
Study on Distribution of Nerve Fibres in the Gastrointestinal Tract of Buffalo
(Bubalus bubalis)

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ABSTRACT

A study was conducted to elucidate nerve fibres and plexuses in enteric nervous system of buffalo using Bielschowsky method and by staining for Acetylcholinesterase (AchE). Tissues of twelve adult buffaloes of 1-1.5 years of age were studied in the present work. Bielschowsky silver revealed neuronal elements as dark black fibers of variable thickness and they stained light yellow to dark colour with AchE. Myenteric and submucosal plexuses had AchE positive nerve fibers. These nerve fibres extended from submucosa to mucosa and terminated on wall of crypts. Cholinergic innervations were demonstrated in the core of villi. The terminal segments of the digestive tract showed greater AchE activity.

Key words: Acetylcholinesterase, Myenteric plexus, Submucosal plexus

Enteric nervous system (ENS) is the intrinsic nervous system of the gastrointestinal tract (GIT) composed of thousands of small ganglia that are present within the wall of the esophagus, stomach, small and large intestine, pancreas, gall bladder and biliary tree. ENS regulate motility, local blood flow, fluid exchange, gastric and pancreatic secretion, mucosal transport and secretion, trophic effects and modulate immune and endocrine functions through brain-gut axis (Greshon, 2005; Furness, 2006). The present study was undertaken to reveal the distribution pattern of the nerve fibers/plexuses/neurons in each segment of digestive tract of buffalo.

MATERIALS AND METHODS

Tissue samples from esophagus, rumen, reticulum, omasum, abomasum, jejunum, ileum, caecum, colon and rectum were collected from carcasses of twelve buffaloes, aged 1-1.5 year from slaughter house of Bhubaneswar. Tissue samples were collected in 10% neutral buffered formalin for routine paraffin section and were then stained with Bielschowsky silver method for nerve fiber and axis cylinder. For demonstration of cholinergic fibers tissue pieces were fixed in chilled 10% formal calcium (⁰C) and cryo sections of 5 µ thickness (Leica, CM 1850, Germany) were obtained for incubation in acetylcholine iodide.

RESULTS AND DISCUSSION

The neuronal elements were found to stain as dark fibres of variable thickness. Thick nerve fibres bundles were found in muscular tunic and in the submucosal connective tissue. Myenteric plexus revealed maximum concentration of neuronal elements. The submucosal plexuses were found to extend into mucosa. The fine nerve fibres were observed to occur in myenteric plexus, submucosal plexus and arterial wall and in the lamina propria adjacent to the gastrointestinal gland.

According to the Vacca (1985) the neuronal elements contain an enzyme called ‘cholinesterase’ which hydrolyses acetylcholine into acetate and thiocholine. The thiocholine thus produced, combines with available copper ions (Cu++) to form copper thiocholine precipitate which is microscopically visualized as light yellow to dark precipitate upon treatment with 2% ammonium sulphide. Nerve fibres and terminals positive to AchE were found in submucosal plexus, myenteric plexus, gastric gland region, region around Brunners gland, few cells of the crypt, core of the villi indicating that the terminal segments of the digestive tract have greater AchE activity. It
suggested that an appreciable component of the intramural innervation of the digestive tract in buffalo was cholinergic. The observation on cholinergic innervation in enteric segments of buffalo was similar to that of Liu et al., 2007 in goat. Cottrell and Greenhorn (1987) reported that the gastrointestinal tract of mammals function under autonomic nervous system which was mainly of adrenergic and cholinergic component. The present report on AchE activity in digestive tract of buffalo corroborated well with the report. Some studies revealed small intestine has a well developed plexus and ganglia were aligned along the longitudinal axis of the gut and had a highest density in ileum (Liu et al., 2007). In contrast, our study showed a fairly moderate neuronal density in buffalo ileum (Fig. 1) but strong AchE reaction was observed in pylorus, caecum and colon (Fig. 2). Jejunum and duodenum revealed a mild AchE reaction. Further the occurrence of the strong AchE activity in few endocrine cells of the intestine particularly in duodenum lays the idea that some of the endocrine cells as well as the nerve fibres of the intestine might largely depend on the AchE to exert their physiological activity during digestion and so AchE may be an important biomolecule of the gut neuroendocrine axis.

**REFERENCE**


