

Pepsin

Pepsin

Pepsin je obecné označení pro řadu **proteináz** (pepsin A,B,C – EC 3.4.23.1,2,3), pepsinogeny jsou jejich **prekurzory** (proenzymy). Aktivace **pepsinogenu A** na **pepsin A** probíhá v kyselém prostředí, vznikající **pepsin A** je schopen další aktivace pepsinogenu a vede k tzv. autokatalýze. Elektroforeticky lze separovat v agarovém gelu 8 **proteáz** žaludeční sliznice, pepsinogeny PG1-PG5 tvoří skupinu imunologicky identických proteinů – pepsinogen I (PG-I, PGA), pepsinogeny PG6 a PG7 tvoří skupinu pepsinogenu II (PG-II, PGC), posledním proteinem je katepsin E (SMP, *slow moving proteinase*). Molekulová hmotnost pepsinogenu I je 42 500.

Pepsin se řadí mezi **endopeptidázy**, hydrolyzuje tedy peptidové vazby uvnitř molekuly, čímž ji štěpí na menší fragmenty. V žaludeční šťávě hydrolyzuje vazby v blízkosti aminokyselin, které mají velké postranní řetězce (AMK s aromatickými zbytky, rozvětvenými řetězci a methionin).^[1]

Klinický význam

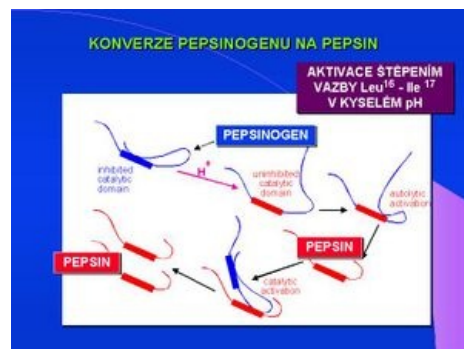
Klinický význam má stanovení pepsinu při insulinovém testu a sérová hladina pepsinogenů A a C. Ke stanovení se používá RIA metodika s ¹²⁵I-pepsinogenem v kompetitivním uspořádání. Pepsinogen A je markerem slizniční atrofie a je používán v genetických studiích jako subklinický marker vředové choroby duodena. **Pepsinogen C** je používán jako marker stavu žaludeční sliznice (případně v poměru PG-A/PG-C) a rovněž jako marker eradikace infekce *Helicobacter pylori*. Snížení hladiny pepsinogenu A prokazujeme u nemocných s achlorhydrií, např. u perniciózní anémie. Nejnovější studie prokazují významné snížení pepsinogenu-I a současně zvýšení hladiny IgA protilátek k *Helicobacter pylori* u karcinomu žaludku.

Stanovení poměru hladin obou pepsinogenů (PG-I:PG-II) je dnes považováno za nejvýhodnější variantu serologických markerů. Poměr PG-I:PG-II signifikantně klesá v závislosti na histologickém riziku, nebo přítomnosti vacA+ pozitivitu *Helicobacter pylori* infekce. Kombinace stanovení hladiny pepsinogenu-I, gastrinu-17 a protilátek k *Helicobacter pylori* je testováno jako tzv. serologická biopsie, GastroPanel, v diferenciální diagnostice gastritid. Screeningové testování rizika atrofické gastritidy, resp. rizika karcinomu žaludku, ve spojení s pozitivitou *Helicobacter pylori*, je další oblastí screeningu nádorů gastrointestinálního traktu.

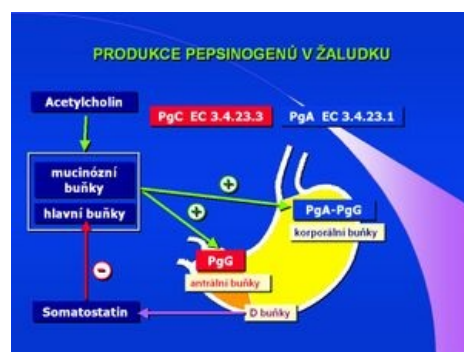
Odkazy

Použitá literatura

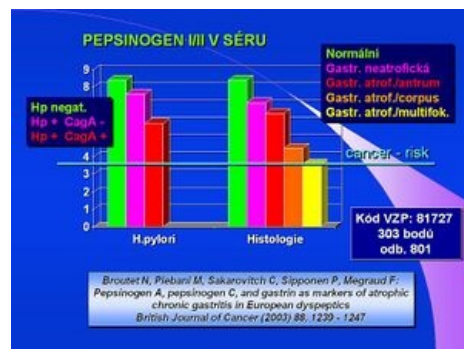
- DI MARIO, F, et al. Non-invasive tests in gastric diseases. *Dig Liver Dis.* 2008, vol. 40, no. 7, s. 523-30, ISSN 1590-8658 (Print), 1878-3562 (Electronic). PMID: 18439884 (<https://www.ncbi.nlm.nih.gov/pubmed/18439884>).
- CHUNG, HW, et al. Comparison of the validity of three biomarkers for gastric cancer screening: carcinoembryonic antigen, pepsinogens, and high sensitive C-reactive protein. *J Clin Gastroenterol.* 2009, vol. 41, no. 3, s. 19-26, ISSN 0192-0790 (Print), 1539-2031 (Electronic). PMID: 18648315 (<https://www.ncbi.nlm.nih.gov/pubmed/18648315>).
- YANAOKA, K, et al. Risk of gastric cancer in asymptomatic, middle-aged Japanese subjects based on serum pepsinogen and *Helicobacter pylori* antibody levels. *Int J Cancer.* 2008, vol. 123, no. 4, s. 917-26, ISSN 0020-7136 (Print), 1097-0215 (Electronic). PMID: 18508314 (<https://www.ncbi.nlm.nih.gov/pubmed/18508314>).
- XIE, XF, et al. Serum pepsinogen levels in the Japanese population: prospective study of 9 years of follow-up. *Hepatogastroenterology.* 2007, vol. 54, no. 78, s. 1887-90, ISSN 0172-6390 (Print). PMID: 18019741 (<http://www.ncbi.nlm.nih.gov/pubmed/18019741>).
- MIKI, K, et al. Using serum pepsinogens wisely in a clinical practice. *J Dig Dis.* 2007, vol. 8, no. 1, s. 8-14, ISSN 1751-2972 (Print), 1751-2980 (Electronic). PMID: 17261129



Konverze pepsinogenu na pepsin



Produkce pepsinogenů v žaludku



Pepsinogen I/II v séru

(<https://www.ncbi.nlm.nih.gov/pubmed/17261129>).

- CAO, Q, et al. Screening of atrophic gastritis and gastric cancer by serum pepsinogen, gastrin-17 and Helicobacter pylori immunoglobulin G antibodies. *J Dig Dis*. 2007, vol. 8, no. 1, s. 15-22, ISSN 1751-2972 (Print), 1751-2980 (Electronic). PMID: 17261130 (<https://www.ncbi.nlm.nih.gov/pubmed/17261130>).
- LOPES, AI, et al. Relationship among serum pepsinogens, serum gastrin, gastric mucosal histology and H. pylori virulence factors in a paediatric population. *Scand J Gastroenterol*. 2006, vol. 41, no. 5, s. 524-31, ISSN 0036-5521 (Print), 1502-7708 (Electronic). PMID: 16638693 (<https://www.ncbi.nlm.nih.gov/pubmed/16638693>).
- STEMMERMANN, GN, et al. The relation of pepsinogen group II (PGII) expression to intestinal metaplasia and gastric cancer. *Histopathology*. 2006, vol. 49, no. 1, s. 45-51, ISSN 0309-0167 (Print), 1365-2559 (Electronic). PMID: 16842245 (<https://www.ncbi.nlm.nih.gov/pubmed/16842245>).
- DERAKHSHAN, MH, et al. Gastric histology, serological markers and age as predictors of gastric acid secretion in patients infected with Helicobacter pylori. *J Clin Pathol*. 2006, vol. 59, no. 12, s. 1293-9, ISSN 0021-9746 (Print), 1472-4146 (Electronic). PMID: 16644877 (<https://www.ncbi.nlm.nih.gov/pubmed/16644877>).
- NARDONE, G, et al. Diagnostic accuracy of the serum profile of gastric mucosa in relation to histological and morphometric diagnosis of atrophy. *Aliment Pharmacol Ther*. 2005, vol. 22, no. 11-12, s. 1139-46, ISSN 0269-2813 (Print), 1365-2036 (Electronic). PMID: 16305728 (<https://www.ncbi.nlm.nih.gov/pubmed/16305728>).
- HOKKANEN, S, et al. Normal serum pepsinogen I levels in adults: a population-based study with special reference to Helicobacter pylori infection and parietal cell antibodies. *Scand J Clin Lab Invest*. 2005, vol. 65, no. 4, s. 291-9, ISSN 0036-5513 (Print), 1502-7686 (Electronic). PMID: 16076684 (<https://www.ncbi.nlm.nih.gov/pubmed/16076684>).
- GERMANÁ, B, et al. Clinical usefulness of serum pepsinogens I and II, gastrin-17 and anti-Helicobacter pylori antibodies in the management of dyspeptic patients in primary care. *Dig Liver Dis*. 2005, vol. 37, no. 7, s. 501-8, ISSN 1590-8658 (Print), 1878-3562 (Electronic). PMID: 15975537 (<https://www.ncbi.nlm.nih.gov/pubmed/15975537>).
- OHKUSA, T, et al. Improvement in serum pepsinogens and gastrin in long-term monitoring after eradication of Helicobacter pylori: comparison with H. pylori-negative patients. *Aliment Pharmacol Ther*. 2004, vol. 20, Suppl 1, s. 25-32, ISSN 0269-2813 (Print), 1365-2036 (Electronic). PMID: 15298602 (<https://www.ncbi.nlm.nih.gov/pubmed/15298602>).
- URITA, Y, et al. Serum pepsinogens as a predictor of the topography of intestinal metaplasia in patients with atrophic gastritis. *Dig Dis Sci*. 2004, vol. 49, no. 5, s. 795-801, ISSN 0163-2116 (Print), 1573-2568 (Electronic). PMID: 15259501 (<https://www.ncbi.nlm.nih.gov/pubmed/15259501>).
- OHATA, H, et al. Progression of chronic atrophic gastritis associated with Helicobacter pylori infection increases risk of gastric cancer. *Int J Cancer*. 2004, vol. 109, no. 1, s. 138-43, ISSN 0020-7136 (Print), 1097-0215 (Electronic). PMID: 14735480 (<https://www.ncbi.nlm.nih.gov/pubmed/14735480>).
- KONTUREK, SJ, et al. Serum progastrin and its products, gastric acid secretion and serum pepsinogen I in gastric cancer. *Digestion*. 2003, vol. 68, no. 4, s. 169-77, ISSN 0012-2823 (Print), 1421-9867 (Electronic). PMID: 14671424 (<https://www.ncbi.nlm.nih.gov/pubmed/14671424>).
- VÄÄNÄNEN, H, et al. Non-endoscopic diagnosis of atrophic gastritis with a blood test. Correlation between gastric histology and serum levels of gastrin-17 and pepsinogen I: a multicentre study. *Eur J Gastroenterol Hepatol*. 2003, vol. 15, no. 8, s. 885-91, ISSN 0954-691X (Print), 1473-5687 (Electronic). PMID: 12867799 (<https://www.ncbi.nlm.nih.gov/pubmed/12867799>).
- MIKI, K, et al. Usefulness of gastric cancer screening using the serum pepsinogen test method. *Am J Gastroenterol*. 2003, vol. 98, no. 4, s. 735-9, ISSN 0002-9270 (Print), 1572-0241 (Electronic). PMID: 12738449 (<https://www.ncbi.nlm.nih.gov/pubmed/12738449>).
- SANDULEANU, S, et al. Ratio between serum IL-8 and pepsinogen A/C: a marker for atrophic body gastritis. *Eur J Clin Invest*. 2003, vol. 33, no. 2, s. 147-54, ISSN 0014-2972 (Print), 1365-2362 (Electronic). PMID: 12588289 (<https://www.ncbi.nlm.nih.gov/pubmed/12588289>).
- BROUTET, N, et al. Pepsinogen A, pepsinogen C, and gastrin as markers of atrophic chronic gastritis in European dyspeptics. *Br J Cancer*. 2003, vol. 88, no. 8, s. 1239-47, ISSN 0007-0920 (Print), 1532-1827 (Electronic). PMID: 12698190 (<https://www.ncbi.nlm.nih.gov/pubmed/12698190>).
- SIPPONEN, P, et al. Serum levels of amidated gastrin-17 and pepsinogen I in atrophic gastritis: an observational case-control study. *Scand J Gastroenterol*. 2002, vol. 37, no. 7, s. 785-91, ISSN 0036-5521 (Print), 1502-7708 (Electronic). PMID: 12190091 (<https://www.ncbi.nlm.nih.gov/pubmed/12190091>).
- MÅRDH, E, et al. Diagnosis of gastritis by means of a combination of serological analyses. *Clin Chim Acta*. 2002, vol. 320, no. 1-2, s. 17-27, ISSN 0009-8981 (Print), 1873-3492 (Electronic). PMID: 11983196 (<https://www.ncbi.nlm.nih.gov/pubmed/11983196>).
- LORENTE, S, et al. Helicobacter pylori stimulates pepsinogen secretion from isolated human peptic cells. *Gut*. 2002, vol. 50, no. 1, s. 13-8, ISSN 0017-5749 (Print), 1468-3288 (Electronic). PMID: 11772960 (<https://www.ncbi.nlm.nih.gov/pubmed/11772960>).

cbi.nlm.nih.gov/pubmed/11772960).

- TABATA, H, et al. Difference in degree of mucosal atrophy between elevated and depressed types of gastric epithelial tumors. *Scand J Gastroenterol*. 2001, vol. 36, no. 11, s. 1134-40, ISSN 0036-5521 (Print), 1502-7708 (Electronic). PMID: 11686211 (<https://www.ncbi.nlm.nih.gov/pubmed/11686211>).
- BODGER, K, et al. Variation in serum pepsinogens with severity and topography of Helicobacter pylori-associated chronic gastritis in dyspeptic patients referred for endoscopy. *Helicobacter*. 2001, vol. 6, no. 3, s. 216-24, ISSN 1083-4389 (Print), 1523-5378 (Electronic). PMID: 11683924 (<https://www.ncbi.nlm.nih.gov/pubmed/11683924>).
- BERMEJO, F, et al. Basal concentrations of gastrin and pepsinogen I and II in gastric ulcer: influence of Helicobacter pylori infection and usefulness in the control of the eradication.. *Gastroenterol Hepatol*. 2001, vol. 24, no. 2, s. 56-62, ISSN 0210-5705. PMID: 11247290 (<https://www.ncbi.nlm.nih.gov/pubmed/11247290>).

Zdroj

- Se svolením autora převzato z KOCNA, Petr. *GastroLab : MiniEncyklopedie laboratorních metod v gastroenterologii* [online]. ©2002. Poslední revize 2011-01-08, [cit. 2011-03-04]. <<http://www1.lf1.cuni.cz/~kocna/glab/glency1.htm>>.
1. *Harper's illustrated biochemistry*. Thirtieth edition. New York: McGraw Hill-Education, [2015], s. 539. Lange medical book. ISBN 978-1-25-925286-0.