

2024 · VOLUME 49 · ISSUE 4

TURKISH JOURNAL OF BIOCHEMISTRY TÜRK BİYOKİMYA DERGİSİ

OFFICIAL JOURNAL OF THE TURKISH BIOCHEMICAL SOCIETY

EDITOR IN CHIEF

Doğan Yücel, Ankara, TR

VICE EDITORS

Aylin Sepici Dinçel, Ankara, TR
Merve Sibel Güngören, Ankara, TR
Güneş Özhan, İzmir, TR
Oytun Portakal, Ankara, TR
Muhittin Serdar, Ankara, TR
Mehmet Şeneş, Ankara, TR

ASSOCIATE EDITORS

Sedat Abuşoğlu, Konya, TR
Hamit Hakan Alp, Van, TR
Sreeparna Banerjee, Ankara, TR
Burak Barut, Trabzon, TR
Tülin Bayrak, Ordu, TR
Murat Bolayırılı, İstanbul, TR
Abdurrahman Coşkun, İstanbul, TR
Özlem Dalmızrak, Nicosia, TRNC
Birsan Can Demirdöğen, Ankara, TR

Halef Okan Doğan, Sivas, TR
Perinur Bozaykut Eker, İstanbul, TR
Suat Erdoğan, Edirne, TR
Uzay Görmüş, Solna, SE
Gürcan Günaydın, Ankara, TR
Semra Koçtürk, İzmir, TR
Işıl Aksun Kurnaz, Kocaeli, TR
Melek Özkan, Kocaeli, TR
Ebru Saatçi, Kayseri, TR
Çağdaş Son, Ankara, TR
Alaattin Şen, Denizli, TR
Deniz İlhan Topçu, İzmir, TR
Hamdi Uysal, Ankara, TR
Serenay Elgün Ülkar, Ankara, TR
Ali Ünlü, Konya, TR
İlhan Yaylım, İstanbul, TR
Fatma Meriç Yılmaz, Ankara, TR
Meral Yüksel, İstanbul, TR

STATISTICS EDITORS

Erdal Coşgun, Redmond, WA, USA
Sevilay Karahan, Ankara, TR
Jale Karakaya, Ankara, TR

TECHNICAL EDITORS

Gizem Yılmaz Çalık, Ankara, TR
Serkan Bolat, Sivas, TR
Merve Sibel Güngören, Ankara, TR
Duygu Eryavuz Onmaz, Konya, TR
Duygu Şahin, İstanbul, TR
Emel Çolak Samsun, Ankara, TR
İsmail Sarı, Kırklareli, TR
Z. Onur Uygun, İzmir, TR
Oğuzhan Zengi, İstanbul, TR

CORRESPONDENCE

Nermin Şahan, Ankara, TR

DE GRUYTER

EDITORIAL BOARD

Erdal Karaöz, Department of Histology and Embryology, Faculty of Medicine, İstinye University, İstanbul, TURKIYE

Reşat Apak, Department of Chemistry, Faculty of Engineering, İstanbul University Cerrahpaşa Research Information System, İstanbul, TURKIYE

Khosrow Adeli, Molecular Medicine, Research Institute, The Hospital for Sick Children, University of Toronto, Toronto, Ontario, CANADA

Fatih Gültekin, Department of Medical Biochemistry, Faculty of Medicine, Lokman Hekim University, Ankara, TURKIYE

Anyla Buló-Kasneci, Laboratory Department, University Hospital Center “Mother Teresa”, Tirana, ALBANIA

Orhan Değer, Department of Medical Biochemistry, Faculty of Medicine, Karadeniz Technical University, Trabzon, TURKIYE

Elif Demirkan, Department of Biology, Faculty of Arts & Sciences, Uludağ University, Bursa, TURKIYE

Z. Günnur Dikmen, Department of Biochemistry, Faculty of Medicine, Hacettepe University, Ankara, TURKIYE

Miral Dizdaroğlu, National Institute of Standards and Technology, Gaithersburg, MD, USA

Mustafa B. A. Djamgoz, Department of Life Sciences, Faculty of Natural Sciences, Imperial College, London, UNITED KINGDOM

Gökhan Hotamışlıgil, Department of Genetics and Complex Diseases, Harvard School of Public Health, Boston, USA

Mehmet Kesimer, Department of Pathology and Laboratory Medicine, Marsico Lung Institute, University of North Carolina at Chapel Hill, NC, USA

İrfan Küfrevioğlu, Department of Chemistry, Faculty of Art & Sciences, Atatürk University, Erzurum, TURKIYE

Nada Majkic-Singh, Institute of Medical Biochemistry, Pharmaceutical Faculty and Clinical Centre of Serbia, Belgrade, SERBIA

Gülgün Oktay, Department of Medical Biochemistry, Faculty of Medicine, University of Dokuz Eylül, İzmir, TURKIYE

Yeşim Özarda, Department of Medical Biochemistry, Faculty of Medicine, Uludağ University, Bursa, TURKIYE

Tomris Özben, Department of Medical Biochemistry, Faculty of Medicine, Akdeniz University, Antalya, TURKIYE

Nazmi Özer, Faculty of Pharmacy, Girne American University, Nicosia, TRNC

İsrail Pecht, Department of Immunology, Weizmann Institute of Science, Rehovot, ISRAEL

Mario Plebani, Department of Medical Sciences, University of Padova, Padova, ITALY

Demetrios Rizos, Hormonal and Biochemical Laboratory, Aretaieio Hospital, University of Athens, Athens, GREECE

George Russev, Bulgarian Academy of Sciences, Institute of Molecular Biology, Sofia, BULGARIA

Fahri Saatçioğlu, Department of Biosciences, University of Oslo, Oslo, NORWAY

Ferhan Girgin Sağın, Department of Medical Biochemistry, Faculty of Medicine, Ege University, İzmir, TURKIYE

Aziz Sancar, Department of Biochemistry and Biophysics, University of North Carolina School of Medicine, Chapel Hill, NC, USA

Praveen Sharma, All India Institute of Medical Sciences, Jodhpur, INDIA

Emin Sofic, Department of Chemistry, Faculty of Science, Sarajevo University, Sarajevo, BOSNIA AND HERZEGOVIA

Eser Sözmen, Department of Medical Biochemistry, Faculty of Medicine, University of Ege, İzmir, TURKIYE

Ali Ünlü, Department of Biochemistry, Faculty of Medicine, Selçuk University, Konya, TURKIYE

Sedef Yenice, Department of Clinical Chemistry, Group Florence Nightingale Hospitals, İstanbul, TURKIYE

Turkish Journal of Biochemistry (TJB), official journal of Turkish Biochemical Society, is issued electronically every 2 months. Research articles, reviews, short communications, technical reports, case presentations, opinions, and letters to the editor, that have not published elsewhere, on biochemistry, clinical biochemistry, molecular biology, molecular genetics, biotechnology, bioinformatics, bioengineering, and their educational disciplines are published in the journal.

The main aim of the journal is to support the research and publishing culture by ensuring that every published manuscript has an added value and thus providing international acceptance of the “readability” of the manuscripts published in the journal.

ABSTRACTED/INDEXED IN Baidu Scholar · Cabells Journalytics · CABI (over 50 subsections) · Chemical Abstracts Service (CAS): CAPplus; SciFinder · CNKI Scholar (China National Knowledge Infrastructure) · CNPIEC: cnpLINKer · Dimensions · DOAJ (Directory of Open Access Journals) · EBSCO (relevant databases) · EBSCO Discovery Service · EMBASE · FSTA: Food Science & Technology Abstracts · Genamics JournalSeek · Google Scholar · Index Copernicus · Japan Science and Technology Agency (JST) · J-Gate · Journal Citation Reports/Science Edition · JournalGuide · MyScienceWork · Naver Academic · Naviga (Softweco) · Primo Central (ExLibris) · Publons · QOAM (Quality Open Access Market) · ReadCube · ScienceON (Korea Institute of Science and Technology Information) · Scilit · SCImago (SJR) · SCOPUS · Semantic Scholar · Sherpa/RoMEO · Summon (ProQuest) · TDNet · TEMA Technik und Management · TÜBİTAK/ULAKBİM · TÜRK MEDLINE-ULUSAL ATIF İNDEKSİ ve TÜRKİYE ATIF DİZİNİ · Ulrich's Periodicals Directory/ulrichsweb · WanFang Data · Web of Science: Science Citation Index Expanded · WorldCat (OCLC) · X-MOL · Yewno Discover

e-ISSN 1303-829X

All information regarding notes for contributors, subscriptions, open access, back volumes and orders is available online at www.degruyter.com/view/j/tjb.

RESPONSIBLE EDITOR Doğan Yücel PhD, Professor of Biochemistry, Department of Medical Biochemistry, Faculty of Medicine, University of Lokman Hekim, Söğütözü Mh. 2179 Cd. No:6, Çankaya, 06510, Ankara, Türkiye, Tel: +90 4448548, Email: dogan.yucel@lokmanhekim.edu.tr

JOURNAL COORDINATOR Heike Jahnke, De Gruyter, Genthiner Str. 13, 10785 Berlin, Germany. Tel.: +49 (0) 30 260 05–220, Email: heike.jahnke@degruyter.com

ADVERTISEMENTS e-mail: anzeigen@degruyter.com

TYPESETTING TNQ Tech Private Limited, Chennai, India

© 2024 Walter de Gruyter GmbH, Berlin/Boston