

Peptidergic nerve fibers in human stomach and duodenal bulb: an immunohistochemical study

Para-benzoquinone-fixed frozen sections of human stomach and duodenal bulb were analyzed for the immunohistochemical localization of peptidergic nerve fibers. Nerve fibers immunoreactive to vasoactive intestinal polypeptide (VIP) and gastrin-releasing peptide (GRP) were richly distributed along capillaries in the fundic mucosa. In fundic mucosa with chronic atrophic gastritis, including intestinal metaplasia, GRP fibers were characteristically decreased while the distribution of VIP fibers showed little change. In the antral and duodenal mucosa, GRP fibers were normally sparse. VIP and neuropeptide Y (NPY) fibers were rich in the tunica muscularis mucosae, particularly in the fundic mucosa, where NPY fibers extended into the lower layer of the mucosa. Substance P (SP) fibers were rich in the duodenal bulb mucosa, scattered in the antral mucosa, but rare in the fundic mucosa. Methionine-enkephalin-Arg-Gly-Leu fibers were predominantly distributed in the proper muscle layer, and sparse in the mucosa and tunica muscularis mucosae. In addition, dense VIP fibers and fewer SP fibers were present in the proper muscle layer. Calcitonin gene-related peptide (CGRP) fibers were present only in the pyloric ring muscle. Such a selective distribution of neuropeptide-containing fibers suggests special roles of the neuropeptides in the respective sites in the stomach.

Ref. Tsutsumi Y, Hara M. Peptidergic nerve fibers in human stomach and duodenal bulb: immunohistochemical demonstration of changes in fiber distribution in chronic gastritis. *Biomed Res* 1989; 10(3): 209-216. doi: 10.2220/biomedres.10.209

Distribution of peptidergic nerve fibers in human gastric fundus

Peptides	Mucosa		Tunica muscularis mucosae	Submucosa	Proper muscle layer
	Normal	AG/IM			
VIP	++	++	++	+	++
GRP	+ / ++	(+)	(+)	(+)	(+)
SP	(+)	(+)	(+)	(+)	+
NPY	+	(+)	++	++	+
ME8	(+)	(+)	(+)	(+)	++
CGRP	-	-	-	-	-

AG/IM: atrophic gastritis/intestinal metaplasia

++: frequently seen, +: moderately seen, (+): sparsely seen, -: absent

VIP: vasoactive intestinal peptide, GRP: gastrin-releasing peptide,

SP: substance P, NPY: neuropeptide Y,

ME8: methionine enkephalin-Arg-Gly-Leu, CGRP: calcitonin gene-related peptide

Distribution of peptidergic nerve fibers in human gastric antrum

Peptides	Mucosa		Tunica muscularis mucosae	Submucosa	Proper muscle layer*
	Normal	AG/IM			
VIP	+	+	+ / ++	(+)	++
GRP	(+)	-	-	(+)	-
SP	+	+	+	(+)	+
NPY	(+)	(+)	+	+	+
ME8	(+)	(+)	(+)	-	++
CGRP	-	-	-	-	+

AG/IM: atrophic gastritis/intestinal metaplasia

++: frequently seen, +: moderately seen, (+): sparsely seen, -: absent

*: pyloric ring muscles examined

VIP: vasoactive intestinal peptide, GRP: gastrin-releasing peptide,

SP: substance P, NPY: neuropeptide Y,

ME8: methionine enkephalin-Arg-Gly-Leu, CGRP: calcitonin gene-related peptide

Distribution of peptidergic nerve fibers in human duodenal bulb

Peptides	Mucosa	Tunica muscularis mucosae	Submucosa	Proper muscle layer	Auerbach's nerve plexus
VIP	+	++	+	++	+
GRP	-	-	-	(+)	(+)
SP	++	(+)	+	+	++
NPY	(+)	+	+	(+)	+
ME8	-	(+)	(+)	+	++
CGRP	-	-	-	-	-

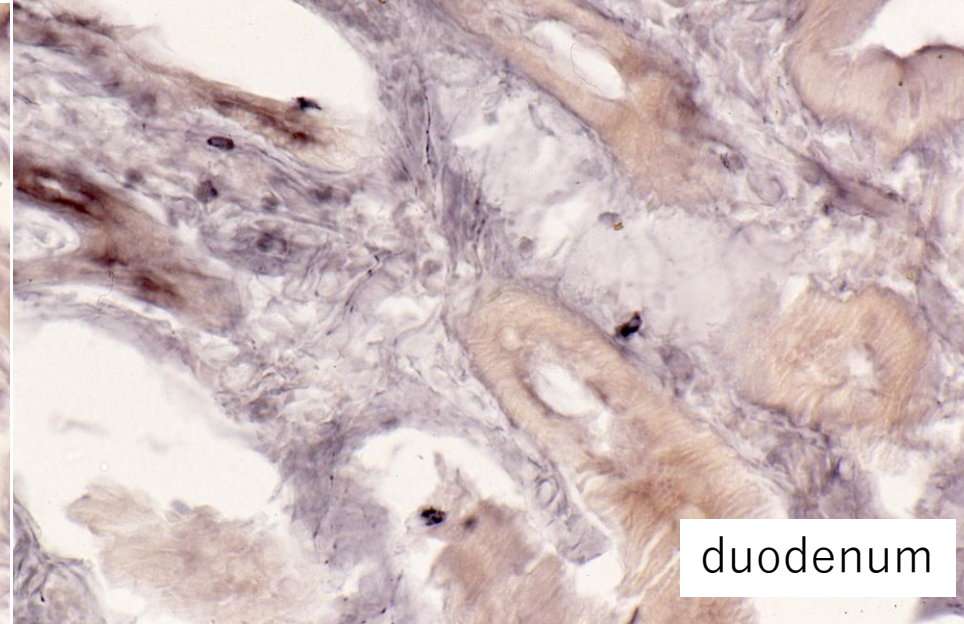
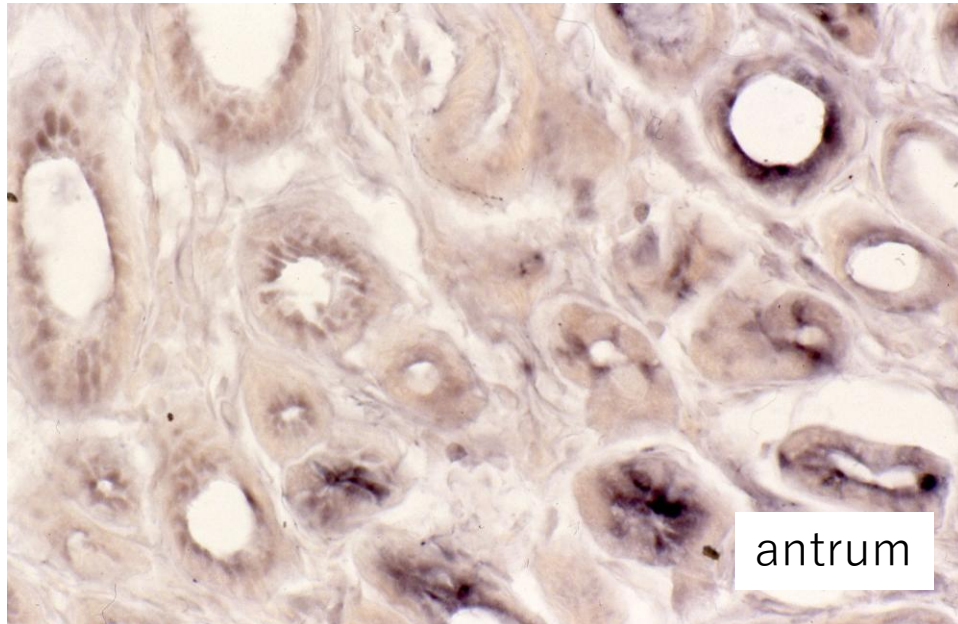
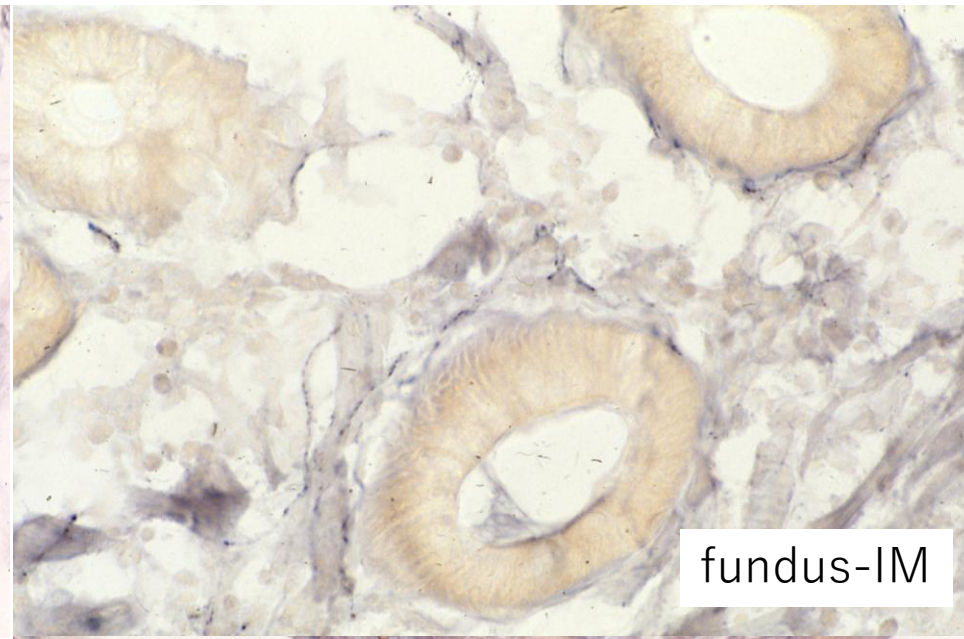
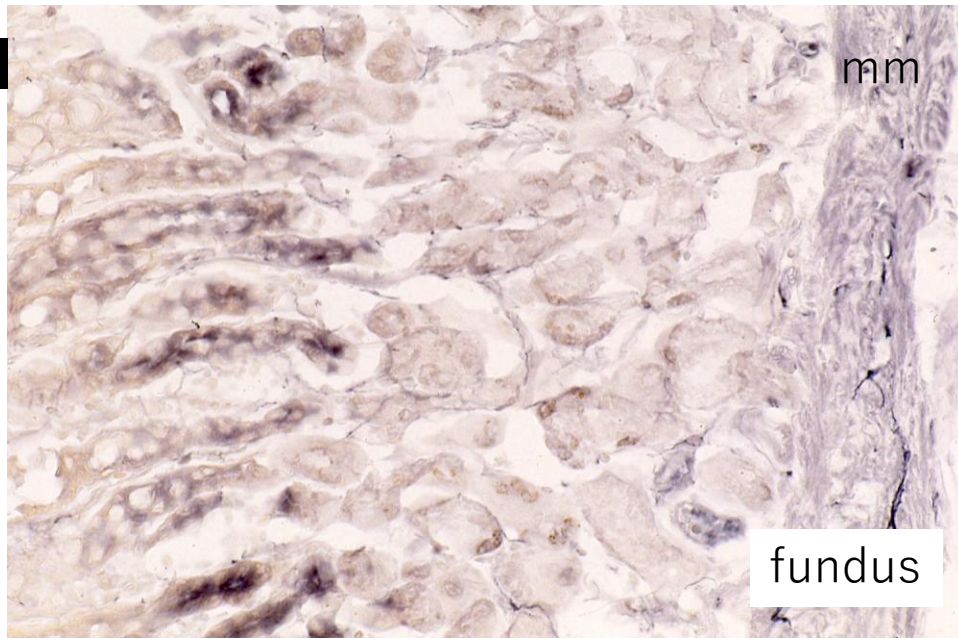
++: frequently seen, +: moderately seen, (+): sparsely seen, -: absent

VIP: vasoactive intestinal peptide, GRP: gastrin-releasing peptide,

SP: substance P, NPY: neuropeptide Y,

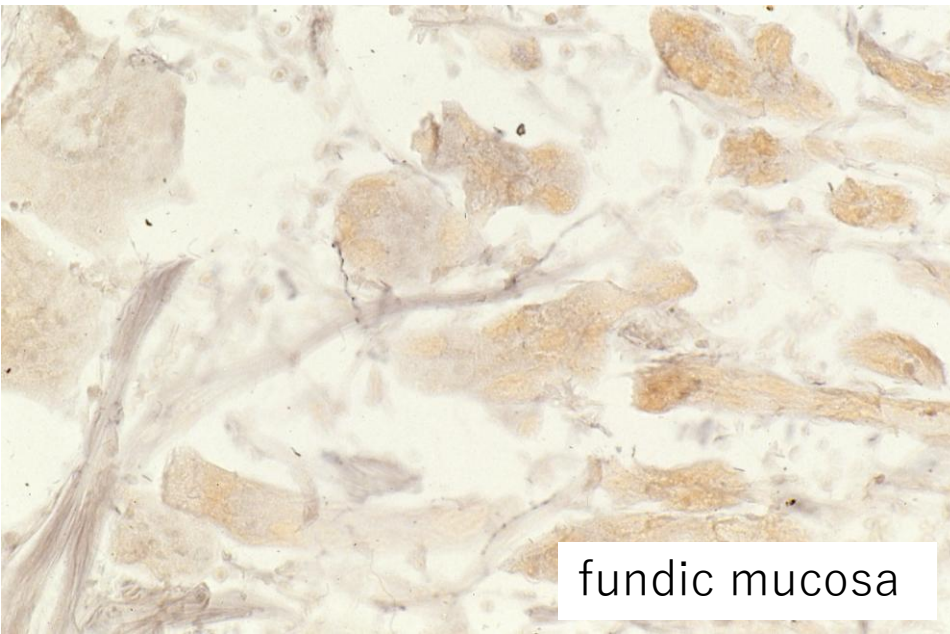
ME8: methionine enkephalin-Arg-Gly-Leu, CGRP: calcitonin gene-related peptide

Mucosal VIP fibers

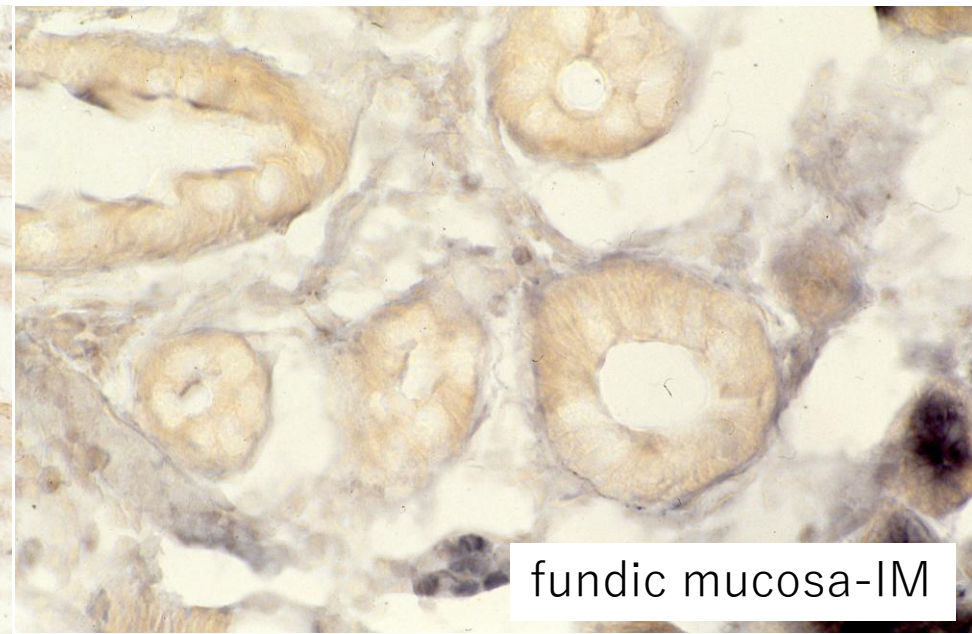


VIP fibers in the gastric and duodenal bulb mucosa. VIP fibers are visualized in black color. $\text{Co}^{2+}/\text{Ni}^{2+}$ diaminobenzidine was used as a chromogen.

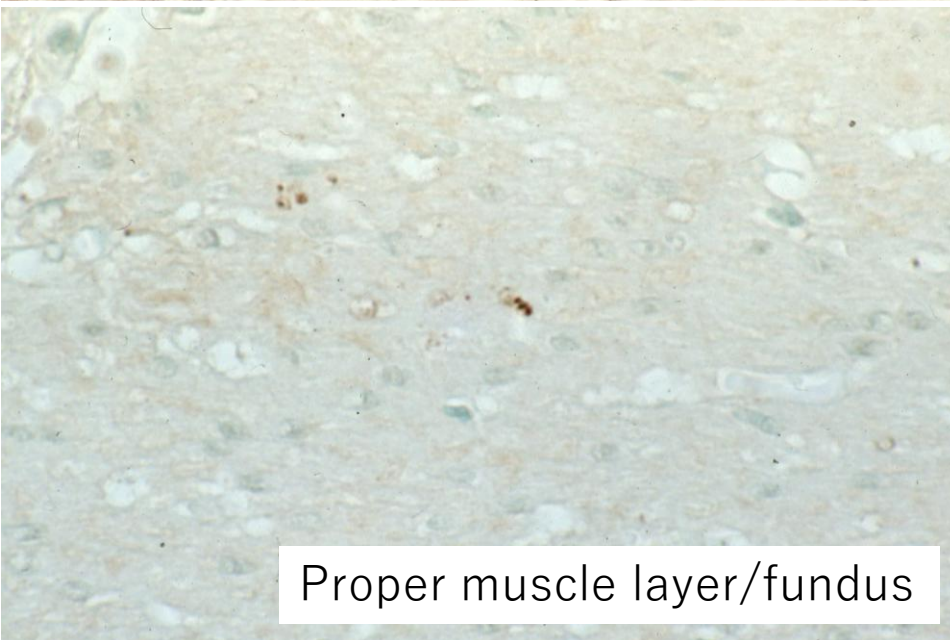
GRP fibers



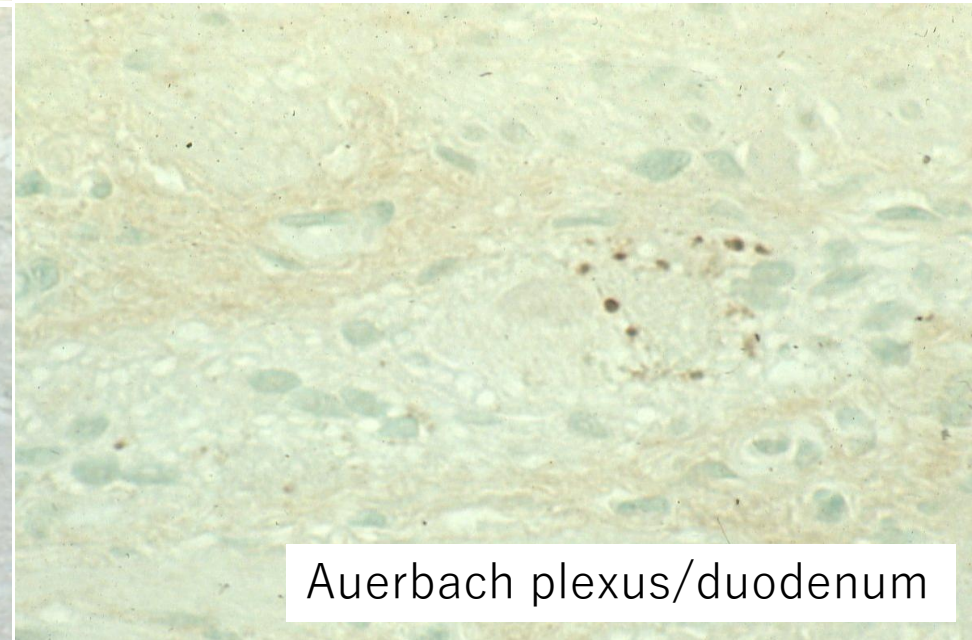
fundic mucosa



fundic mucosa-IM



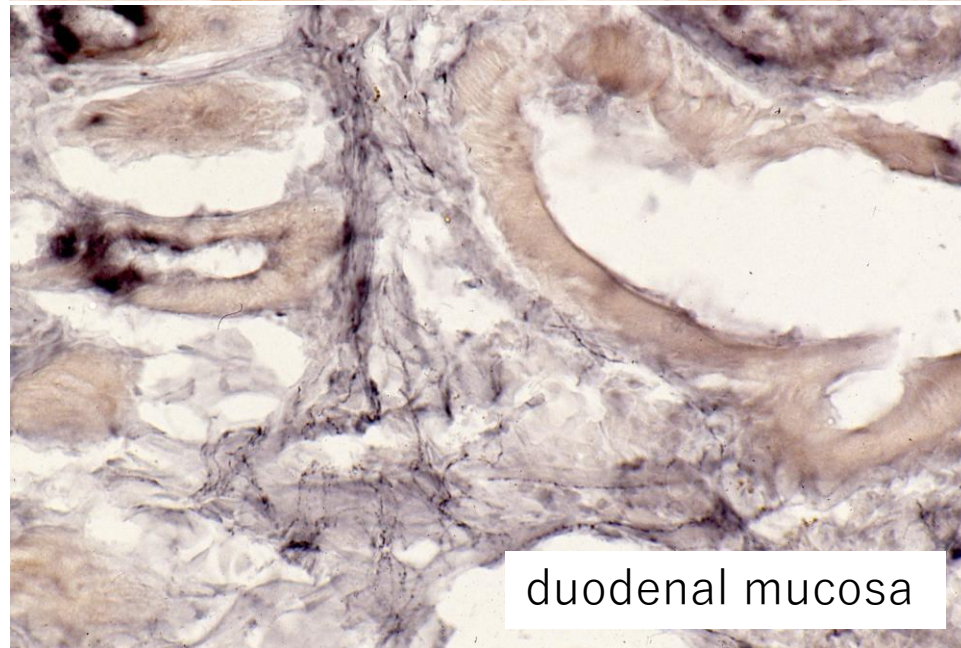
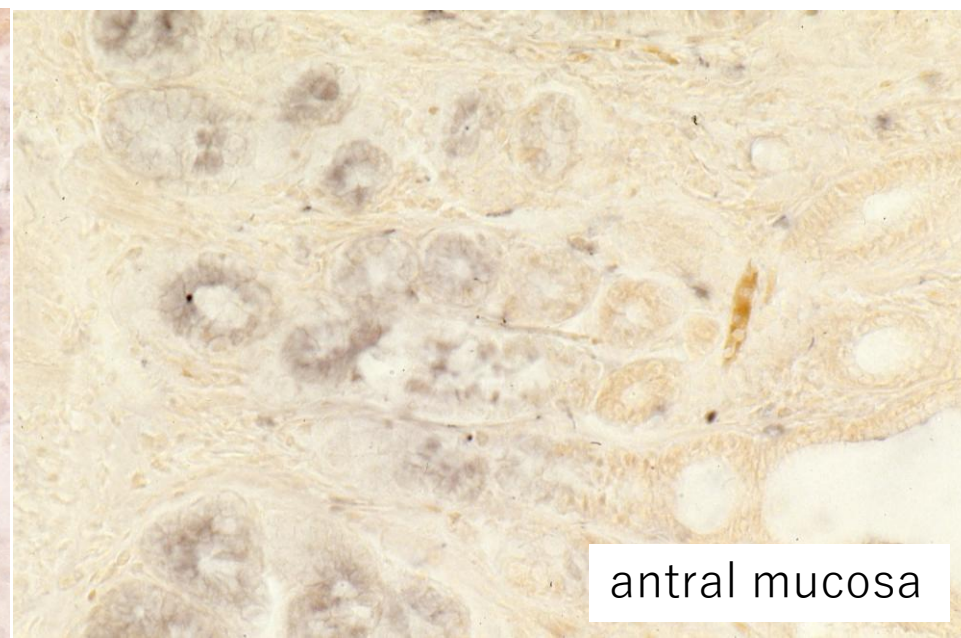
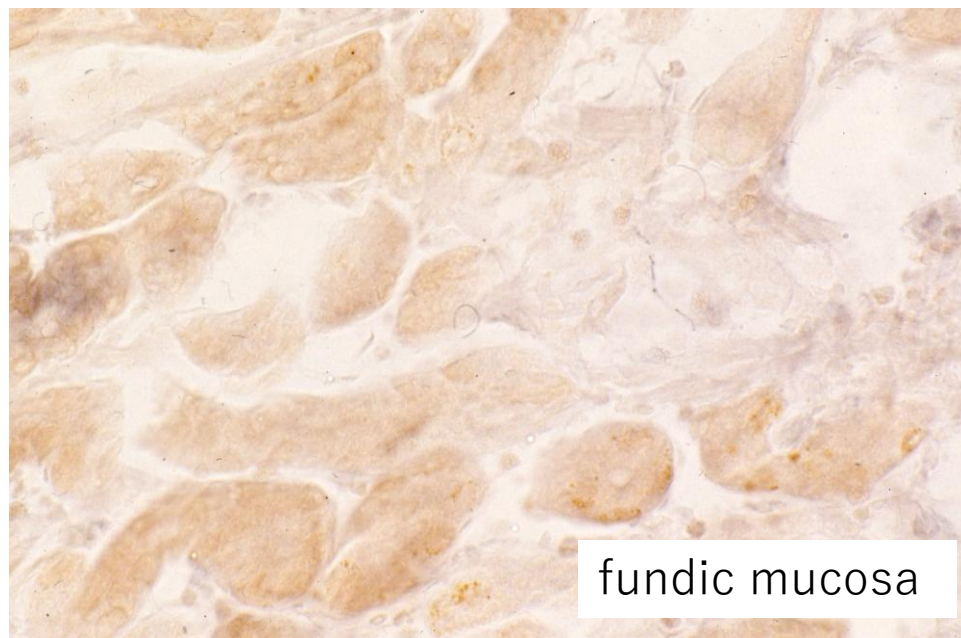
Proper muscle layer/fundus



Auerbach plexus/duodenum

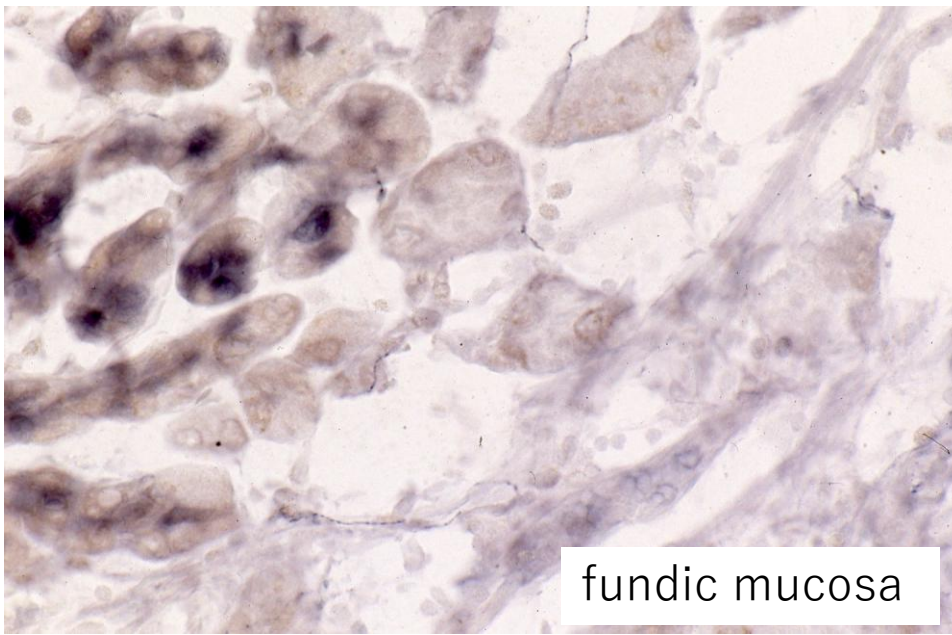
GRP fibers are relatively rich in the fundic gastric mucosa, but markedly decreased in intestinal metaplasia (IM). A few GRP fibers are seen in the proper muscle layer of the fundus and in duodenal Auerbach's nerve plexus.

SP fibers

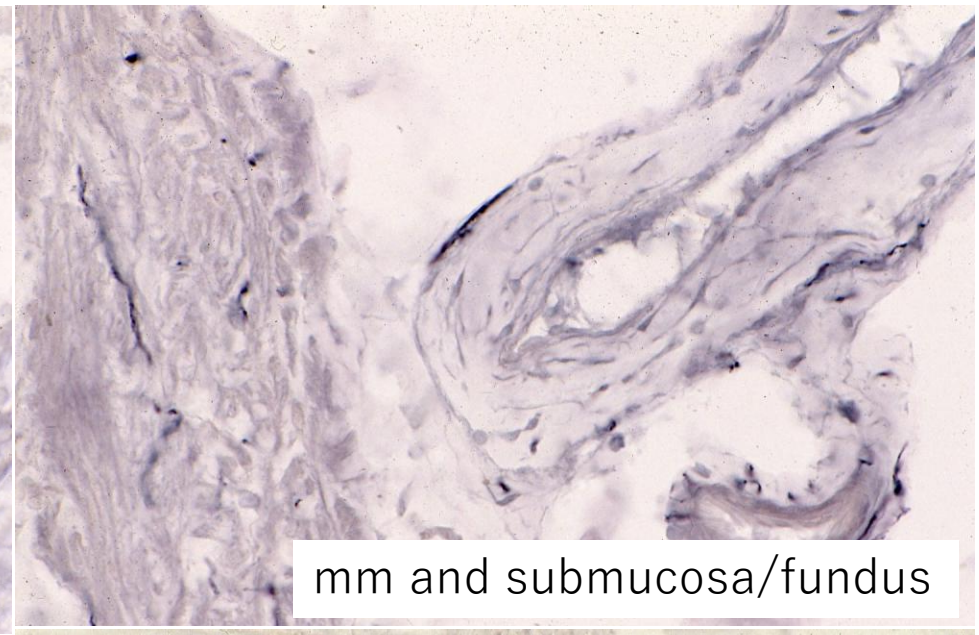


SP fibers are relatively rich in the duodenal wall, while SP fibers are sparse in the gastric mucosa. SP fibers are clustered in the duodenal Auerbach's nerve plexus.

NPY fibers

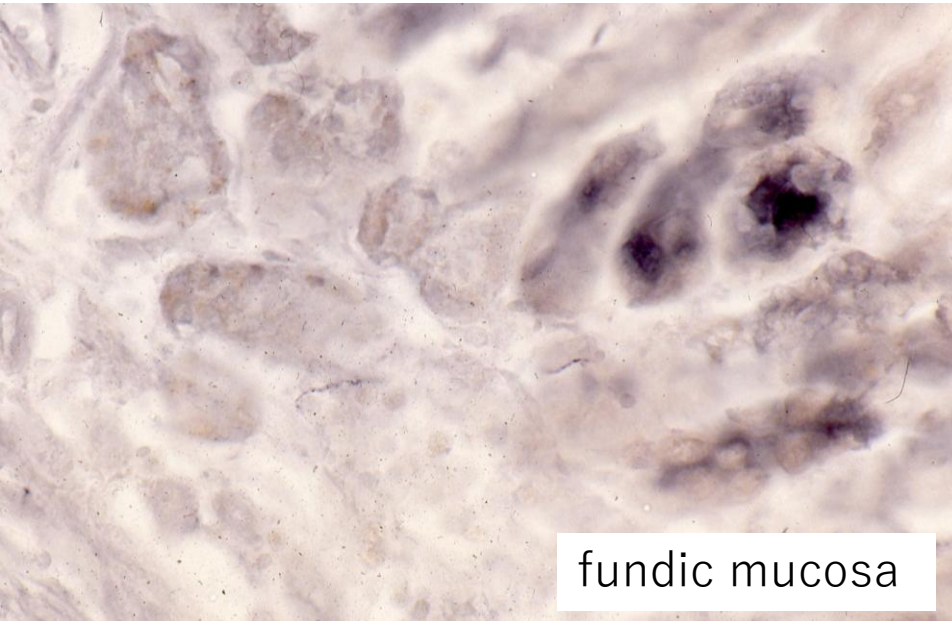


fundic mucosa

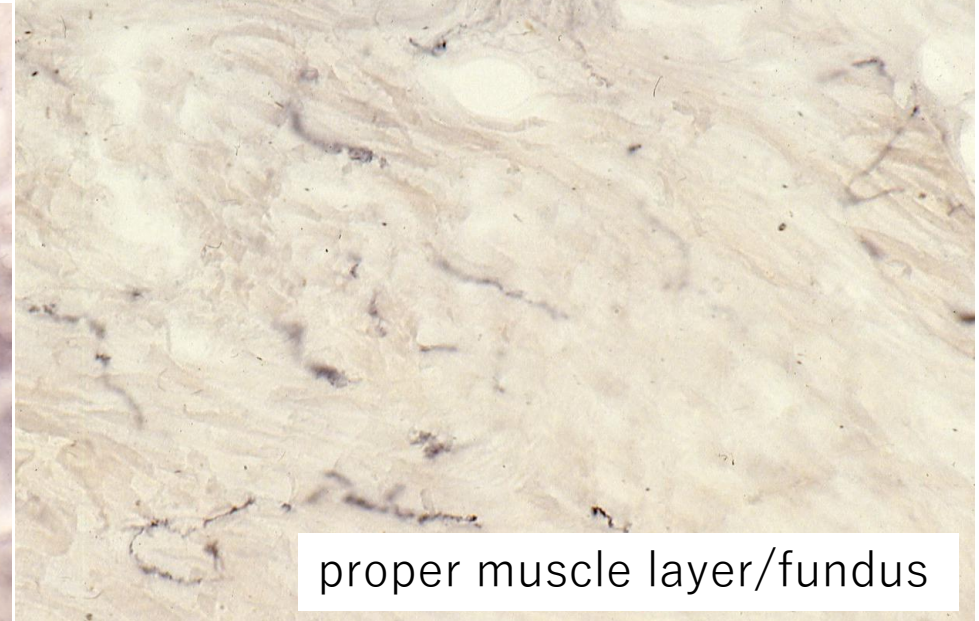


mm and submucosa/fundus

ME8 fibers



fundic mucosa



proper muscle layer/fundus

NPY fibers are relatively rich in the fundus, and they distribute in the arteriolar walls. ME8 fibers are sparse in the mucosa, while they are richly seen in the proper muscle layer.