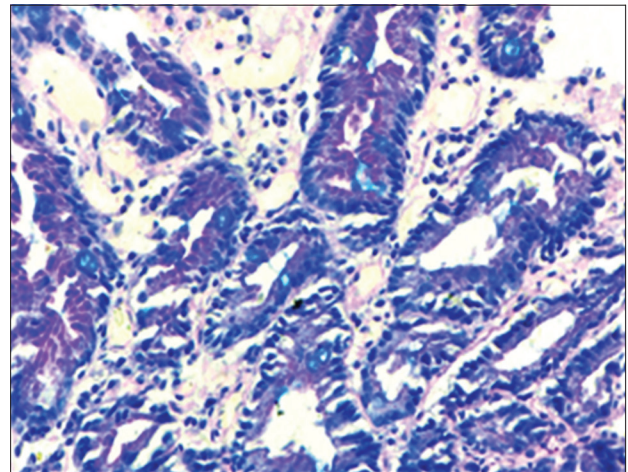
**Figure 1:** Chronic gastric ulcer, showing neutral mucin, mixture of acid and neutral mucins, and occasional sialomucin (periodic acid-Schiff/Alcian blue pH 2.5, x40)



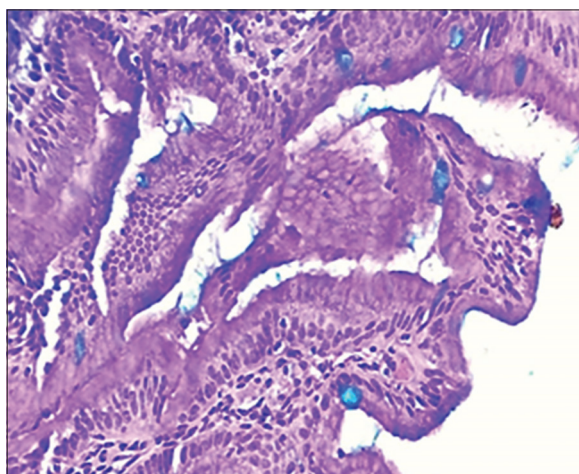
**Figure 4:** Well differentiated adenocarcinoma showing sialomucin (periodic acid-Schiff/Alcian blue 2.5 pH, x40)



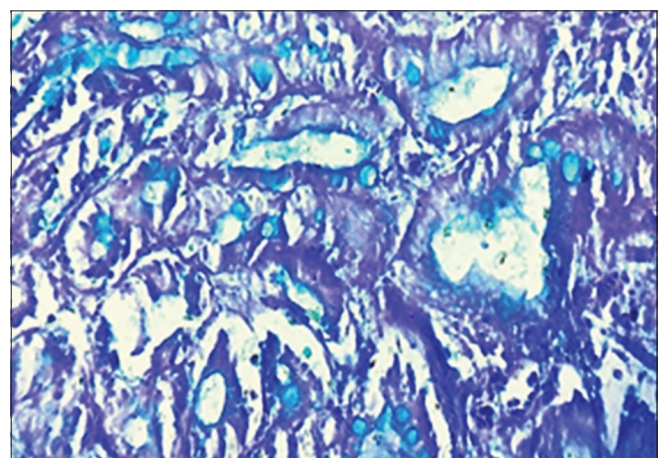
**Figure 2:** Chronic gastritis with intestinal metaplasia showing sialomucin (aldehyde fuchsin/Alcian blue pH 2.5, x40)



**Figure 5:** Dysplasia showing sulfomucin (periodic acid-Schiff/Alcian blue pH 1.0, x40)



**Figure 3:** Hyperplastic polyp showing predominantly neutral mucin with occasional sialomucin (periodic acid-Schiff/Alcian blue pH 2.5, x40)



**Figure 6:** Moderately differentiated adenocarcinoma showing sulfomucin with sialomucin in goblet cells (aldehyde fuchsin/Alcian blue pH 2.5, x40)

mucous cells secrete neutral mucin, acid sialomucin, and occasionally sulfomucins. The goblet cells secrete

sialomucin and occasionally sulfomucin. In Type 3, the columnar mucous cells secrete predominantly

sulfomucins and goblet cells contain sialomucins and/or sulfomucins.<sup>6,7</sup> Studies in different population from various centers have indicated a close relationship between sulfomucin secreting Type 3 IM and intestinal type gastric carcinoma. Type 1 and Type 2 sialomucin secreting intestinal metaplasia are prevalent in both benign and malignant conditions.<sup>8-10</sup> Inflammatory lesions show neutral mucins and mixture of acidic and neutral mucins.<sup>11</sup> Dysplasia in adenomatous polyp in the stomach often shares mucin profiles with incomplete sulfated IM. Hyperplastic polyp, which has low malignant potential, secretes only traces of sulfomucin or more frequently none at all. Hyperplastic polyps that occasionally undergo malignant change show sulfomucin secretion in areas of IM within the polyp.<sup>12</sup>

These techniques are particularly suitable for countries like India as they can substantially contribute in the definite classification of gastric IM and carcinoma.<sup>13</sup>

## CONCLUSION

We conclude that mucin histochemistry helps in identifying the specific subtype of mucin secretion in various gastric mucosal lesions and subsequent typing of IM.

## REFERENCES

1. Silva S, Filipe MI, Pinho A. Variants of intestinal metaplasia in the evolution of chronic atrophic gastritis and gastric ulcer. A follow up study. *Gut* 1990;31:1097-104.
2. Eiman A, Mohamed AR. Demonstration of mucins in gastrointestinal tract carcinoma lesions in Sudanese patients. *Int J Pure Appl Sci Technol* 2014;21:28-31.
3. Suvarna N, Sasidharan VP. Histopathological and histogenetic study of carcinoma stomach in a high risk area. *Indian J Cancer* 1995;32:36-42.
4. Correa P, Piazuelo MB, Wilson KT. Pathology of gastric intestinal metaplasia: Clinical implications. *Am J Gastroenterol* 2010;105:493-8.
5. Rehman M, Chughtai NM, Hashmi SN, Jalil S, Riaz S. Histochemical detection of O-acetyl sialomucin in adenocarcinoma in gastric biopsies: An old mucin with new perspective. *J Cytol Histol* 2016;7:420.
6. Mowry RW, John PB. Detection and properties of acidic polysaccharides in gastric carcinoma and in stomach resected for peptic ulcer. *J Histochem Cytochem* 1959;7:321-6.
7. Sorvari TE, Lauren P. Epithelial mucosubstances in human gastrointestinal tract. *Scand J Clin Lab Invest* 1968;21:106-13.
8. Jass R, Filipe MI. The mucin profile of normal gastric mucosa, intestinal metaplasia and its variants and gastric carcinoma. *Histochem J* 1981;13:931-9.
9. Silva E, Teixeira A, David L, Carneiro F, Reis CA, Sobrinho-Simões J, *et al.* Mucins as key molecules for the classification of intestinal metaplasia of the stomach. *Virchows Arch* 2002;440:311-7.
10. Smith JL, Dixon MF. Is subtyping of intestinal metaplasia in the upper gastrointestinal tract a worthwhile exercise? An evaluation of current mucin histochemical stains. *Br J Biomed Sci* 2003;60:180-6.
11. Prathima S, Kumar ML. Mucin profile of upper gastrointestinal tract lesions. *J Clin Biomed Sci* 2012;2:185-91.
12. Lev R. The mucin histochemistry of normal and neoplastic gastric mucosa. *Lab Invest* 1965;14:2080-100.
13. Mandal PK, Chakrabarti S, Ray A, Chattopadhyay B, Das S. Mucin histochemistry of stomach in metaplasia and adenocarcinoma: An observation. *Indian J Med Paediatr Oncol* 2013;34:229-33.

**How to cite this article:** Einstien D, Prathiba A, Parijatham BO, Maheswari K. Role of Mucin Histochemistry in Gastric Mucosal Lesions. *Int J Sci Stud* 2016;4(8):146-149.

**Source of Support:** Nil, **Conflict of Interest:** None declared.