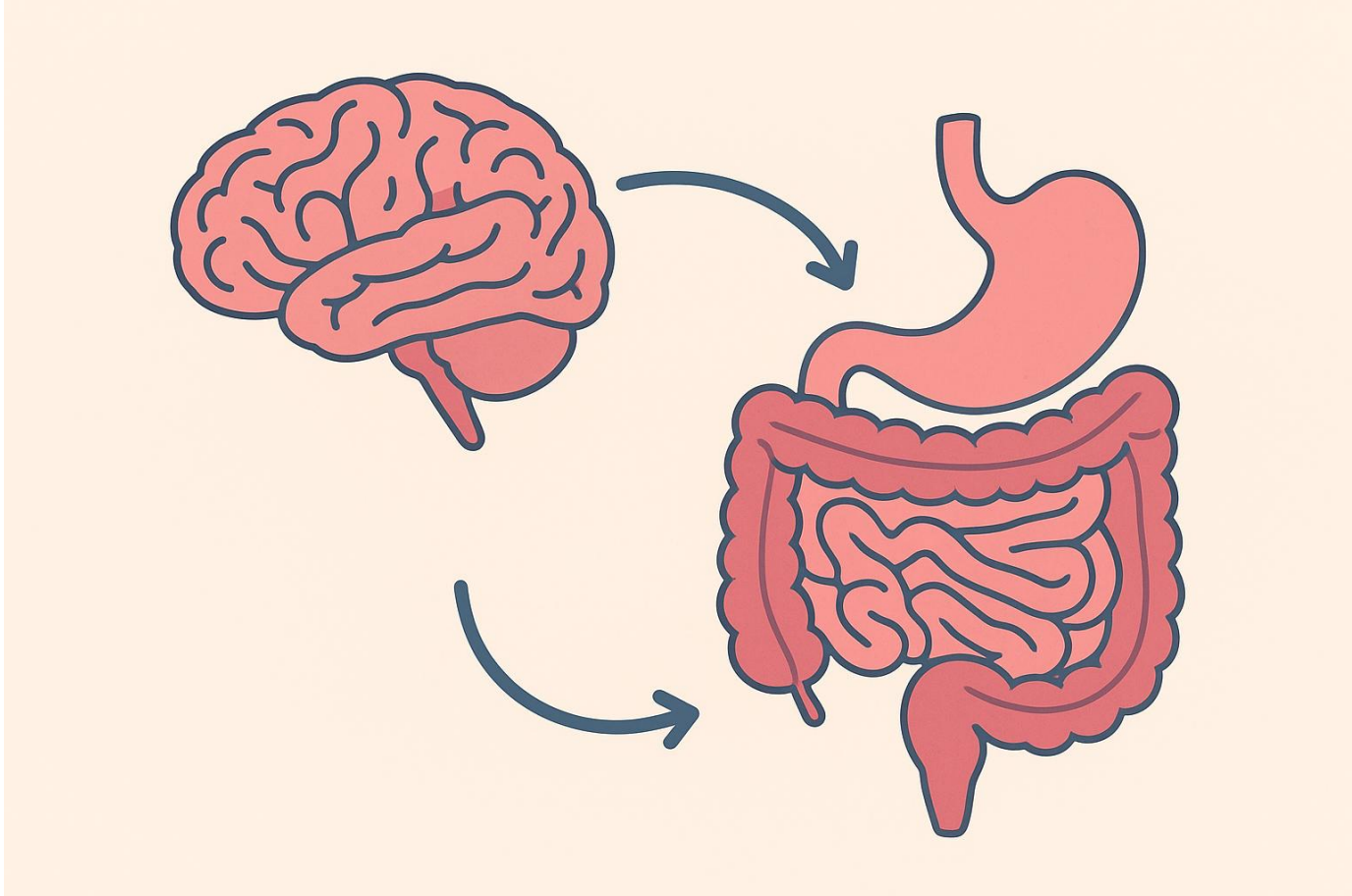


Povezanost crijeva i mozga

Utjecaj mikrobiote na zdravlje živčanog sustava

Frane Herenda, mag.pharm.



Pacijenti u praksi

PACIJENTI OPISUJU

- Kronični stres
- Anksioznost
- Nedostatak energije
- Loš san
- Visok TSH
- Pretilost

PROBAVNE TEGOBE

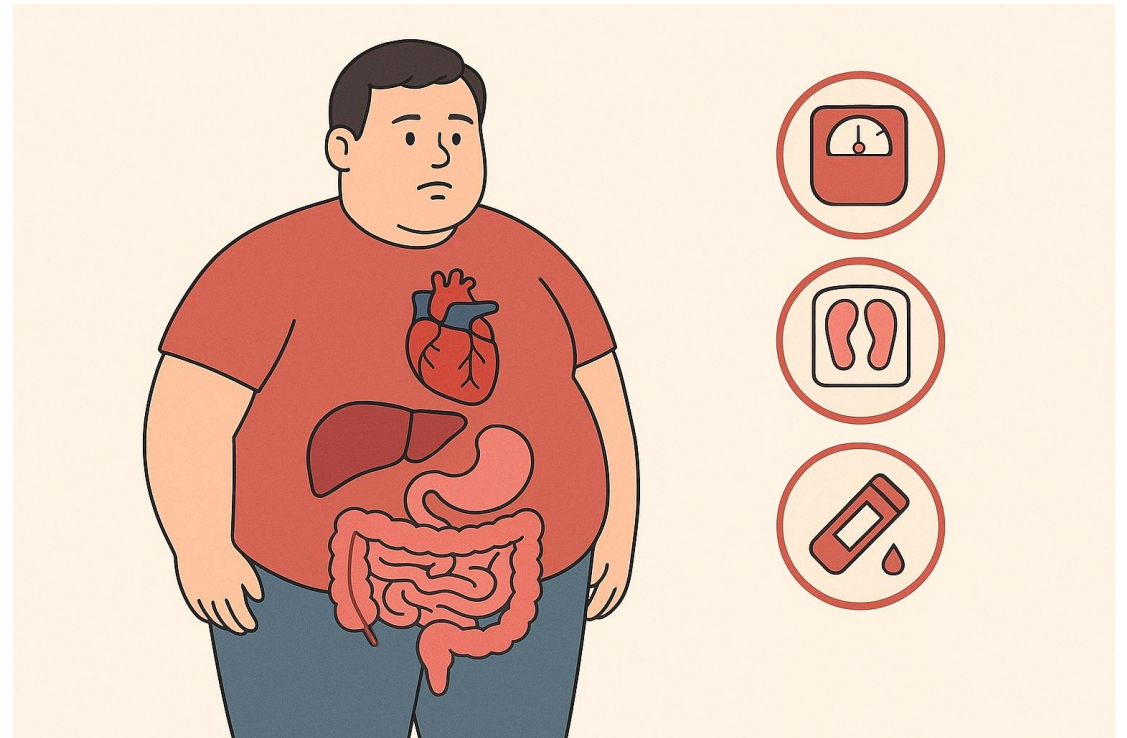
- Nadutost
- Lakša ili otežana stolica
- Gastritis / GERB
- IBS / SIBO

PREHRANA

- DORUČAK – M: ništa / burek, Ž: zobene i banana
- RUČAK – M: brzo jedu i previše, puno UH i pivo/vino, Ž: premalo proteina
- VEČERA – grickalice i slatko, fast food

Odakle krenuti?

- Mikrobiota?
 - Propusna crijeva?
 - Promjena prehrane i tjelovježba?
 - Ukloniti stres?
-
- Lijek po lijek...? IPP, statin, spazmolitik, GLP-1, hormoni štitnjače, anksiolitik, antidepresiv..? SVE?



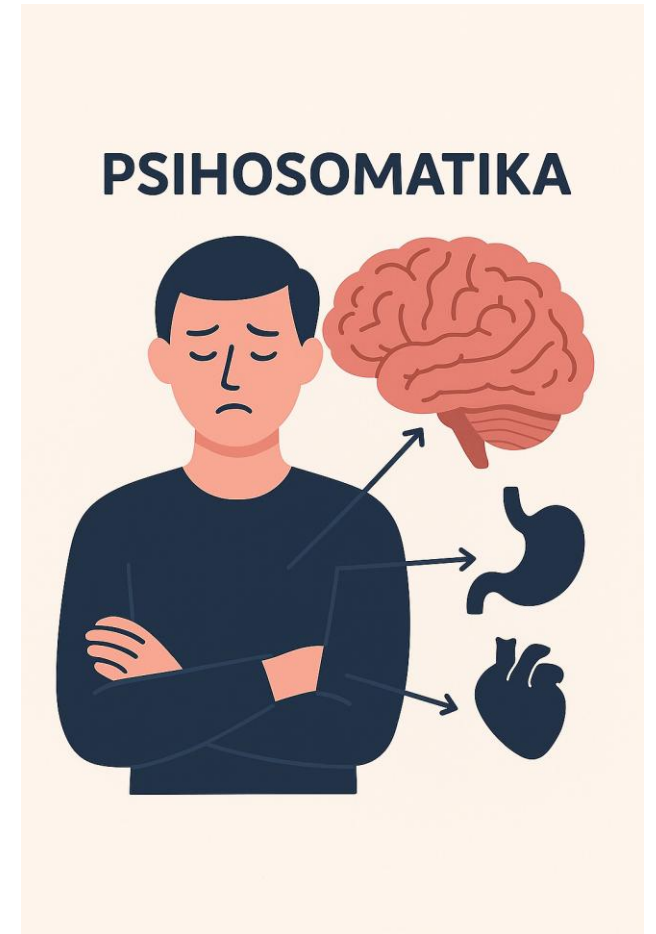
Primjeri povezanosti crijeva i stresa

Psihosomatika

- Pojačano lučenje kiseline u želucu (gastritis i ulkus)
- Stresna dijareja, povraćanje...
- IBS

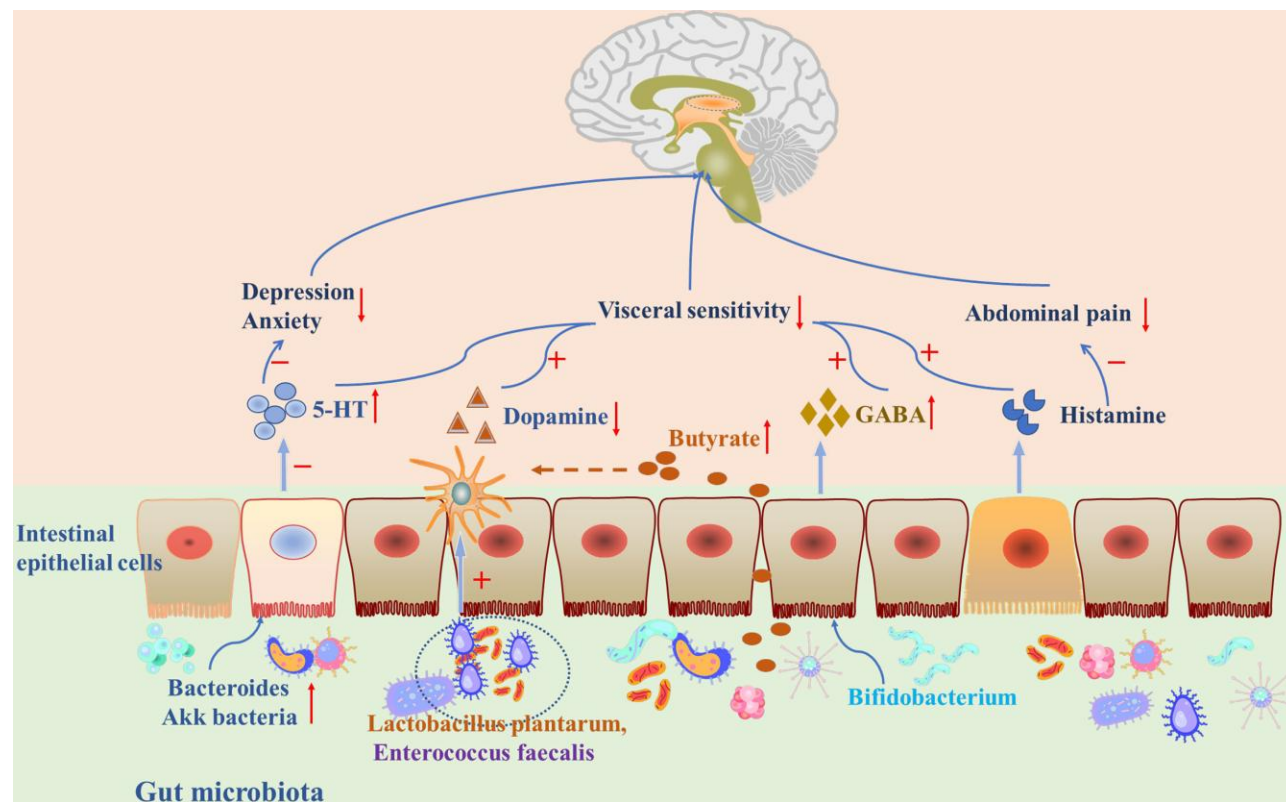
Somatopsihotika

- Upalne i funkcionalne bolesti crijeva utječu na psihičko stanje (nadutost, SIBO...)



Živčani sustav crijeva

- Zadužen za zdravlje probavnog sustava
- Oko 100 milijuna neurona (200 do 600 mil.?) - regulacija peristaltike i druge funkcije
- Lokalna produkcija neurotransmitera – serotonin, dopamin, noradrenalin, GABA...
- Mikrobiota utječe na razine neurotransmitera (češće modulacija, ali i direktna proizvodnja)

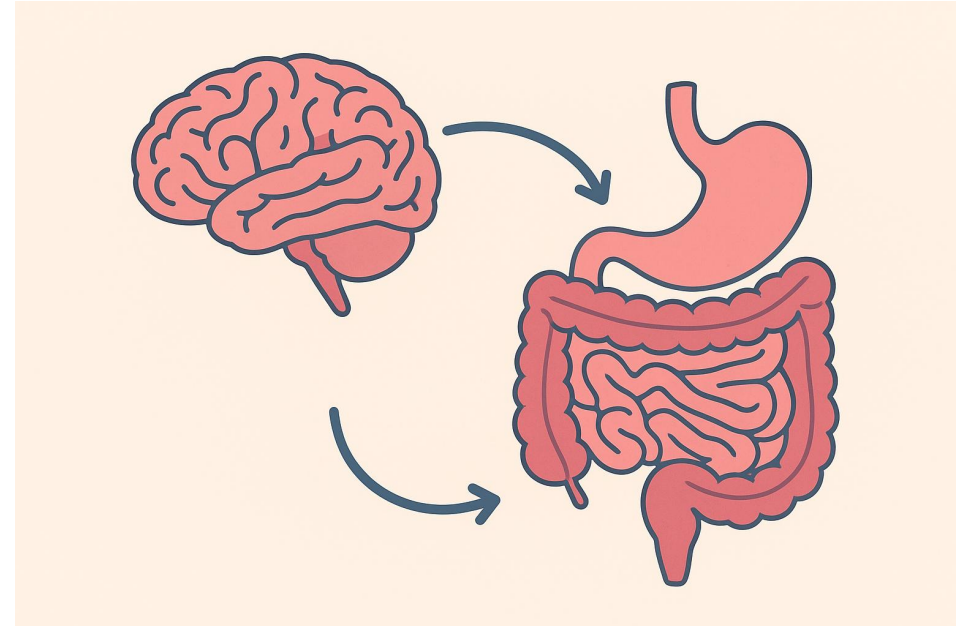


Povezanost crijeva i mozga

- Hormoni (grelin, leptin)
- Povećana propusnost crijeva (utjecaj endotoksina na mozak)
- Utjecaj nelagode i boli na cijeli organizam Vagus!
- Vagus!

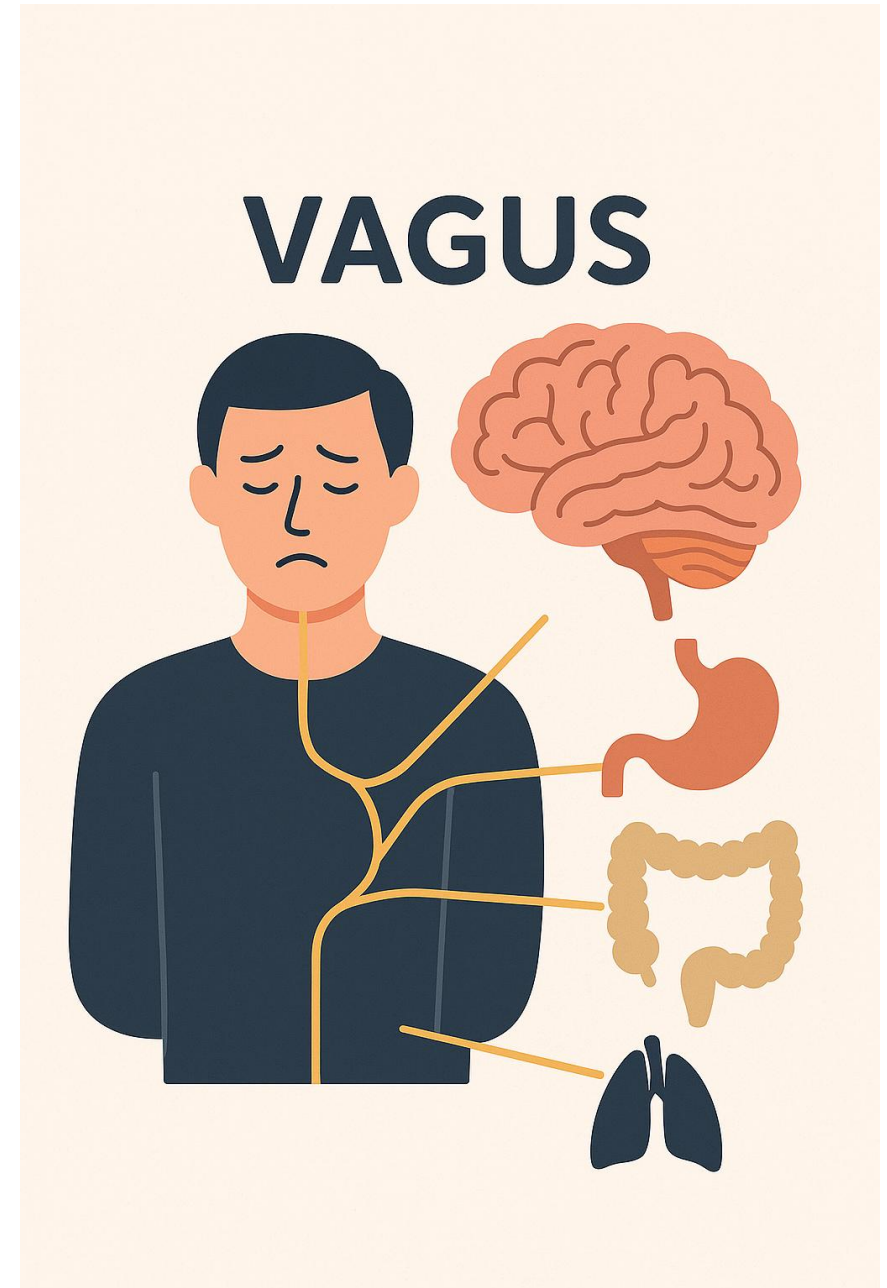
Neurotransmiteri:

- Glutamat (prekursor: acetat, *Lactobacillus plantarum*...)
- GABA (prekursor: acetat; *Bifidobacterium*...)
- Acetil-kolin (prekursor: kolin, *Lactobacillus plantarum*...)



Utjecaj vagusa na crijeva

- 20% eferventna vlakna –
pražnjenje želuca i
poticanje motiliteta i
peristaltike, potiče jetru i
rad žuči

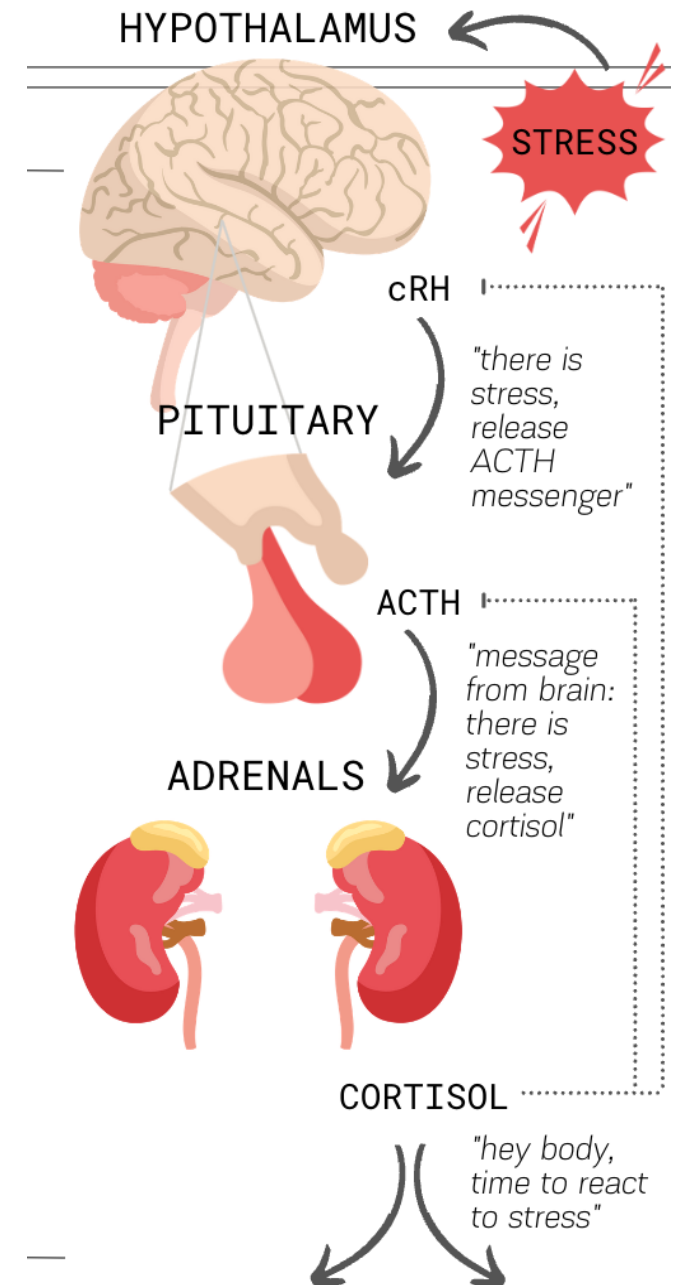


Utjecaj crijeva na vagus

- 80% aferentna vlakna – crijeva stalno komuniciraju s mozgom (sadržaj želuca, informacije o sitosti ili gladi!
- Mikrobiota – produkcija SCFA, prekursora ili samih neurotransmitera (stimuliraju vagus i enteričke stanice)
- Mikrobiota – metaboliti i prekursori vagusom do mozga?
- Vagus detektira citokine i bakterijske LPS

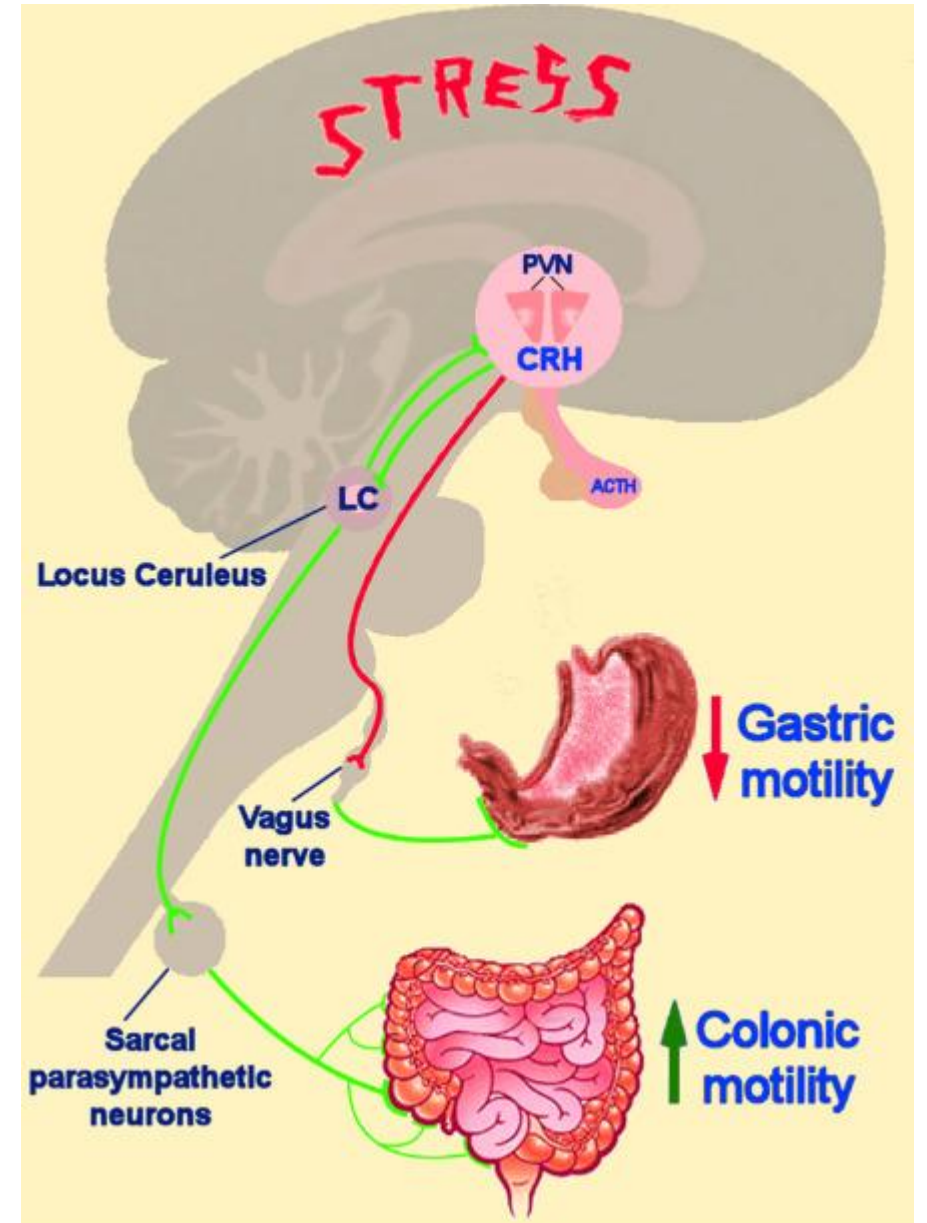
Mehanizmi stresa i HPA osovina

- Stres smanjuje tonus vagusa! – slabija peristaltika, više refluksa
- Vagus dio parasimpatikusa – u stresu, blokiran
- Stres – utjecaj na simpatikus (fight or flight)
- STRES – aktivacija HPA – povišeni kortizol i adrenalin: TSH, inverzija FSH/LH, GUK, glukoneogeneza, lipogeneza



Utjecaj stresa na crijeva

- MANIFESTACIJA:
kolesterol, zatvor, IBS,
nesanica, anksioznost,
štitnjača, neplodnost...



Povezanost stresa i mikrobiote

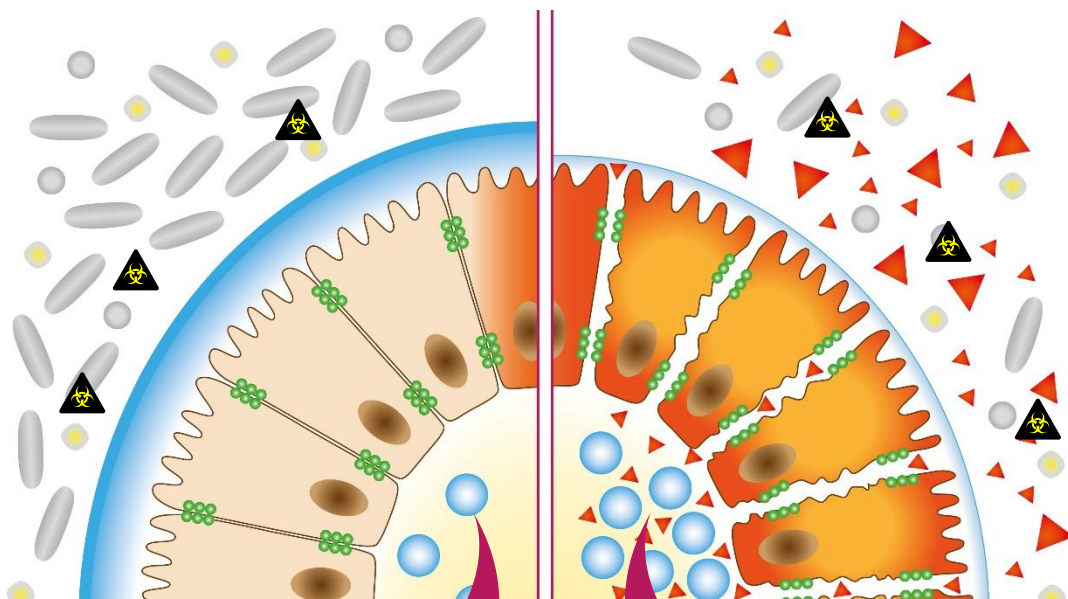
- Stres kod miševa utječe na sastav crijevne mikrobiote (Burokas i sur. (2017) , Bailey i sur. (2011))., te da upotreba prebiotika može ublažiti učinke kroničnog stresa (Burokas i sur. (2017)). Također mikrobiota može modulirati odgovor na stres proizvodnjom neurotransmitera.
- Istraživanja na ljudima: primjene određenih sojeva iz roda *Lactoabillus* i *Bifidobacterium* dovode do smanjenja anksioznosti i depresivnih simptoma, uz smanjenje razine kortizola (Messaoudi i sur. (2011)).
- Probiotici su ispitivani kod fibromialgije (Liu i sur. (2019)), gdje je zabilježeno poboljšanje kvalitete života i smanjenje boli te depresivnih simptoma.

Povezanost stresa i mikrobiote

- Jesti u miru!
- Brzo jedenje pogoduje žučnoj insuficijenciji i nedovoljnoj probavi hrane – te pogoduje SIBOu
- Potencijalni utjecaj mikrobiote na razvoj neuroloških bolesti (metaboliti i endotoksini)
- Potreba za više neurotransmitera – uloga mikrobiote i crijevnih stanica

Disbioza i povećana propusnost crijeva

nepropusna
crijevna
barijera



disbioza i
propusna crijeva



ENDOTOKSIN
= LPS
prisutan u
vanjskoj membrani

Utjecaj probiotika

- Smanjiti propusnost crijeva
- Smanjiti prodor endotoksina
- Povećati proizvodnju SCFA
- Utjecati na mikrobiotu, vagus, metaboličke parametre

Kod pacijenata s metaboličkim sindromom uočena je povećana propusnost crijeva

OPEN ACCESS Freely available online

Circulating Zonulin, a Marker of Intestinal Tight Junctions, Is Increased in Association with Insulin Resistance

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Department of Diabetes, Endocrinology and Nutrition, Institut d'Investigacions Biomèdiques August Pi i Sunyer (IDIBAPS), Girona, Spain

Abstract

Zonulin is the only physiological mediator known to regulate intestinal tight junctions. To investigate the relationship between zonulin disturbances in humans, we aimed to study circulating zonulin (ELISA) was measured in 123 caucasian men with minimal model-measured insulin sensitivity). Circulating zonulin (WHR), fasting insulin, fasting triglycerides, uric acid, and insulin sensitivity. In multiple regression analysis, insulin resistance, after controlling for the effects of BMI, fasting glucose, and only BMI ($p=0.01$) contributed independently to insulin sensitivity and circulating zonulin might be

Citation: Moreno-Navarrete JM, Sabater M, Ortega F, Ricart W, Fernández-Real JM (2012) Circulating Zonulin, a Marker of Intestinal Tight Junctions, Is Increased in Association with Obesity-Associated Insulin Resistance. PLoS ONE 7(1): e30811. doi:10.1371/journal.pone.0030811

Editor: Massimo Federici, University of Tor Vergata, Italy

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British Journal of Nutrition

Review Article

Influence of a high-fat diet on gut microbiota, intestinal permeability and metabolic endotoxaemia

Ana Paula Boroni Moreira*, Tatiana Fliche Salles Teixeira, Alessandra Barbosa Ferreira, Maria do Carmo Gouveia Peluzio and Rita de Cássia Gonçalves Alfenas

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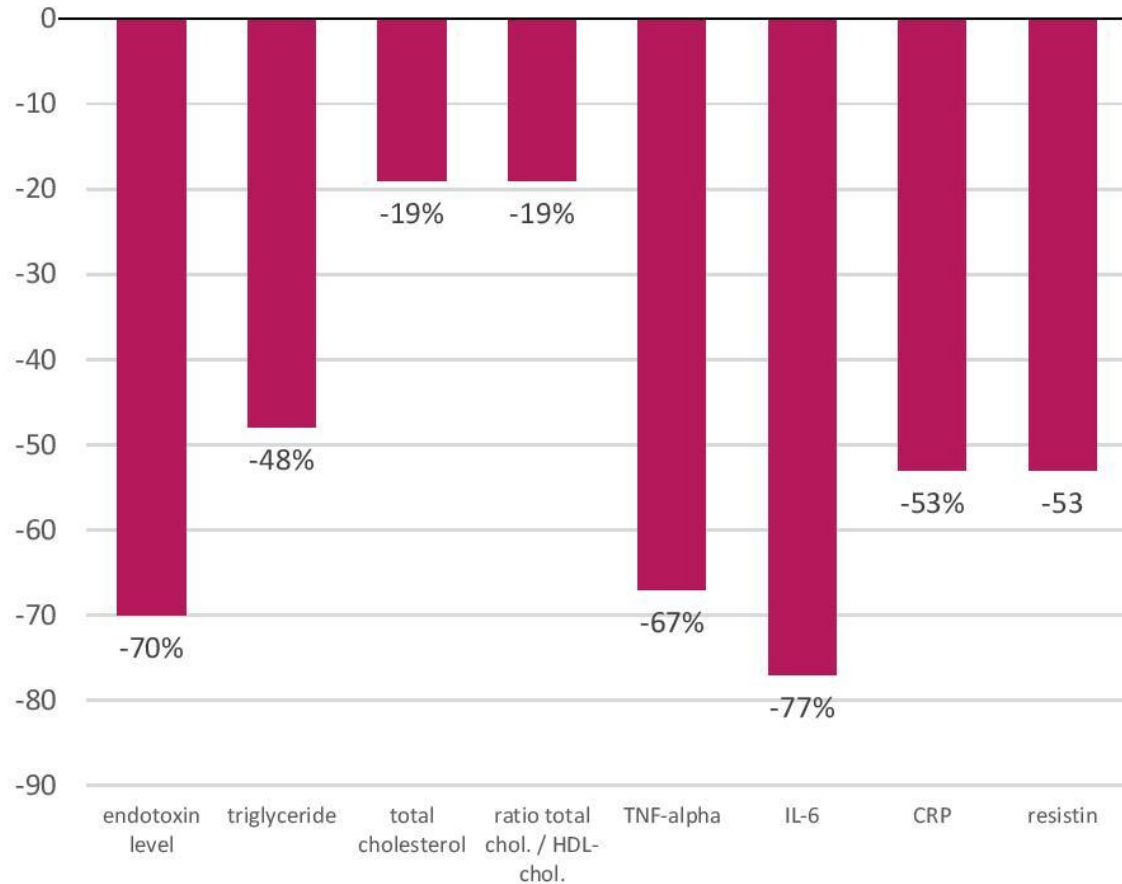
(Submitted 1 November 2011 – Final revision received 20 February 2012 – Accepted 1 March 2012 – First published online 16 April 2012)

Abstract

Lipopolysaccharide (LPS) may play an important role in chronic diseases through the activation of inflammatory responses. The type of diet consumed is of major concern for the prevention and treatment of these diseases. Evidence from animal and human studies has shown that LPS can diffuse from the gut to the circulatory system in response to the intake of high amounts of fat. The method by which LPS move into the circulatory system is either through direct diffusion due to intestinal paracellular permeability or through absorption by enterocytes during chylomicron secretion. Considering the impact of metabolic diseases on public health and the association between these diseases and the levels of LPS in the circulatory system, this review will mainly discuss the current knowledge about high-fat diets and subclinical inflammation. It will also describe the new evidence that correlates gut microbiota, intestinal permeability and alkaline phosphatase activity with increased blood LPS levels and the biological effects of this increase, such as insulin resistance. Although the majority of the studies published so far have assessed the effects of dietary fat, additional studies are necessary to deepen the understanding of how the amount, the quality and the structure of the fat may affect endotoxaemia. The potential of food combinations to reduce the negative effects of fat intake should also be considered in future studies. In these studies, the effects of flavonoids, prebiotics and probiotics on endotoxaemia should be investigated. Thus, it is essential to identify dietetic strategies capable of minimising endotoxaemia and its postprandial inflammatory effects.

Key words: High-fat diets; Lipopolysaccharides; Gut microbiota; Intestinal permeability

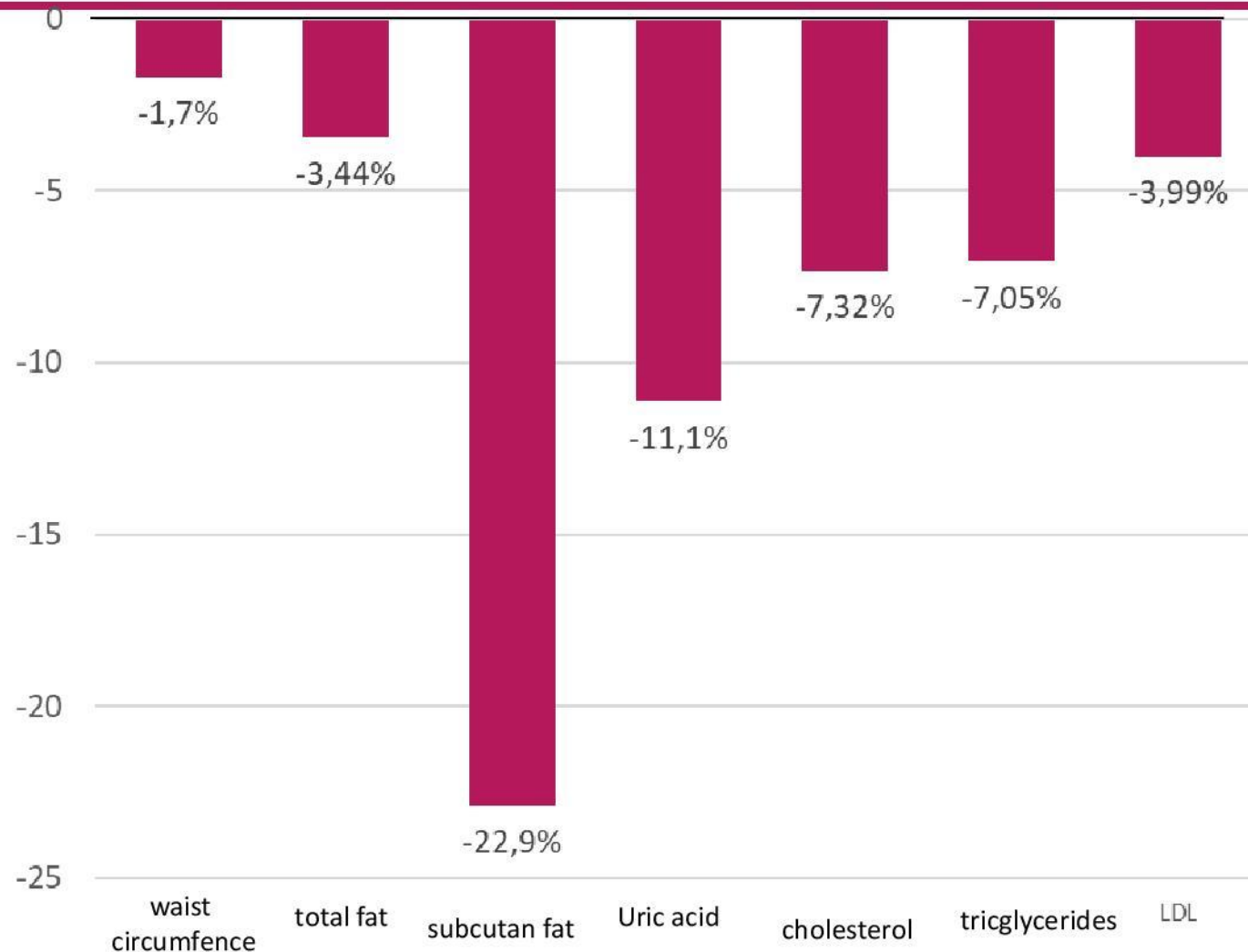
Positive effect of OMNi-BiOTiC® METAtox on cardiometabolic parameters and inflammation



✓ significant reduction after 6 months intake of OMNi-BiOTiC® METAtox (10×10^9 cfu)

$p < 0,05$
compared to initial value

Positive effect of OMNi-BiOTiC® METAtox on cardiometabolic parameters and inflammation



✓ significant reduction
after 6 months intake
of OMNi-BiOTiC®
METAtox
(10×10^9 cfu)

Mikrobiom lovaca sakupljača



ARTICLE

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OPEN

Gut microbiome of the Hadza hunter-gatherers

Stephanie L. Schnorr^{1,*}, Marco Candela^{2,*}, Simone Rampelli², Manuela Centanni², Clarissa Consolandi³, Giulia Basaglia², Silvia Turroni², Elena Biagi², Clelia Peano³, Marco Severgnini³, Jessica Fiori², Roberto Gotti², Gianluca De Bellis³, Donata Luiselli⁴, Patrizia Brigidi², Audax Mabulla⁵, Frank Marlowe⁶, Amanda G. Henry¹ & Alyssa N. Crittenden⁷

ZAKLJUČAK AUTORA: Debljamo se jer unosimo previše (pogrešnih) kalorija, ne jer živimo sjedilačkim životom

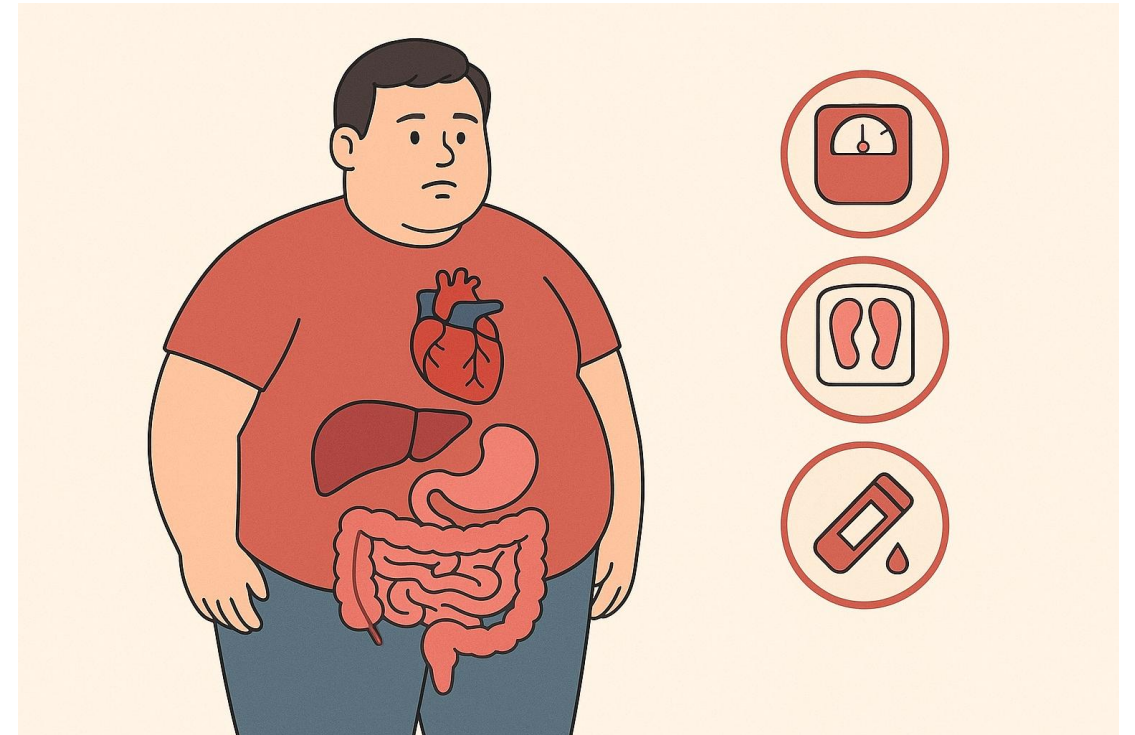
Schnorr, S., Candela, M., Rampelli, S. *et al.* Gut microbiome of the Hadza hunter-gatherers. *Nat Commun* 5, 3654 (2014).
<https://doi.org/10.1038/ncomms4654>

Što napraviti?

- Uvesti/ostaviti niz lijekova do kraja života?
- Tjelovježba
- Utjecaj na stres – disanje, odmor
- Promjena prehrane
- Probiotici

Prehrana

- Manje šećera!
- Dovoljno proteina!
- Kvalitetne protuupalne nezasićene masne kiseline!
- Dovoljno i ne previše zasićenih masnih kiselina!
- Dovoljno polifenola u prehrani!
- Žvakati hranu polako i temeljito!
- (Proteinski) doručak!



Stil života

- Redovita umjerena sportska aktivnost!
- Čovjek – stroj za rad i nošenje s AKUTNIM stresom – dovoljno odmora!
- Promjene okoline, tehnike disanja, meditacije – jačanje tonusa vagusa.



The vagus nerve is a long and important nerve in your body. Its name, "vagus," comes from a Latin word meaning "wandering" because it branches out and connects to many organs throughout your body. Think of it like a complex communication network that reaches almost everywhere.

Hvala na pažnji.

Frane Herenda

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www.panacea.hr