Volume 46(1-2):49, 2002
Acta Biologica Szegediensis
http://www.sci.u-szeged.hu/ABS

DISSERTATION SUMMARY

Embryonic development of the human enteric nervous system and the enteric microenvironment

Mária Bagyánszki

Department of Zoology and Cell Biology, University of Szeged, Szeged, Hungary

The enteric nervous system (ENS) is large, complex and independent of the central nervous system. Its neural-crest-derived precursors migrate along defined pathways to colonize the bowel. It has been established that signalling molecules produced by the developing neurons and the mesenchyma of the gut wall play a critical role in the development of the mammalian ENS (Furness and Costa 1987).

Since the morphological and neurochemical properties of the enteric plexuses are various in different species, the investigation of human fetal material is necessary in order to establish the basic rules of the development of the human ENS. All experiments with human fetal material were performed in accordance with the declaration of the Medical World Federation proclamed in Helsinki in 1964.

Morphometric analysis of the tissue layers of human gut wall

The ENS develops in close correspondence with the enteric microenvironment (Fekete et al. 2000). Throughout present investigation, the qualitative and quantitative changes in the tissue layers around the intestinal lumen were investigated in the different segments of the developing human fetal gut at weeks 12 and 18 of gestation using light and electron microscopic techniques. Two main questions were raised during studying the fetal development: is there any correlation between the development of the tissue layers forming the gut wall? Is there any regional difference between the development of tissue layers in the gut wall under the observed period?

Thin and ultrathin sections were prepared from different parts of the human fetal gut. The thin sections were analysed with Image-Pro Plus 3.0 software. Analysis of the data was made by two-way ANOVA and Pearson's-correlation.

The development of the different layers showed various tendencies. The thickness of the epithelia did not change significantly, but the ultrastructural features exhibited remarkable changes. Pearson's correlation revealed correlative development between the change in the thickness of the circular muscle layer and the thickness of the myenteric plexus, but not between the other tissue layers (Bagyánszki et al. 2002a).

Supervisor: Éva Fekete
E-mail: bmarcsi@bio.u-szeged.hu

Neurotransmitters and receptors of myenteric neurons in the developing human fetal ENS

The first aim of our work was to determine the individual distribution and colocalization of VIP, NPY, NOS, GABA and glutamate in the developing human small intestine. Since the presence of the glutamatergic neurons in the human ENS was not investigated before, our second aim was to find neurons expressing NMDA receptors and serving as a target of glutamatergic excitatory input.

Wholemounts were prepared from the human fetal gut. Single- and double-labelling immunofluorescence histochemistry were used with antibodies raised against NOS, VIP, NPY, GABA, glutamate and NMDA receptors. The species-specific secondary antibodies used for visualizing immunopositivity were conjugated to Cy3, TRITC or FITC.

NOS-immunopositive neurons were numerous whereas VIP-, NPY, GABA- and glutamate-immunoreactive cells were rarely seen. Double-labelling experiments revealed NOS, GABA and NOS, NPY coexistence, in addition, these experiments demonstrated VIP-immunopositive pericellular baskets around a given population of NOS- and NMDA-immunopositive myenteric neurons (Román et al. 2002; Bagyánszki et al. 2002b).

References

Bagyánszki M, Kovács ÉG, Resch BE, Román V, Fekete É (2002a) Computer-aided morphometric analysis of the developing concentric structure of the human fetal intestinal tube. Histol Histopathol (in press).

Bagyánszki M, Román V, Krecsmarik M, Resch BÁ, Fekete É (2002b) Individual distribution of nitric oxide synthase with vasoactive intestinal polipeptide Y in the developing human fetal small intestine Acta Biol Szeged (in press).

Fekete É, Bagyánszki M, Resch BÁ (2000) Prenatal development of the myenteric plexus in the human fetal small intestine. Acta Biol Szeged 44:3-19.

Furness JB, Costa M (1987) The enteric nervous system. Churchill Livingstone, London.

Román V, Bagyánszki M, Resch BÁ, Fekete É (2002) Individual distribution and colocalization of VIP, nitric oxide synthase, GABA, glutamate and NMDA receptors in the developing human enteric nervous system. Acta Biol Hung (in press).