

ISSN: 2008-3289

eISSN: 2008-4447



IJM Iranian Journal of *Microbiology*

Bimonthly



Tehran University
of Medical Sciences

pISSN: 2008-3289

eISSN: 2008-4447

CHAIRMAN AND EDITOR:

Mohammad Mehdi Feizabadi

MAKE A SUBMISSION

INFORMATION

Publication Fee

For Readers

For Authors

For Librarians



Editorial Board

Chairman & Editor:

[Mohammad Mehdi Feizabadi](#), Ph.D.

Professor, Department of Microbiology, [Tehran University of Medical Sciences](#), Tehran, Iran.

Editorial Board:

[Deanna Gibson](#), Ph.D.

Associate Professor, Department of Biology, University of British Columbia, Okanagan Campus, Kelowna, British Columbia, Canada.

[Gholamreza Salehi Jouzani](#) Ph.D.

Professor, Microbial Biotechnology and Biosafety Department, Agricultural Biotechnology Research Institute, Karaj, Iran.

[Gilla Yavarian](#) Ph.D.

Associate Professor, Department of Virology, [Tehran University of Medical Sciences](#), Tehran, Iran.

[Ingrid S Surono](#), MSc, Ph.D.

Associate Professor, Department of Food Technology, Bina Nusantara University, Jakarta, Indonesia.

[İpek Kurtböke](#), Ph.D.

Associate Professor, School of Science and Education, Faculty of Science, Health and Education, University of the Sunshine Coast Maroochydore DC, Australia.

[Leonid Titov](#), M.D., Ph.D.

Professor, Belarusian Research Institute for Epidemiology and Microbiology, Minsk, Belarus.

[Mahshid Nasehi](#), M.D.

Associate Professor, Department of Epidemiology, Iran University of Medical Sciences, Tehran, Iran.

[Manuchehr Makvandi](#) Ph.D.


Professor, Department of Virology, Ahvaz Jundishapur University of Medical Sciences, Ahvaz, Iran.

[Masoud Hajizadeh Manjili](#), Ph.D.

Professor, Department of Microbiology & Immunology, Virginia Commonwealth University, USA.

[Mehrnaz Rasoolinejad](#), M.D.

Professor, Department of Infectious Diseases, [Tehran University of Medical Sciences](#), Tehran, Iran.

Mina Tabrizi, M.D., Ph.D. 


Associate professor, Department of Genetics, [Tehran University of Medical Sciences](#), Tehran, Iran.

Mohammad Katouli, Ph.D. 

Professor, School of Health and Sport Science, Faculty of Science, Health and Education, University of the Sunshine Coast Maroochydore DC, Australia.

Mohammad Mehdi Aslani, Ph.D. 

Professor, Department of Bacteriology, Pasteur Institute of Iran, Tehran, Iran.

Mostafa Rezaeian, Ph.D. 

Professor, Department of Medical Parasitology and Mycology, [Tehran University of Medical Sciences](#), Tehran, Iran.

Rouha Kasra Kermanshahi, Ph.D. 

Professor, Department of Biological Science, Alzahra University, Vanak, Tehran, Iran.

Saeid Bouzari, Ph.D. 

Professor, Department of Molecular Biology, Pasteur Institute of Iran, Tehran, Iran

Saeid Bokaei, D.V.M., Ph.D. 

Professor, Department of Epidemiology, University of Tehran, Tehran, Iran.

Sedigheh Zakeri, Ph.D. 

Professor, Malaria and Vector Research Group, Biotechnology Research Center, Pasteur Institute of Iran, Tehran, Iran.

Sirus Jafari, M.D. 

Associate Professor, Department of Infectious Diseases, [Tehran University of Medical Sciences](#), Tehran, Iran.

Taghi Zahraei Salehi, D.V.M., Ph.D. 

Professor, Department of Veterinary Microbiology, University of Tehran, Tehran, Iran.

Willem B. van Leeuwen, Ph.D. 

Professor, Leiden Centre for Applied Bioscience, University of Leiden, The Netherlands.



[HOME](#) [ABOUT](#) [CURRENT](#) [ARCHIVES](#) [INDEXING & ABSTRACTING](#) [FOR AUTHORS](#)

Search

[HOME](#) [ARCHIVES](#) Vol 11 No 2 (2019)

PUBLISHED: 2019-06-01

REVIEW ARTICLE(S)

Priorities in prevention and control of flood hazards in Iran 2019 massive flood

Laleh Sharifi, Saied Bokaie

80-84

[XML](#) [PDF \(236KB\)](#) [Downloads : 35](#) | [Views : 181](#)

MINI REVIEW

Possible viral infections in flood disasters: a review considering 2019 spring floods in Iran

Jila Yavarian, Nazanin Zahra Shafiei-Jandaghi, Talat Mokhtari-Azad

85-89

[XML](#) [PDF \(235KB\)](#) [Downloads : 30](#) | [Views : 222](#)

ORIGINAL ARTICLE(S)

Blood culture and antimicrobial susceptibility pattern of bacteria and fungi isolated from febrile neutropenic patients treated with chemotherapy at Taleghani hospital, Tehran

Rozita Khodashahi, Mojdeh Hakemi-Vala, Masoud Mardani, Sara Abolghasemi, Ensieh Lotfali, Zahra Arab-Mazar, Naser Omid, Sepideh Ghasemshahi

90-97

[XML](#) [PDF \(502KB\)](#) [Downloads : 49](#) | [Views : 126](#)

Molecular analysis and antimicrobial resistance pattern of distinct strains of *Pseudomonas aeruginosa* isolated from cystic fibrosis patients in Iran

Mohammad Emaneini, Davood Kalantar-Neyestanaki, Leila Jabalameli, Mojtaba Hashemi, Reza Beigverdi, Fereshteh Jabalameli
98-107

 XML  PDF (625KB)  Downloads : 55 |  Views : 125

Prevalence of *Candida* bloodstream isolates from patients in two hospitals in Vietnam

Nguyen Duy Bac, Le Tran Anh, Le Bach Quang, Nguyen Khac Luc, Tran Thi Thanh Nga, Minoru Nagi, Miyazaki Yoshitsugu, Hoang Thi Thu Ha, Dang Duc Anh, Do Quyet, Do Ngoc Anh
108-113

 XML  PDF (276KB)  Downloads : 21 |  Views : 111

Identification of *Candida* spp. isolated from oral mucosa in patients with leukemias and lymphomas in Iran

Sara Sara Hamzehee, Davood Kalantar-Neyestanaki, Mohammad Ali Mohammadi, Saeed Nasibi, Seyed Amin Ayatollahi Mousavi
114-119

 XML  PDF (300KB)  Downloads : 47 |  Views : 258

Identification of microorganisms in persistent/secondary endodontic infections with respect to clinical and radiographic findings: bacterial culture and molecular detection

Nazanin Zargar, Mahmoud Amin Marashi, Hengameh Ashraf, Rene Hakopian, Peyman Beigi
120-128

 XML  PDF (376KB)  Downloads : 40 |  Views : 197

Frequency of adenovirus serotype 8 in patients with Keratoconjunctivitis, in Ahvaz, Iran

Kolsoom Shafiei, Manoochehr Makvandi, Ali Teimoori, Alireza Samarbarfzadeh, Gholamreza Khataminia, Shahram Jalilian, Niloofar Neisi, Kimia Makvandi, Mehrdad Sadeghi Haj
129-136

 XML  PDF (338KB)  Downloads : 28 |  Views : 227

Effect of *Lactobacillus plantarum* IS-10506 on blood lipopolysaccharide level and immune response in HIV-infected children

Alpha Fardah Athiyah, Herwina Brahmantya, Stephani Dwiastuti, Andy Darma, Dwiyantri Puspitasari, Dominicus Husada, Reza Ranuh, Anang Endaryanto, Ingrid Surono, Subijanto Marto Sudarmo
137-144

 XML  PDF (347KB)  Downloads : 36 |  Views : 101

Effect of the probiotic *Lactobacillus plantarum* IS-10506 on BDNF and 5HT stimulation: role of intestinal microbiota on the gut-brain axis

Reza Ranuh, Alpha Fardah Athiyah, Andy Darma, Vitria Prasetyo Risky, Wibi Riawan, Ingrid S. Surono, Subijanto Marto Sudarmo
145-150

 XML  PDF (678KB)  Downloads : 53 |  Views : 217

Fecal human β -defensin-2 (hBD-2) levels and gut microbiota patterns in preterm neonates with different feeding patterns

Brigitta I.R.V. Corebima, Rinawati Rohsiswatmo, Pramita Gayatri, Sanjay Patole
151-159

[XML](#) [PDF \(390KB\)](#) [Downloads : 24](#) | [Views : 79](#)

Effect of microencapsulation on *Saccharomyces cerevisiae* var. *boulardii* viability in the gastrointestinal tract and level of some blood biochemical factors in wistar rats

Hassan Ghorbani-Choboghlo, Donya Nikaein, Ali-Reza Khosravi, Reza Rahmani, Zohreh Farahnejad
160-165

[XML](#) [PDF \(331KB\)](#) [Downloads : 42](#) | [Views : 86](#)

Analysis of antibacterial and antibiofilm activity of purified recombinant Azurin from *Pseudomonas aeruginosa*

Hajar Mohammadi-Barzelighi, Bahram Nasr-Esfahani, Bita Bakhshi, Bahram Daraei, Sharareh Moghim, Hossein Fazeli
166-176

[XML](#) [PDF \(602KB\)](#) [Downloads : 16](#) | [Views : 74](#)

Antibacterial effect of chitosan from squid pens against *Porphyromonas gingivalis* bacteria

Latief Mooduto, Dian Agustin Wahjuningrum, Agatha Prita A, Cecilia G. J. Lunardhi
177-180

[XML](#) [PDF \(266KB\)](#) [Downloads : 40](#) | [Views : 74](#)

A simple method for in-house Pfu DNA polymerase purification for high-fidelity PCR amplification

Prabu Siva Sankar, Marimuthu Citartan, Aminah Ahmed Siti, Boris V. Skryabin, Timofey S. Rozhdestvensky, Goot Heah Khor, Thean Hock Tang
181-186

[XML](#) [PDF \(419KB\)](#) [Downloads : 51](#) | [Views : 303](#)

CASE REPORT(S)

Bilateral septic arthritis of the knee caused by group B streptococci: a case report

Seyed Ali Dehghan Manshadi, Ramazanali Alizadeh, Mohammadreza Salehi, Arash Seifi, Mojgan Seifi
187-190

[XML](#) [PDF \(182KB\)](#) [Downloads : 38](#) | [Views : 90](#)

Effect of the probiotic *Lactobacillus plantarum* IS-10506 on BDNF and 5HT stimulation: role of intestinal microbiota on the gut-brain axis

Reza Ranuh^{1*}, Alpha Fardah Athiyah¹, Andy Darma¹, Vitria Prasetyo Risky¹, Wibi Riawan²,
Ingrid S. Surono³, Subijanto Marto Sudarmo¹

¹Department of Child Health, Dr. Soetomo Hospital, Faculty of Medicine Universitas Airlangga, Surabaya, Indonesia

²Department of Biomolecular Laboratory, Faculty of Medicine, Universitas Brawijaya, Malang, Indonesia

³Department of Food Technology, Faculty of Engineering, Bina Nusantara University, Jakarta, Indonesia

Received: September 2018, Accepted: February 2019

ABSTRACT

Background and Objectives: Microbial communities residing in the gut play a major role in the communication between the gut and the brain through neural, immune, and hormonal routes. Changes in abundance of beneficial intestinal bacteria can affect health of individuals. Conversely, drugs, disease, diet and other factors can alter the gut microbiome. However, there is limited information on the effect of exogenous factors on gut microbiota. In this study, we investigated whether a beneficial bacterium, the probiotic *Lactobacillus plantarum* IS-10506, can stimulate the gut-brain axis using Wistar rats.

Materials and Methods: The animals were divided into two groups: one received *L. plantarum* IS strain 10506 supplementation, while the control group received no treatment. Activation of the gut-brain axis was evaluated by immunohistochemical analysis of intestinal and brain serotonin (5-HT) and brain neurotrophin (NT), serotonin transporter (5-HTT), and brain-derived neurotrophic factor (BDNF) levels.

Results: The results showed that BDNF ($p < 0.000$), NT ($p < 0.000007$), and 5-HTT ($p < 0.000007$) expression was upregulated in the brain along with intestinal 5-HT ($p < 0.000$) level in rats treated with *L. plantarum* strain IS-10506 relative to the control group.

Conclusion: The probiotic *L. plantarum* IS-10506 stimulates the gut-brain axis and can potentially promote brain development and function.

Keywords: Gut-brain axis; Brain-derived neurotrophic factor; Serotonin; Probiotic *Lactobacillus plantarum* IS 10506

*Corresponding author: Reza Ranuh, MD, Department of Child Health, Dr. Soetomo Hospital, Faculty of Medicine Universitas Airlangga, Surabaya, Indonesia.
Tel: +62-811379844
Email: rezagunadi@gmail.com

INTRODUCTION

The digestive tract and brain are intimately connected (1). Microbial communities residing in the gut play a major role in the communication between the gut and the brain (1-3). In humans, the 200-600

million neurons of the enteric nervous system respond to chemical and mechanical stimuli from the gastrointestinal tract and combine this information with that transmitted by the brain via the vagus nerve (i.e., cranial nerve X) (4, 5). Signals between these two organs are bidirectional but most (90%) are retrograde and keep the brain informed of gut activity. The communication between the brain's emotional and cognitive centres and peripheral intestinal function is known as the gut-brain axis (1, 2, 6, 7).

Data from mice and humans have shown that gut microbiota influence the gut-brain axis; disruption of gut microbiota communities alters the expression of the neuromodulator brain-derived neurotrophic factor (BDNF), the growth factor neurotrophin (NT), and the serotonin (5-HT) transporter (5-HTT) in the hippocampus and amygdala (8-10). Additionally, clinical studies have reported that changes in gut microbiota lead to observable changes in mood or behaviour; conversely, ingestion of probiotics can positively affect brain function in healthy individuals (6, 11-13).

In the present study, we investigated whether the probiotic bacterium *Lactobacillus plantarum* strain IS-10506, which is prevalent in Indonesia and is a typical resident of the intestine, can influence the gut-brain axis.

MATERIALS AND METHODS

Animals. Male Wistar rats (8-12 weeks old; 100-120 g) were divided into two groups (n = 10 each): animals in the first served as untreated controls, and the second group received probiotic supplementation (*L. plantarum* IS-10506) for 7 days at 2.67×10^9 CFU/day in 0.25 ml saline. At the end of the experiment, rats were sacrificed by cervical dislocation and the brain and small intestine (ileum) were immediately dissected. The intestinal contents were removed, and the tissues were washed with phosphate-buffered saline (PBS) and prepared for immunohistochemistry. This study was approved by the Animal Care and Use Committee of Ethics Committee of the Veterinary Faculty of Universitas Airlangga, Surabaya, Indonesia.

Probiotic supplementation. Microencapsulated *L. plantarum* strain IS-10506 (GenBank accession no. DQ860148) was packed in an aluminium foil

sachet at the Pharmacy Installation of Dr. Soetomo Hospital (Surabaya, Indonesia) and dissolved in 1.5 ml sterile water, and administered to rats via a gastric tube once daily for 7 days at a dose of 2.67×10^9 CFU/day. Probiotic viability was assessed 1 week prior to the treatment.

Immunohistochemistry. Ileum and brain tissues were fixed in 10% formalin solution, followed by dehydration and paraffin embedding. Serial sections of the tissues were done by cleaned and fixed in 1n 10% formallin buffer solution. Then, this procedure followed by dehydration, clearing, and embedding. Tissue sections were probed with antibodies against 5-HT (YC5/45 sc-58031, Santacruz Biotech, USA), BDNF ((n20) sc-546, Santacruz Biotech, USA), 5-HTT (SR2A antibody (A-4) sc-166775, Santacruz Biotech, USA) and NT (sc-365444, Santacruz Biotech, USA). The sections were observed under a light microscope (CX21; Olympus, Tokyo, Japan) and photographed with an ILCE6000 camera (Sony, Tokyo, Japan). The number of immunopositive cells in 20 random fields at 1000 \times magnification was counted.

Statistical analysis. Differences between groups were evaluated with a paired sample t test and one-way analysis of variance for normally distributed data. Significance was set at $p < 0.05$.

RESULTS

Rats that received *L. plantarum* IS-10506 supplementation showed an increased number of 5-HT-positive cells in the ileum relative to the control group ($p < 0.0001$; Figs. 1-3). Similar trends were observed in the brain levels of BDNF ($p < 0.0001$; Figs. 4-6), 5-HTT ($p < 0.000007$; Figs. 7-9), and NT ($p < 0.000007$; Figs. 10-12); in each case, the number of immunopositive cells was higher in the treatment group than in control rats.

DISCUSSION

A growing body of evidence indicates that gut-brain communication is influenced by the gut microbiome (5, 12, 14). The results of the present study demonstrate that a probiotic bacterium, which is a typical gut microbe, influences neurotransmitter and



Fig. 1. Representative image of intestinal 5-HT expression in control rats, as detected by immunohistochemistry (400× magnification).

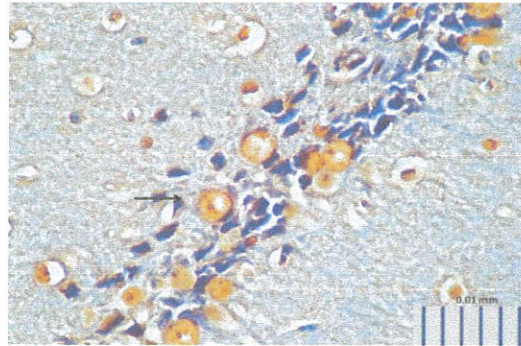


Fig. 4. Representative image of brain BDNF expression in control rats, as detected by immunohistochemistry (400× magnification).

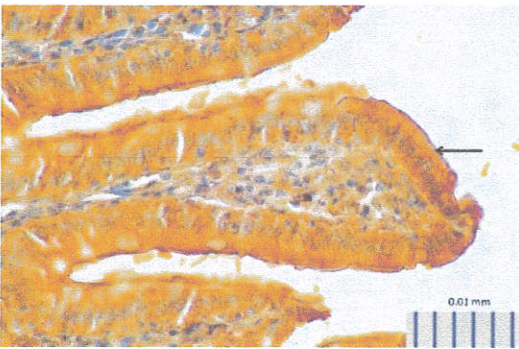


Fig. 2. Representative image of intestinal 5-HT in rats treated with *L. plantarum* IS-19596 (400× magnification).

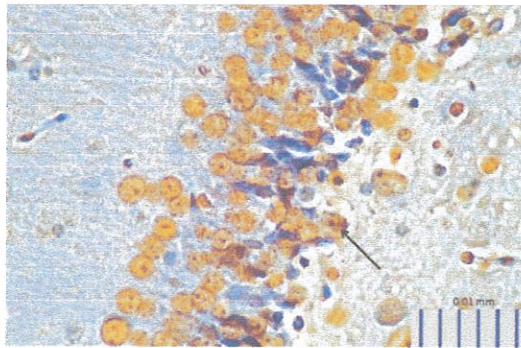


Fig. 5. Representative image of brain BDNF expression in rats treated with *L. plantarum* IS-10506 (400× magnification).

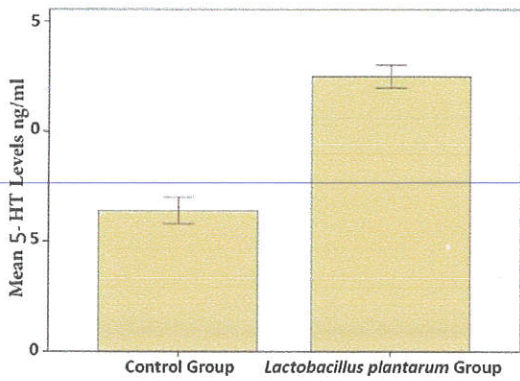


Fig. 3. Quantitative analysis of intestinal 5-HT levels in *L. plantarum* IS-10506 treated and control rats. Data represent mean \pm SE (n = 10/group).

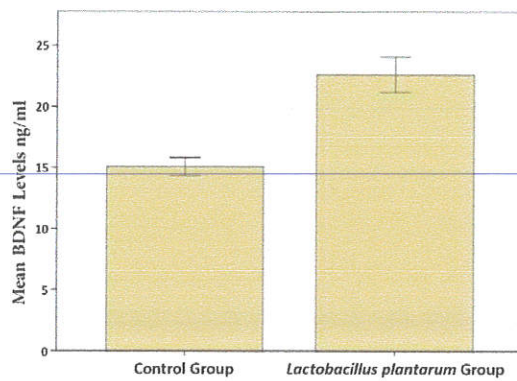


Fig. 6. Quantitative analysis of intestinal BDNF levels in *L. plantarum* IS-10506 treated and control rats. Data represent mean \pm SE (n = 10/group).

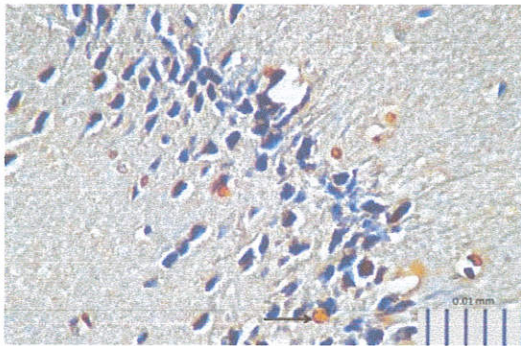


Fig. 7. Representative image of brain 5-HTT expression in control rats, as detected by immunohistochemistry (400× magnification).

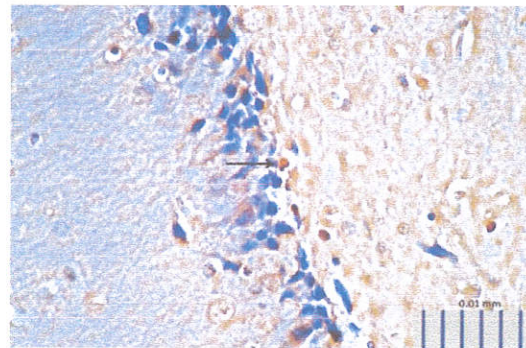


Fig. 10. Representative image of brain NT expression in control rats, as detected by immunohistochemistry (400× magnification).

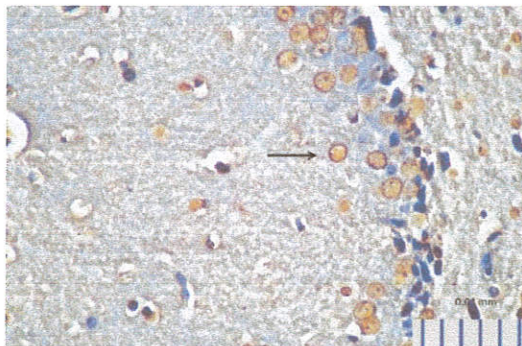


Fig. 8. Representative image of brain 5-HTT expression in rats treated with *L. plantarum* IS-10506 (400× magnification).

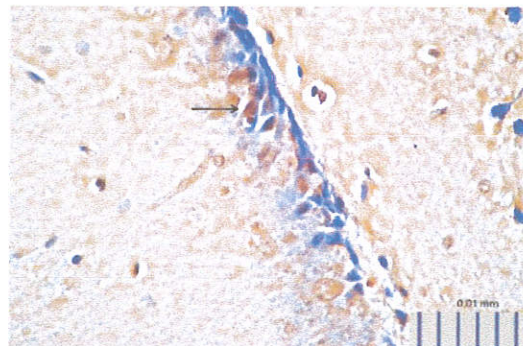


Fig. 11. Representative image of brain NT expression in rats treated with *L. plantarum* IS-10506 (400× magnification).

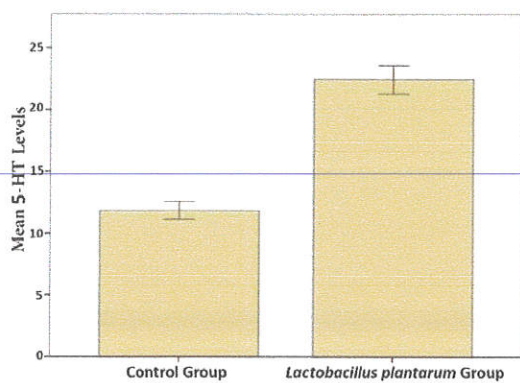


Fig. 9. Quantitative analysis of brain 5-HTT levels in *L. plantarum* IS-10506 treated and control rats. Data represent mean \pm SE (n = 10/group).

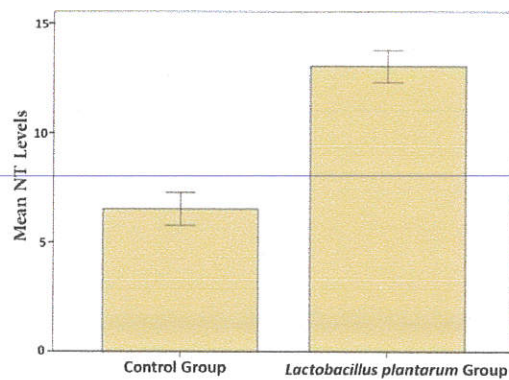


Fig. 12. Quantitative analysis of brain NT levels in *L. plantarum* IS-10506 treated and control rats. Data represent mean \pm SE (n = 10/group).

neurotrophin expression in the brain and intestine.

5-HT is released from enterochromaffin cells of the gastric mucosa in response to various stimuli including signals from gut microbiota (15-17). Although 5-HT is a well-known neurotransmitter that is associated with emotion and behaviour, about 90% of 5-HT in the body is produced in the digestive tract where it is involved in the detection of resource availability and regulation of bowel movement. In platelets, 5-HT contributes to haemostasis and in the central nervous system (CNS), it regulates mood, cognition, appetite, and sleep. 5-HT is also associated with bone metabolism and organ development (8, 9, 17). Gut microbiota stimulates host intestinal cells to produce 5-HT. An imbalance of 5-HT in the brain can lead to depression, whereas peripheral dysregulation of this neurotransmitter has been linked to a variety of diseases (1, 2, 7, 12, 15, 16, 18-21). In this study we found that treatment with *L. plantarum* IS-10506 caused an increase in brain 5-HT level in rats relative to the control group.

BDNF is the most abundant and widely distributed growth factor in the CNS and is important for neuronal survival, migration, and differentiation; axonal and dendritic growth; synapse formation; regulation of synaptic plasticity and behaviour (1, 10, 14, 16, 22); and hippocampal neurogenesis (23). We found here that brain BDNF expression in the hippocampus was enhanced by *L. plantarum* IS-10506 treatment relative to untreated rats, implying that probiotic supplementation can enhance brain development, especially memory and brain plasticity.

5-HTT may contribute to the maintenance of BDNF equilibrium and brain function. Gut microbes are thought to regulate 5-HTT expression (24). Previous studies have shown that the supernatant of *Lactobacillus rhamnosus* GG (LGG) cultures increases 5-HTT expression in mouse intestine (25), whereas *Lactobacillus acidophilus* and *Bifidobacterium longum* culture supernatants have the same effect in intestinal epithelial cells (2). In this study, the number of hippocampal neurons expressing 5-HTT was higher in rats that received *L. plantarum* IS-10506 supplementation than in those without treatment, suggesting that probiotics enhance serotonergic function in the brain.

NTs constitute a family of proteins that promote the survival, development, and function of neurons, in part by inducing BDNF release from hippocampal neurons (26). We observed that *L. plantarum*

IS-10506 treatment increased the level of NT in the brain, which corresponded to the elevation in BDNF level. Thus, *L. plantarum* IS-10506 supplementation may enhance neuronal survival, differentiation, and growth.

CONCLUSION

The results of this study indicate that *L. plantarum* IS-10506 treatment can increase intestinal 5-HT and brain 5-HTT, BDNF, and NT expression in adult rats. These findings suggest that probiotics can promote brain development and function and offer a model for investigating the effects of exogenous factors on the gut-brain axis.

ACKNOWLEDGEMENTS

All authors declare that they have no conflict of interest.

REFERENCES

1. Carabotti M, Scirocco A, Antonietta M, Severi C. The gut-brain axis : interactions between enteric microbiota , central and enteric nervous systems. *Ann Gastroenterol* 2015; 28:203-209.
2. Cao H, Liu X, An Y, Zhou G, Liu Y, Xu M. Dysbiosis contributes to chronic constipation development via regulation of serotonin transporter in the intestine. *Sci Rep* 2017;7:10322.
3. Chen JJ, Li Z, Pan H, Murphy DL, Tamir H, Koepsell H, et al. Maintenance of serotonin in the intestinal mucosa and ganglia of mice that lack the high-affinity serotonin transporter : Abnormal intestinal motility and the expression of cation transporters. *J Neurosci* 2001;21:6348-6361.
4. Foster JA, Rinaman L, Cryan JF. Stress & the gut-brain axis: Regulation by the microbiome. *Neurobiol Stress* 2017;7:124-136.
5. Farzi A, Fröhlich EE, Holzer P. Gut microbiota and the neuroendocrine system. *Neurotherapeutics* 2018;15:5-22.
6. Dinan TG, Cryan JF. The microbiome-gut-brain axis in health and disease. *Gastroenterol Clin North Am* 2017;46:77-89.
7. Cerdó T, Ruiz A, Suárez A, Campoy C. Probiotic, pebiotic, and brain development. *Nutrients* 2017;9(11):

- E1247.
8. Popova NK, Naumenko VS. 5-HT 1A receptor as a key player in the brain 5-HT system. *Rev Neurosci* 2013;24:191-204.
 9. Colucci R, Gambaccini D, Ghisu N, Rossi G, Costa F, Tuccori M, et al. Influence of the serotonin transporter 5HTTLPR polymorphism on symptom severity in irritable bowel syndrome. *PLoS One* 2013;8(2):e54831.
 10. Morse JK, Wiegand SJ, Anderson K, You Y, Cai N, Carnahan J, et al. Brain-derived neurotrophic factor (BDNF) prevents the degeneration of medial septal cholinergic neurons following fimbria transection. *J Neurosci* 1993;13:4146-4156.
 11. Montiel-Castro AJ, González-Cervantes RM, Bravo-Ruiseco G, Pacheco-López G. The microbiota-gut-brain axis: neurobehavioral correlates, health and sociality. *Front Integr Neurosci* 2013;7:70.
 12. Jiang H, Ling Z, Zhang Y, Mao H, Ma Z, Yin Y, et al. Brain, behavior, and immunity altered fecal microbiota composition in patients with major depressive disorder. *Brain Behav Immun* 2015;48:186-194.
 13. Sarkar A, Lehto SM, Harty S, Dinan TG, Cryan JF, Burnet PWJ. Psychobiotics and the manipulation of bacteria-gut-brain signals. *Trends Neurosci* 2016;39:763-781.
 14. Hata T, Asano Y, Yoshihara K, Kimura-Todani T, Miyata N, Zhang XT, et al. Regulation of gut luminal serotonin by commensal microbiota in mice. *PLoS One* 2017;12(7):e0180745.
 15. Malinova TS, Dijkstra CD, de Vries HE. Serotonin: A mediator of the gut-brain axis in multiple sclerosis. *Mult Scler* 2018;24:1144-1150.
 16. Martinowich K, Lu B. Interaction between BDNF and serotonin: role in mood disorders. *Neuropsychopharmacology* 2008;33:73-83.
 17. Pittalà V, Salerno L, Modica M, Siracusa MA, Romeo G. 5-HT 7 receptor ligands: recent developments and potential therapeutic applications. *Mini Rev Med Chem* 2007;7:945-960.
 18. Artigas I, Academy N. Neurotrophin release by neurotrophins: Implications for activity-dependent neuronal plasticity. *Proc Natl Acad Sci U S A* 1997;94:13279-13286.
 19. Erny D, Hrabě de Angelis AL, Jaitin D, Wieghofer P, Staszewski O, David E, et al. Host microbiota constantly control maturation and function of microglia in the CNS. *Nat Neurosci* 2015;18:965-977.
 20. Evrensel A, Ceylan ME. Gut-microbiota-brain axis: the missing link in depression. *Clin Psychopharmacol Neurosci* 2015;13:239-244.
 21. George R, Kumar J, Gouda S, Park Y, Shin H, Das G. Science direct benefaction of probiotics for human health: A review. *J Food Drug Anal* 2018;26:927-939.
 22. Mayer EA. Gut feelings: the emerging biology of gut-brain communication. *Nat Rev Neurosci* 2011;12:453-466.
 23. Rossi C, Angelucci A, Costantin L, Braschi C, Mazzantini M, Babbini F. Brain-derived neurotrophic factor (BDNF) is required for the enhancement of hippocampal neurogenesis following environmental enrichment. *Eur J Neurosci* 2006;24: 1850-1856.
 24. Sahar El Aidy, Anouschka S. Ramsteijn, Francisco Dini-Andreote, Roel van Eijk, Danielle J. Houwing, Joana F. Salles, et al. Serotonin transporter genotype modulates the gut microbiota composition in young rats, an effect augmented by early life stress. *Front Cell Neurosci* 2017; 11: 222.
 25. Wang YM, Ge XZ, Wang WQ, Wang T, Cao HL, Wang BL, et al. *Lactobacillus rhamnosus* GG supernatant up-regulates serotonin transporter expression in intestinal epithelial cells and mice intestinal tissues. *Neurogastroenterol Motil* 2015; 27: 1239-1248.
 26. Canossa M, Giordano E, Cappello S, Guarnieri C, Ffiri S. Nitric oxide down-regulates brain-derived neurotrophic factor secretion in culture hippocampal neurons. *Proc Natl Acad Sci U S A* 2002 ;99:3282-3287.

Source details

Iranian Journal of Microbiology

Open Access ⓘ

Scopus coverage years: from 2010 to Present

Publisher: Tehran University of Medical Sciences

ISSN: 2008-3289 E-ISSN: 2008-4447

Subject area: Medicine: Microbiology (medical) Immunology and Microbiology: Microbiology

CiteScore 2019
1.6 ⓘ

Add CiteScore to your site

SJR 2019
0.329 ⓘ

SNIP 2019
0.655 ⓘ

[View all documents >](#) [Set document alert](#) [Save to source list](#)

[CiteScore](#) [CiteScore rank & trend](#) [Scopus content coverage](#)

Improved CiteScore methodology ⓘ

CiteScore 2019 counts the citations received in 2016-2019 to articles, reviews, conference papers, book chapters and data papers published in 2016-2019, and divides this by the number of publications published in 2016-2019. [Learn more >](#)

CiteScore 2019

1.6 = $\frac{387 \text{ Citations 2016 - 2019}}{247 \text{ Documents 2016 - 2019}}$

Calculated on 06 May, 2020

CiteScoreTracker 2020 ⓘ

1.1 = $\frac{252 \text{ Citations to date}}{221 \text{ Documents to date}}$

Last updated on 10 June, 2020 • Updated monthly

CiteScore rank 2019 ⓘ

Category	Rank	Percentile
Medicine		
Microbiology (medical)	#81/115	30th
Immunology and Microbiology		
Microbiology	#119/147	19th

[View CiteScore methodology >](#) [CiteScore FAQ >](#) [🔗](#)

- About Scopus**
- What is Scopus
 - Content coverage
 - Scopus blog
 - Scopus API
 - Privacy matters

- Language**
- 日本語に切り替える
 - 切换到简体中文
 - 切换到繁體中文
 - Русский язык

- Customer Service**
- Help
 - Contact us



SJR

Scimago Journal & Country Rank

Enter Journal Title, ISSN or Publisher Name

[Home](#)
[Journal Rankings](#)
[Country Rankings](#)
[Viz Tools](#)
[Help](#)
[About Us](#)

Ads by Google

[Stop seeing this ad](#)
[Why this ad?](#)

Iranian Journal of Microbiology

Country [Iran](#) - [SJR Ranking of Iran](#)
Subject Area and Category [Immunology and Microbiology](#)
[Microbiology](#)
[Medicine](#)
[Microbiology \(medical\)](#)
Publisher [Teheran University of Medical Sciences](#)

23

H Index

Publication type Journals

ISSN 20083289, 20084447

Coverage 2010-2020

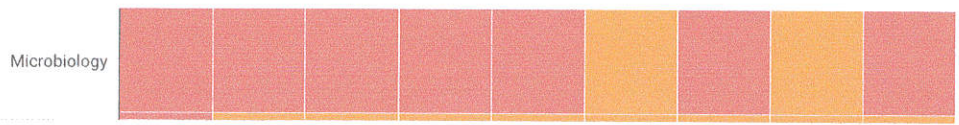
Scope The Iranian Journal of Microbiology (IJM) is an international, multi-disciplinary, peer-reviewed journal that provides rapid publication of the most advanced scientific research in the areas of basic and applied research on bacteria and other micro-organisms, including bacteria, viruses, yeasts, fungi, microalgae, and protozoa concerning the development of tools for diagnosis and disease control, epidemiology, antimicrobial agents, clinical microbiology, immunology, Genetics, Genomics and Molecular Biology. Contributions may be in the form of original research papers, review articles, short communications, case reports, technical reports, and letters to the Editor. Research findings must be novel and the original data must be available for review by the Editors, if necessary. Studies that are preliminary, of weak originality or merely descriptive as well as negative results are not appropriate for the journal. Papers considered for publication must be unpublished work (except in an abstract form) that is not under consideration for publication anywhere else, and all co-authors should have agreed to the submission. Manuscripts should be written in English.

[Homepage](#)[How to publish in this journal](#)[Contact](#)[Join the conversation about this journal](#)

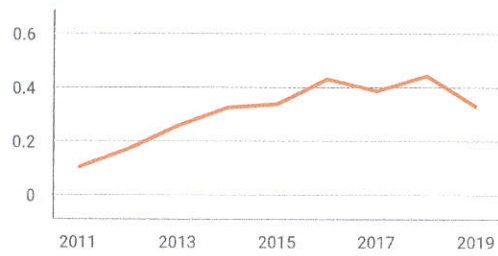
Ads by Google

[Stop seeing this ad](#)
[Why this ad?](#)

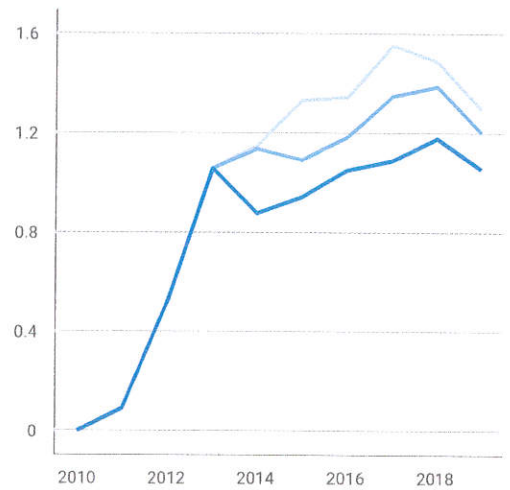
Quartiles



SJR

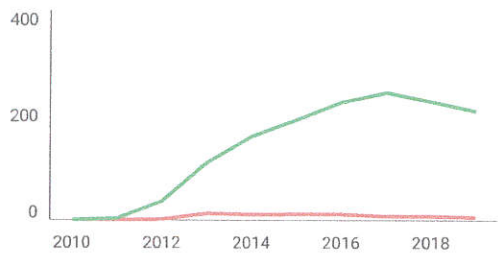


Citations per document

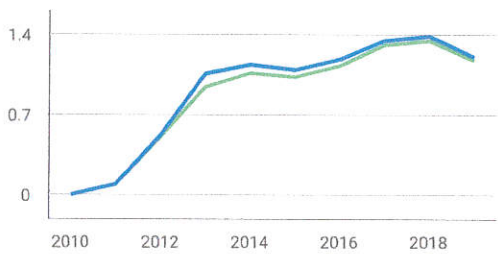


● Cites / Doc. (4 years)
● Cites / Doc. (3 years)
● Cites / Doc. (2 years)

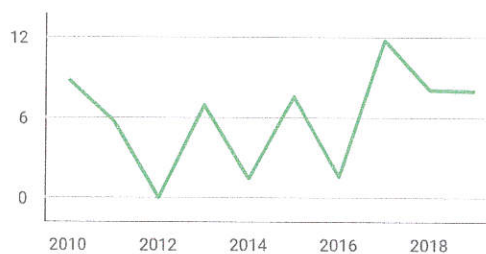
Total Cites Self-Cites



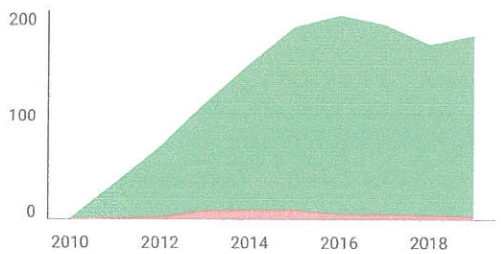
External Cites per Doc Cites per Doc



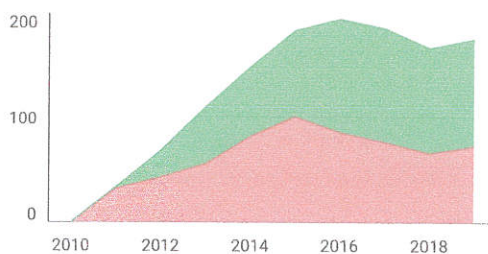
% International Collaboration



Citable documents Non-citable documents



Cited documents Uncited documents



Iranian Journal of Microbiology

Q3

Microbiology (medical)

best quartile

SJR 2019
0.33



powered by scimagojr.com

Show this widget in your own website

Just copy the code below and paste within your html code:

<a href="https://www.scima

Muhammad Ibrahim 7 months ago

Dear Sir,

I hope you will be fine. I want to publish a paper in your Journal. What are APC and how much time will be taken in publishing?

reply



Melanie Ortiz 7 months ago

SCImago Team

Dear Muhammad,

thank you for contacting us.

Sorry to tell you that SCImago Journal & Country Rank is not a journal. SJR is a portal with scientometric indicators of journals indexed in Elsevier/Scopus.

Unfortunately, we cannot help you with your request, we suggest you to visit the journal's homepage or contact the journal's editorial staff , so they could inform you more deeply.

Best Regards, SCImago Team

Reham 2 years ago

I have Original article and I want to publishing in your Journal (Iranian Journal of Microbiology) please help me I ready to pay the cost . thanks so much

reply

Leave a comment

Name

Email

(will not be published)

I'm not a robot

reCAPTCHA
Privacy - Terms

Submit

The users of Scimago Journal & Country Rank have the possibility to dialogue through comments linked to a specific journal. The purpose is to have a forum in which general doubts about the processes of publication in the journal, experiences and other issues derived from the publication of papers are resolved. For topics on particular articles, maintain the dialogue through the usual channels with your editor.

Developed by:



Powered by:



Follow us on @ScimagoJR

Scimago Lab, Copyright 2007-2020. Data Source: Scopus®

EST MODUS IN REBUS
Horatio (Saturni 1.1.106)