

ZDRAVSTVENE KORISTI PRIMENE PROBIOTIKA KOD LJUDI SA METABOLIČKIM SINDROMOM

Gordana Zavišić¹, Slavica Ristić², Drina Janković³, Branka Petković⁴

¹Farmaceutski fakultet, Univerzitet Privredna akademija u Novom Sadu, Trg mladenaca 5, Novi Sad, Republika Srbija

²Medicinski fakultet Univerziteta u Beogradu, Pasterova 2, Republika Srbija

³Institut za nuklearne nauke “Vinča” – Institut od nacionalnog značaja za Republiku Srbiju, Mike Petrovića Alasa 12-14, Vinča, Beograd, Univerzitet u Beogradu, Republika Srbija

⁴Institut za biološka istraživanja “Siniša Stanković” – Institut od nacionalnog značaja za Republiku Srbiju, Bulevar despota Stefana 142, Beograd, Univerzitet u Beogradu, Republika Srbija

Sažetak. Metabolički sindrom je kompleksno stanje koje uključuje dislipidemiju, poremećenu homeostazu glukoze, povišen krvni pritisak, prekomjernu težinu, abdominalnu gojaznost i/ili insulinsku rezistenciju, i samim tim povećava rizik od srčanih oboljenja, moždanog udara i dijabetesa tipa 2. Posljedica je energetskog disbalansa koji pogoduje akumulaciji masti u tkivima, dok molekularne promjene uključuju smanjen oksidativni kapacitet mitohondrija, oštećeno ćelijsko redoks stanje i izmijenjenu signalizaciju insulina koja dovodi do poremećenog transporta glukoze i lipolize. Probiotici su prepoznati kao moćni sastojci u ishrani sa višestrukim funkcijama za unapređenje zdravlja, zajedno sa njihovom sposobnošću da pomažu u borbi protiv specifičnih bolesti. U ovom radu je dat pregled efekata i mehanizama djelovanja probiotika (uglavnom *Lactobacillus* sojeva) u prevenciji i pri terapiji metaboličkog sindroma. Bez obzira na pokazane koristi primjene *Lactobacillus*, još uvijek nije razjašnjen tačan mehanizam djelovanja, ali je najvjerovatnije povezan sa smanjenjem stresa endoplazmatskog retikuluma i potisnutom aktivacijom makrofaga, što dovodi do povećane osjetljivosti na insulin. Analiza devet kliničkih studija, od kojih je šest randomiziranih, pokazala je da primjena probiotika kod pacijenata sa metaboličkim sindromom u nekim slučajevima dovodi do poboljšanja indeksa tjelesne mase, krvnog pritiska, metabolizma glukoze i lipidnog profila. Probiotici su takođe imali pozitivan efekat na inflamatorne biomarkere kao što su rastvorljivi molekul adhezije vaskularnih ćelija-1, interleukin-6, faktor nekroze tumora-alfa, faktor rasta vaskularnog endotela i trombomodulin. Iako upotreba probiotika može dovesti do diskretnog poboljšanja nekih kliničkih karakteristika i smanjenja inflamatornih biomarkera, čini se da su ovi korisni efekti marginalni u poređenju sa efektima terapije lekovima i zdravim načinom života. Takođe, i poremećaj mikrobiote creva utiče na različite faktore rizika za metabolički sindrom. Stoga je održavanje zdrave mikrobiote važno kao i obnavljanje poremećene mikrobiote.

Ključne reči: probiotici, *Lactobacillus*, metabolički sindrom

HEALTH BENEFITS OF TAKING PROBIOTICS IN PEOPLE WITH METABOLIC SYNDROME

Gordana Zavišić¹, Slavica Ristić², Drina Janković³, Branka Petković⁴

¹Faculty of Pharmacy, University Business Academy in Novi Sad,

Trg mladenaca 5, Novi Sad, Republic of Serbia

²Faculty of Medicine, Pasterova 2, University of Belgrade, Republic of Serbia

³Vinča Institute of Nuclear Sciences – National Institute of the Republic of Serbia,

Mike Petrovića Alasa 12-14, Vinča, Belgrade, University of Belgrade,

Republic of Serbia

⁴Institute for Biological Research “Siniša Stanković” – National Institute of the Republic of Serbia, Bulevar despota Stefana 142, Belgrade, University of Belgrade, Republic of Serbia

Abstract. Metabolic syndrome is a complex condition that includes dyslipidemia, impaired glucose homeostasis, elevated blood pressure, overweight, abdominal obesity, and/or insulin resistance, increasing the risk of heart disease, stroke, and type 2 diabetes. It is the result of an energy imbalance that favors the accumulation of fat in tissues. Molecular changes include reduced mitochondrial oxidative capacity, damaged cellular redox state, and altered insulin signaling leading to impaired glucose transport and lipolysis. Probiotics are recognized as powerful dietary components with numerous health-promoting functions that can also help fight certain diseases. This paper provides an overview of the effects and mechanisms of action of probiotics (mainly *Lactobacillus* strains) in the prevention and treatment of metabolic syndrome. Despite the observed benefits of *Lactobacillus* administration, the exact mechanism of action is not yet clear, but it is most likely related to the reduction of endoplasmic reticulum stress and suppressed macrophage activation, leading to increased insulin sensitivity. An analysis of nine clinical trials, six of which were randomized, has shown that in some cases the use of probiotics in patients with metabolic syndrome leads to an improvement in body mass index, blood pressure, glucose metabolism, and lipid profile. Probiotics also had a positive effect on inflammatory biomarkers such as soluble vascular cell adhesion molecule-1, interleukin-6, tumor necrosis factor-alpha, vascular endothelial growth factor, and thrombomodulin. Although the use of probiotics may lead to a discrete improvement in some clinical features and a reduction in inflammatory biomarkers, these beneficial effects appear to be marginal compared to the effects of drug therapy and a healthy lifestyle. Disruption of the gut microbiota also influences various risk factors for metabolic syndrome. Thus, maintaining a healthy microbiota is as important as restoring a disturbed microbiota.

Key words: probiotics, *Lactobacillus*, metabolic syndrome