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STUDIES ON THE AUTONOMIC INNERVATION IN THE INTESTINE OF *HYLA ARBOREA*

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The distribution, structure and function of nerve fibres, nerve plexuses, nerve cells, nerve endings, ganglions and blood vessels in different layers *viz.* mucosa, submucosa, muscularis and serosa of intestine of *H. arborea* has been discussed and compared with other amphibians.

Important contribution in the field of neurobiology of the alimentary canal of amphibians are made by Burnstock *et al.* (1964); Chin *et al.* (1971 & 1973); Fugiwara *et al.* (1972); Helan *et al.* (1965) and Hukuhara *et al.* (1972). However, nothing is known about the intrinsic innervation in the alimentary tissues of *Hyla arborea* and thus, the present investigation has been undertaken.

The intestine was removed from the decapitated specimen and fixed in neutral 8% formaline. Bielchowsky method (Davenport, 1934) was used for neurological impregnation in tissue. The localization was further made in mucosa, submucosa, muscularis, serosa and in other vital parts of microtomy serials cut at 5 μ thickness.

Intestine of *H. arborea* is profusely innervated by splanchnic sympathetic and vagus parasympathetic nerves. Thick bundles of medulated nerve fibres are observed outside the serosa layer penetrating in longitudinal and transverse directions into muscularis layer. In the upper layer of muscularis, the thick myenteric plexuses of nerves are present which gives out fine lateral nerves penetrating the longitudinal and circular muscles without changing their diamension. Few prominent scattered nerve cell having indistinct nuclei are present in this layer. These nerve fibres further run longitudinally into submucosa where they devide and redevide to form the submucous plexuses called Meissener plexuses. Some fine nerve fibres are also observed lying near the blood vessels, nerve cells and lymph spaces. Few scattered ganglions are present in this layer which are thick and lie near the nerve cells. The submucosa is higly vascular having number of blood vessels, lymph spaces and nerve cells but scanty in nerve fibres with distinct nuclei and nerve endings. Nerve fibres do not form the nerve plexuses in submucosa. Some nerve fibres run longitudinally and penetrates the lamina propria layer of mucosa where nerve fibres devide and redevide repeatedly to form the dense nerve plexuses extending into the columnar epithelial cells of mucosa. Nerve cells and ganglions could not be distinctly observed in columnar epithelial cells of mucosa but their nerve ending were deeply stained.

The author supports the findings of Burnstock *et al.* (1964) who have reported an autonomic innervation in the intestine of *Bufo marinus*, controlled by cholinergic and adrenergic nerves expressing an inhibitory autonomic control of alimentary canal in lower vertebrates first appear in the hind gut region. The present investigation also confirms the view of Chin *et al.* (1971 & 1973) who stated the presence of Auerbach's

plexuses, Myenteric plexuses, ganglions, nerve cells and varying nerve endings in different layers of intestine of *Bufo melanosticus*; but submucosa reported highly vascular wanting of nerve cells while nerve plexuses and nerve endings are observed in the columnar epithelial cells of lamina propria layer of mucosa. The author also agrees with the statement of earlier researchers *Hukuhara et al.* (1972) who reported an autonomic innervation in stomach and intestine of *Rana catesbeinna* via splanchnic sympathetic and vagal parasympathetic nervous pathways having multiple neurons and perifascular, intramuscular and free nerve endings. Fugiwara *et al.* (1972) described the movements and innervation of large intestine of bull frog, *Rana catesbeinna* concluding that intramuscular ganglion cells have no function to regulate the strength and direction of propagation of the contraction wave. Present investigation supports the findings of Helan *et al.* (1965) who reported the afferent innervation in alimentary tissues of *Rana catesbeinna* expressing that the afferent fibres of the alimentary tissues are incorporated in a number of sympathetic and parasympathetic nerve trunks, as well as in the neuroplexi of blood vessels and lymph spaces having multiple affarent innervation. The vagus and coeliac nerves serve the entire gastrointestinal tract and form both direct and circuit affarent pathways. It clearly appears from the findings of earlier investigators supported by present author that the profused innervation of the alimentary tissues, presence of nerve cells, ganglion cells and innervation of the blood vessels indicates an autonomic nervous control on the activity of physiological process of the alimentary canal. These nervous elements are stimulated either directly or indirectly by the presence of food in the alimentary canal and the impulses are transmitted by the motor neurons with which they form physiological contect. Nerve plexuses among the columnar epithetial cells of the lamina propria of mucosa control and regulate the peristaltic movement of intestine by transmitting the impulses causing contraction and relaxation of the muscles of the adjoining layers of muscularis.

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REFERENCES

BURNSTOCK, G., BODY, H. & ROGERS, D. 1964. Innervation of the large intestine of toad, *Bufo marinus. Proc. J. Pharmoc. 23* : 153-163.

CHIN, K.N., SIT, K.H. & WONG, W.C. 1971. The submucous plexuses in the intestine of the toad, *Bufo melanosticus. Acta. Anat. 79* (1) : 60-69.

1973. Yellow flourescent cells in intestinal submucosa of the toad, *Bufo melanosticus. Acta. Anat. 79* (4) : 492-503.

FUGIWARA, Y., TAKESHI, H. & TOMIO, N. 1972. The movement and innervation of the large intestine of the bull frog, *Rana catesbeinna. Jap. J. Smooth. Muscle Res. 8* (2) : 75-84.

HELAN, B., BURNSTOCK, G. & ROGERS, D. 1965. Innervation of the large intestine of food, *Bufo marinus. Brit. J. Pharmac. Therap 23* (1) : 151-163.

HUKUHARA, T., NATHE, T. & FUGIWARA, Y. 1972. The movement and innervation of the large intestine of the bull frog, *Rana catesbeinna. Jap. J. Smooth Muscle Res. 8* (2) : 85-98.