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Microanatomical localization of dopamine receptor subtypes in the rat gastrointestinal vasculature

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The expression of dopamine (DA) D1-D5 receptor subtypes and their relationships with sympathetic neuroeffector plexus were investigated in mesenteric artery branches and different sized arteries of rat gastrointestinal tract by immunochemical and immunohistochemical techniques.

Male Sprague-Dawley rats were fasted for 24 h, anaesthetized and killed. Mesenteric artery and its main branches, stomach, duodenum, jejunum, ileum and colon were removed. Part of samples were put in a 30% sucrose solution, frozen and cut serially using a microtome cryostat. Sections were processed for tyrosine-hydroxylase (TH) and DA receptor protein immunohistochemistry. The remaining samples were homogenized and processed for Western blot analysis of the same parameters investigated immunohistochemically.

DA D1-like (D1-D5) receptors were located in smooth muscle of superior mesenteric artery, muscular and submucous coats and mucous arteries of stomach, duodenum, jejunum, ileum and colon. The D1 receptor was apparently more expressed than the D5 receptor. DA D2-like (D2, D3 and D4) receptor immunoreactivity was located in the adventitia and adventitia-media border of superior mesenteric artery branches, muscular and submucous coats and mucous arteries of stomach, duodenum, jejunum, ileum and colon. The intensity of D3 receptor immunostaining as well as of TH immunoreactivity was inversely proportional to the decrease of arterial diameter. An association between TH and DA D2-like receptor was found in double immune staining experiments.

The above findings indicate that rat superior mesenteric artery, gastric, small and large intestine arteries express the different subtypes of DA receptors. Both D1 and D5 receptors are postjunctional while the demonstration of the co-expression of the sympathetic marker TH and DA D2-like receptor protein immunoreactivity, indicates the prejunctional localization of these receptors. The particular microanatomical localization of DA receptors in rat gastrointestinal circulation suggests that their stimulation or inhibition may cause different hemodynamic consequences on gastrointestinal circulation.

Key words

Dopamine receptors, gastrointestinal vasculature, immunohistochemistry