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Expression of N-Acetylglucosamine Residues in Abomasum of The Swamp Buffalo

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INTRODUCTION

Swamp buffaloes (*Bubalus bubalis*) have been adapted and grown in swampland of South Kalimantan, Indonesia. They have been success to survive in swampland with extreme environment where the feed supply is low on quantity and quality. The ability of swamp buffaloes for adaptation to swampland was suggested to be supported by their digestive system efficiency. The ability of digestive efficiency on swamp buffalo often close related with larger rumen volume, slower rumen motility, higher cellulolytic activity of microbial population, and slower rate of digestion passage through the reticulo-rumen. The ability of digestive efficiency in a species also has correlation with the glycoconjugate compositions in mucous substance of digestion tract.⁽¹⁾ According to the previous studies, D mannose/D glucose glycoconjugates were found dominantly in forestomach of swamp buffalo as a bacterial receptor attachment. The existence of D mannose/D glucose glycoconjugates causes high bacteria population and it has the impact directly to increase fermentation process and indirectly to increase digestive efficiency ability of swamp buffalo.⁽²⁾

Since abomasum is a glandular area and location for enzymatic digestion, the structure and function are very similar to the "true stomach" of monogastric. Furthermore, our study was designed to obtain scientific explanation about digestive efficiency ability of swamp buffalo comprehensively by doing identification of the glycoconjugate type and distribution pattern in abomasum.

MATERIALS AND METHODS

Six male swamp buffaloes, 2.5-3 years old and body weight between 300-400 kg were used in this study. Samples were obtained from the Regency of Banjar slaughter house, South Kalimantan, Indonesia. Every part of the abomasum includes cardiac, fundic, and pyloric was taken and processed for the microscopic observation. Sugar residues of glycoconjugates in abomasum were localized with lectin histochemistry i.e *Wheat Germ Agglutinin* (WGA), *Ricinus Communis Agglutinin* (RCA), *Concanavalin Agglutinin* (Con A), *Ulex Europaeus Agglutinin* (UEA), and *Soybean Agglutinin* (SBA). The staining pattern with WGA, RCA, Con A, UEA, and SBA can be explained on the basis of the presence of N-acetylglucosamine, β -D-galactose, D-mannose or α -D glucose, α -L-fucose, and N-acetylgalactosamine residues respectively.

RESULTS

The N-acetylglucosamine was found in all part of abomasum. In the cardiac and pyloric region, N-acetylglucosamine was found in gastric pit cells, neck, body, and base gland cells. In the fundic region, N-acetylglucosamine was expressed in gastric pit cells, mucous neck cells, and parietal cells (Figure 1). While the N-acetylglucosamine was found widely in abomasum, other residues were only found in certain part of abomasum. The existence of β -D-galactose and D-mannose or α -D glucose was only found in cardiac and fundic region. The β -D-galactose was found in surface mucous cell of cardiac, and in the fundic was found in surface mucous cells, gastric pit

cells, mucous neck cells, and parietal cells. The presence of D-mannose or α -D glucose in cardiac region was found in surface mucous cells and gastric pit cells. In fundic region D-mannose or α -D glucose was only found in mucous neck cells. The α -L-fucose was only found in fundic and pyloric region. All part of the fundic and pyloric region expressed α -L-fucose, except in surface mucous cell and chief cell. The N-acetylgalactosamine was only found in fundic area, i.e gastric pit, mucous neck, and parietal cells.

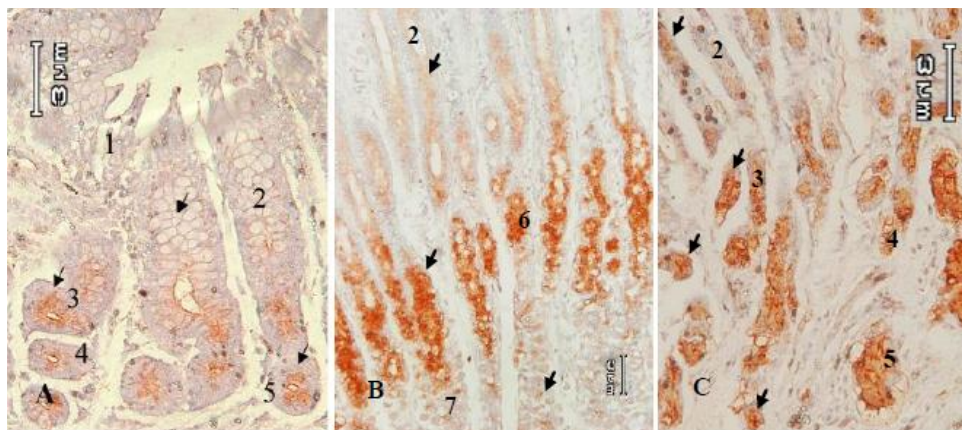


Figure 1. Lectin histochemistry abomasum of swamp buffalo. Cardiac (A), fundic (B) and pyloric (C) of swamp buffalo shows intensively reaction (✓) with WGA. It indicates the presence of N-acetylglucosamine exclusively. Surface mucous cell (1), gastric pit cell (2), neck gland cell (3), body gland cell (4), base gland cell (5), mucous neck cell (6), and parietal cell (7).

DISCUSSION

The presence of N-acetylglucosamine residues in all part of abomasum plays important role as a mediator in mucin-synthesis. The N-acetylglucosamine will be transferred by N-acetylglucosaminyltransferase from UDP-N-acetylglucosamine to yield mucin.⁽³⁾ Mucin is a high molecular weight glycoprotein that is the principal component of gastric mucus. Gastric mucins are widely assumed to play important cytoprotective roles. They protect the epithelium against acid and pepsin in the gastric juice and against exogenous damaging agents (e.g pathogens, drugs), and against mechanical damage.⁽⁴⁾

CONCLUSION

The expression of N-acetylglucosamine residues as a mediator in mucin-synthesis is dominant in abomasum. It has function to support chemical digestion in swamp buffalo. The histochemical characteristic of swamp buffalo abomasum is estimated as supporting factors for increasing digestive efficiency to survive in swampland.

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