

VOL. 146 NO. 6 DEC. 2009
JOBIAO 146 (6) 743–923 (2009)

THE JOURNAL OF BIOCHEMISTRY

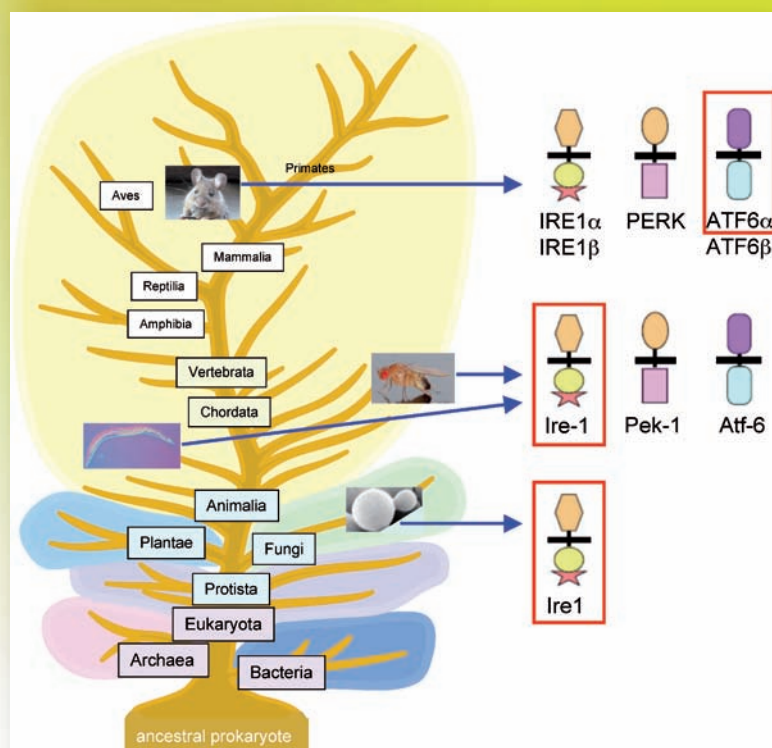
JB

Published Monthly by THE JAPANESE BIOCHEMICAL SOCIETY

BIOCHEMISTRY
MOLECULAR BIOLOGY
CELL
BIOTECHNOLOGY

JB MINIREVIEWS
Quality Control of the Cellular Protein Systems

JB REVIEW
Hypoxia Signal Transduction



<http://jb.oxfordjournals.org/>

EDITORIAL BOARD

Editor-in-Chief

Naoyuki TANIGUCHI (Suita)

Editors

<i>JB Reviews</i>	Sen-itiroh HAKOMORI (Seattle) Atsushi MIYAJIMA (Tokyo)
<i>Biochemistry</i>	Gerald W. HART (Baltimore) Seiki KURAMITSU (Toyonaka) Bettie Sue MASTERS (San Antonio) Akemi SUZUKI (Hiratsuka)
<i>Molecular Biology</i>	Walter NEUPERT (München) Yoshihide TSUJIMOTO (Suita)
<i>Cell</i>	Frank D. BÖHMER (Jena) Kohei MIYAZONO (Tokyo)
<i>Biotechnology</i>	Chris Y. H. TAN (Vancouver, Canada) Takuya UEDA (Tokyo)

Managing Editors

Kensaku MIZUNO (Sendai) Yoshinobu NAKANISHI (Kanazawa)

Associate Editors

<i>JB Reviews</i>	Anindya DUTTA (Charlottesville) Tatsuro IRIMURA (Tokyo) Shigeaki KATO (Tokyo)	Hisao MASAI (Tokyo) Hiroshi OHNO (Yokohama)
<i>Biochemistry</i>	Fumio ARISAKA (Yokohama) Vytas A. BANKAITIS (Chapel Hill) Junichi FUJII (Yamagata) Yuji GOTO (Suita) Koichi HONKE (Nankoku) Shoichi ISHIURA (Tokyo) Johannis P. KAMERLING (Utrecht)	Nobuo KAMIYA (Osaka) Makoto KIMURA (Fukuoka) Ken KITAJIMA (Nagoya) Katsuyuki TANIZAWA (Ibaraki) Masato UMEDA (Uji) Yuriko YAMAGATA (Kumamoto) Takehiko YOKOMIZO (Fukuoka) Pradman K. QASBA (Frederick) Takashi SUDA (Kanazawa) Takeshi TODO (Suita)
<i>Molecular Biology</i>	Yukio FUJIKI (Fukuoka) Kenji KOHNO (Ikoma) Bok Luel LEE (Busan) Shoko NISHIHARA (Hachioji) Suk-Chul BAE (Gaesindong) Nils BROSE (Gottingen) Yutaka HATA (Tokyo) Shigeki HIGASHIYAMA (Toon)	Eunjoon KIM (Daejeon) Tohru KOZASA (Chicago) Aristidis MOUSTAKAS (Uppsala) Atsuko SEHARA-FUJISAWA (Kyoto) Toshiyuki TAKAI (Sendai)
<i>Cell</i>	Takeshi IWATSUBO (Tokyo) Akira KIKUCHI (Hiroshima) Yo KIKUCHI (Toyohashi) Sunghoon KIM (Seoul) Włodzimierz J. KRZYŻOSIAK (Poznan) Keiko MIZUTA (Higashihiroshima)	Ken-ichi NISHIYAMA (Tokyo) Kouhei TSUMOTO (Kashiwa) Kazuo YAMAMOTO (Tokyo)
<i>Biotechnology</i>		

Advisory Board

<i>Biochemistry</i> Junken AOKI (Sendai) Jin Won CHO (Seoul) Catherine E. COSTELLO (Boston) Jeffrey D. ESKO (La Jolla) Jianguo GU (Sendai) Yann GUÉRARDEL (Villeneuve d'Ascq) Robert S. HALTIWANGER (Stony Brook) Toshiharu HASE (Suita) Yasuhiro HASHIMOTO (Fukushima) Kihachiro HORIIKE (Otsu) Yoshizumi ISHINO (Fukuoka) Makoto ITO (Fukuoka) Kenji KADOMATSU (Nagoya)	Reiji KANNAGI (Nagoya) Shun-ichiro KAWABATA (Fukuoka) Ikuro KAWAGISHI (Koganei) Gota KAWAI (Narashino) Hiroshi KITAGAWA (Kobe) Masayasu KOJIMA (Kurume) Hiroki KONDO (Iizuka) Michiko KONNO (Tokyo) Yasunori KOZUTSUMI (Kyoto) Ryoji MASUI (Toyonaka) Catharina Taiko MIGITA (Yamaguchi) Toru NAKAYAMA (Sendai) Hisashi NARIMATSU (Tsukuba)	Takeshi NIKAWA (Tokushima) Haruko OGAWA (Tokyo) Toshihisa OHSHIMA (Fukuoka) Michael PIERCE (Athens) Yoshihiro SAMBONGI (Higashi-Hiroshima) Ryo TAGUCHI (Tokyo) Yoshinao WADA (Izumi) Keisuke WAKASUGI (Tokyo) Akihiko YOSHIMURA (Tokyo) Tohru YOSHIMURA (Nagoya) Junn YANAGISAWA (Tsukuba)
<i>Molecular Biology</i> Masato ENARI (Tokyo) Toshiya ENDO (Nagoya) Masatoshi FUJITA (Tokyo) Tetsuro KOKUBO (Yokohama) Won-Jae LEE (Seoul) Roland LILL (Marburg)	Katsuyoshi MIHARA (Fukuoka) Masayuki MIURA (Tokyo) Masamichi MURAMATSU (Kanazawa) Kazuhiro NAGATA (Kyoto) Kunihiro OHTA (Tokyo) Takashi OSUMI (Hyogo)	Kazuhiro SAKAMAKI (Kyoto) Shigeomi SHIMIZU (Tokyo) Kaoru SUGASAWA (Kobe) Minoru TAKATA (Kyoto) Tohru YOSHIHISA (Nagoya)

Cell

Tomoichiro ASANO (Hiroshima)
Mitsunori FUKUDA (Sendai)
Masato HASEGAWA (Tokyo)
Thorsten HEINZEL (Jena)
Hidenori ICHJO (Tokyo)
Yasuki ISHIZAKI (Maebashi)
Bong-Kiun KAANG (Seoul)
Dimitris KARDASSIS (Heraklion)

Michael KLAGSBRUN (Boston)
Hitoshi KUROSE (Fukuoka)
Noboru MIZUSHIMA (Tokyo)
Tatsushi MUTA (Sendai)
Hideaki NAGASE (London)
Koh-ichi NAGATA (Kasugai)
Kazuhisa NAKAYAMA (Kyoto)
Hitoshi OHMORI (Okayama)

Chie SAKANAKA (South San Francisco)
Takuya SASAKI (Tokushima)
Kiyotoshi SEKIGUCHI (Suita)
Roger K. SUNAHARA (Ann Arbor)
Kazuma TANAKA (Sapporo)
Keiko UDAKA (Nankoku)
Tamotsu YOSHIMORI (Suita)

Biotechnology

Toshihiko EKI (Toyohashi)
Yoshihisa HAGIHARA (Ikeda)
Jun HIRABAYASHI (Tsukuba)

Mitsuhiro ITAYA (Tsuruoka)
Yasushi KAWATA (Tottori)
Katsumi MAENAKA (Fukuoka)

Makoto MAKISHIMA (Tokyo)
Tomoaki MATSUURA (Suita)
Hiroshi UEDA (Tokyo)

This JOURNAL, devoted to publication of original papers in the fields of biochemistry, molecular biology, cell, and biotechnology, was founded in 1922.

The JOURNAL is published monthly, with two volumes per annum.

All correspondences concerning this JOURNAL should be addressed to: The Japanese Biochemical Society, Ishikawa Building-3f, 25-16, Hongo 5-chome, Bunkyo-ku, Tokyo 113-0033, Japan. Tel. +81-3-3815-1913, Fax. +81-3-3815-1934

Subscription

Annual subscription rate (Volume 145 and Volume 146, 2009)

Corporate Subscribers

Print and Online £318.00/ \$636.00/ €477.00

Online Only £302.00/ \$604.00/ €453.00

Print Only £302.00/ \$604.00/ €453.00

Institutional Subscribers

Print and Online £254.00/ \$508.00/ €381.00

Online Only £241.00/ \$482.00/ €362.00

Print Only £241.00/ \$482.00/ €362.00

Methods of Payment

- (1) By cheque in £ sterling drawn on a UK bank, € Euro drawn on a European bank, or in \$ US drawn on a US bank. Cheques should be made payable to Oxford Journals. All orders should be accompanied by full payment and sent to your nearest Oxford Journals office.
- (2) By bank transfer to Barclays Bank Plc, Oxford Group Office, Oxford (bank sort code: 20-65-18) (UK). Overseas only: SWIFT BARC GB 22.
 - GB £ Sterling to a/c no 70299332 – IBAN GB89BARC20651870299332
 - US \$ Dollars to a/c no 66014600 – IBAN GB27BARC20651866014600
 - EU € Euros to a/c no 78923655 – IBAN GB16BARC20651878923655Please quote our renewal/invoice number and subscriber (if known) when making payment.
- (3) By MasterCard, Switch/Maestro, Visa, or American Express.
- (4) By charge card: automatic annual charge to either Visa or MasterCard is available. Please contact us for further details.

Periodicals postage paid at Rahway, NJ and at additional entry points.

US Postmaster: send address changes to The Journal of Biochemistry (ISSN 0021-924X), c/o Mercury International, 365 Blair Road, Avenel, NJ 07001, USA.

Agencies

Oxford University Press
Journals Subscription Department
Great Clarendon Street
Oxford, OX2 6DP, UK

Japan Publications Trading Co., Ltd.
P.O. Box 5030, Tokyo International,
2-1, Sarugaku-cho 1-chome, Chiyoda-ku,
Tokyo 101-0064, Japan

Maruzen Co., Ltd.
P.O. Box 5050, Tokyo International,
100-3199, Japan

All back issues of the *Journal of Biochemistry* from Volume 1, 1922, are available from our agency: TOA BOOK EXPORTS, INC., Ikebukuro 4-13-4, Toshima-ku, Tokyo 171-0014, Japan. Tel. +81-3-3985-4701, Fax. +81-3-3985-4703

Copyright © 2009, by the Japanese Biochemical Society

Published in association with Oxford University Press

Notice on photocopying With the exception of cases permitted by the Copyrights Law, such as the photocopying services provided by the libraries duly designated by government ordinance and photocopying for lectures by teachers at educational institutions, the photocopying of any part of this publication without explicit consent of the relevant author is a violation of the law. To legally photocopy any part of this publication, the person wishing to photocopy, or the corporation or organization employing such person, is recommended to enter into a comprehensive copyright approval agreement with the following trustee of copyrights from the authors:

(Except in the U.S.A.) The Copyright Council of the Academic Societies, 41-6, Akasaka 9-chome, Minato-ku, Tokyo 107-0052, Japan. Phone: 3-3475-4621, Fax: 3-3403-1738

(In the U.S.A.) Copyright Clearance Center, Inc., 222 Rosewood Drive, Danvers, MA 01923, U.S.A. Phone: 978-750-8400, Fax: 978-646-8600

NOTES TO CONTRIBUTORS

The JOURNAL OF BIOCHEMISTRY publishes contributions written in English and submitted in the form of (1) Regular paper or (2) Rapid communication, covering materials requiring prompt publication.

The submission of a manuscript implies that the work has not been published previously, that it is not under consideration for publication elsewhere, and that if it is accepted for publication, the author(s) will grant an exclusive license to publish to the Japanese Biochemical Society.

Manuscripts should be succinct. No length limit is set for a Regular paper, whereas a Rapid communication must not exceed 3.5 printed pages. Author charges consist of Color Charge and Offprint Charge, but there are no Page Charges.

Submission should be made through the online submission system at <<http://mc.manuscriptcentral.com/jb>>. We no longer handle submission by post. For further information on online submission, please see: Instructions for Online Submission <http://www.oxfordjournals.org/jbchem/for_authors/auth1.html>.

Reprints can be purchased, in lots of 50 copies, at cost prices. The orders should be submitted with the returned proof.

When submitting manuscripts, authors are asked to select one of the following four fields and its topic under which the submission should be reviewed. Please indicate this selection on the title page of the manuscript. Authors may suggest names and addresses of persons suitable for reviewing their submitted works.

Fields and topics to be selected:

Fields: Topics

Biochemistry: Biochemistry General

- Protein Structure
- Protein Interaction and Recognition
- Biomolecular Structures
- Nucleic Acid and Peptide Biochemistry
- Glycobiology and Carbohydrate Biochemistry
- Lipid Biochemistry
- Enzymology
- Enzyme Inhibitors
- Biochemistry of Proteolysis
- Metabolism and Bioenergetics
- Reactive Oxygen and Nitrogen Species
- Biochemistry in Cell Membranes
- Biochemistry in Diseases and Aging
- Neurochemistry
- Immunochemistry
- Physiological Chemistry
- Biochemical Pharmacology
- Analytical Biochemistry

Molecular Biology: Molecular Biology General

- Genes and Other Genetic Materials
- Replication and Recombination
- Gene Expression
- Protein Synthesis
- DNA-Protein Interaction
- RNA Processing
- Genetic Engineering
- Genetic Diseases
- Molecular Genetics
- Molecular Evolution
- Bioinformatics

Fields: Topics

Cell: Cell General

Biomembranes, Organelles, and Protein Sorting
Muscles
Cytoskeleton, Cell Motility, and Cell Shape
Extracellular Matrices and Cell Adhesion Molecules
Cell Cycle
Receptors and Signal Transduction
Stress Proteins and Molecular Chaperones
Cell Death
Differentiation, Development, and Aging
Neurobiology
Tumor and Immunology

Biotechnology: Biotechnology General

Biomimetic Chemistry
Biomaterials
Bioactive Substances
Synthetic Peptides and Oligonucleotides
Gene and Protein Engineering
RNA Technology
Glycotechnology
Immunological Engineering
Cell and Tissue Engineering
Transgenic Technology
Gene Delivery Systems
Drug Delivery Systems
Biosensor and Bioelectronics
New Devices in Biotechnology
Environmental Technology

“Instructions to Authors” are printed in the January and July issues of this JOURNAL every year. Please conform to these instructions when submitting manuscripts. Reprint of “Instructions to Authors” is available.

New Announcement (Limited Publication)

JOURNAL OF BIOCHEMISTRY, GENERAL CONTENTS

Volume 37–66 (1950–1969) Cloth Bound
700 page, including Author and Subject
Index US \$90.00

Volume 67–98 (1970–1985) Cloth Bound
1000 page, including Author and Subject
Index US \$120.00

Now available through: TOA BOOK EXPORTS, INC.,
Ikebukuro 4-13-4, Toshima-ku, Tokyo 171-0014, Japan.

Author Index

- | | | | |
|-----------------------------|---------------------------|--------------------|----------------------|
| Akagawa, K., 905 | Kamitani, T., 821 | Nagayasu, Y., 881 | Suzuki, T., 833 |
| Arakaki, N., 787 | Kato, Y., 833 | Naiki, H., 751 | Suzuki, Y., 839 |
| Arumugam, B., 895 | Kawarabayasi, Y., 767 | Nakanishi, N., 857 | |
| Azumi, Y., 867 | Kijima, H., 833 | Nakanishi, T., 867 | Takeuchi, F., 857 |
| | Kimura, M., 767 | Nakayama, K., 757 | Tamura, H., 917 |
| Chávez, E., 887 | Kishikawa, J.-i., 845 | Niida, M., 821 | Tanaka, M., 821 |
| Chen, S.-U., 815 | Kita, T., 787 | Niimi, S., 787 | Tanaka, Tsutomu, 867 |
| Chiti, F., 805 | Kohno, T., 875 | Nishida, H., 787 | Tanaka, Takeshi, 875 |
| | Kondo, A., 867 | Nishida, T., 881 | Tayyab, S., 895 |
| Fukuda, H., 867 | Kondo, J., 833 | | Tomiyama, T., 905 |
| | Kubota, M., 875 | Ogino, C., 867 | Torii, S., 839 |
| García, N., 887 | Kurokawa, T., 845 | Okamura, N., 839 | Tsubaki, M., 857 |
| | Kushida, A., 917 | Ong, H.N., 895 | |
| | | | Umetsu, M., 867 |
| Hernández-Esquivel, L., 887 | Lee, H., 815 | Park, S.-Y., 857 | |
| Higashimoto, K., 771 | Lin, H.-S., 815 | Pavón, N., 887 | Wada, K., 821 |
| Higuti, T., 787 | Liu, Y., 833 | | Wakamatsu, K., 875 |
| Hossain, Md. M., 767 | Martínez-Abundis, E., 887 | Rahman, M.M., 857 | |
| Huang, Y.-L., 815 | Matsushita, I., 775, 797 | | Yanase, H., 775, 797 |
| | Miura, M., 857 | Saito, A., 905 | Yasumoto, K.-i., 839 |
| Imaizumi, T., 833 | Monsellier, E., 805 | Sakamoto, J., 845 | Yatsuki, H., 771 |
| Ishizawa, T., 839 | Mori, H., 905 | Sakamoto, Y., 857 | Yokoyama, S., 881 |
| Ito, J.-i., 881 | Mori, K., 743 | Sato, F., 833 | |
| | Morohashi, S., 833 | Shibata, H., 787 | Zazueta, C., 887 |
| Joh, K., 771 | Motamedi-Shad, N., 805 | Shishido, T., 867 | |
| | Mukai, T., 771 | Soejima, H., 771 | |
| Kabashima, Y., 845 | Nagai, Y., 751 | Sogawa, K., 839 | |
| Kakuta, Y., 767 | Nagata, C., 833 | Suga, K., 905 | |

COVER: The UPR mechanism has been investigated mainly in four species, namely, *S. cerevisiae*, *C. elegans*, *D. melanogaster* and *M. musculus*, resulting in identification of UPR transducers localized in the ER, which sense ER stress and transmit signal across the membrane. Yeast UPR consists of the Ire1 pathway only. Worm and fly genomes encode three UPR transducers, Ire-1 (yeast Ire1 homolog), Pek-1 and Atf-6, and the Ire-1 pathway is responsible for the regulation of ER quality control proteins (ER chaperones and ERAD components), as in yeast. Mammalian genome encodes two Ire1 homologues (IRE1 α expressed ubiquitously and IRE1 β expressed only in the gut), one PERK (worm pek-1 homolog), and two ATF6 (ATF6 α and ATF6 β both expressed ubiquitously), and ATF6 α is in charge of regulating ER quality control proteins. Thus, the major regulator of ER quality control proteins has switched from IRE1 to ATF6 during evolution from fly to mammals. [See Mori, p. 743.]

The JB Prize

The Japanese Biochemical Society has introduced the JB Prize since 1993 for the purpose of encouraging the author(s) to submit more papers to the Journal of Biochemistry. The JB prize is awarded annually to the outstanding papers appeared in the issues of the journal published during the preceding one year from January through December. The prize-winning papers are selected from candidate papers nominated by the Committee of the JB Editorial Board and applications of individual author(s), by the Award Committee, which is chosen by the Board of Trustees. The prize may be offered to several papers each with ¥100,000 every year, but the number will never exceed ten.

The 2009 JB Prize goes to:

Yuka Suzuki, Kevin Montagne, Ayako Nishihara, Tetsuro Watabe and Kohei Miyazono: BMPs Promote Proliferation and Migration of Endothelial Cells via Stimulation of VEGF-A/VEGFR2 and Angiopoietin-1/Tie2 Signalling (Vol. 143, No. 2, 199–206, doi:10.1093/jb/mvm215)

Ryohei Ichishita, Kousuke Tanaka, Yoshimi Sugiura, Tomoko Sayano, Katsuyoshi Mihara and Toshihiko Oka: An RNAi Screen for Mitochondrial Proteins Required to Maintain the Morphology of the Organelle in *Caenorhabditis elegans* (Vol. 143, No. 4, 449–454, doi:10.1093/jb/mvm245)

Hiroto Hirayama, Morihisa Fujita, Takehiko Yoko-o and Yoshifumi Jigami: O-Mannosylation is Required for Degradation of the Endoplasmic Reticulum-associated Degradation Substrate Gas1*_p via the Ubiquitin/Proteasome Pathway in *Saccharomyces cerevisiae* (Vol. 143, No. 4, 555–567, doi:10.1093/jb/mvm249)

Runcong Ke, Noriyuki Sakiyama, Ryusuke Sawada, Masashi Sonoyama and Shigeki Mitaku: Vertebrate Genomes Code Excess Proteins with Charge Periodicity of 28 Residues (Vol. 143, No. 5, 661–665, doi:10.1093/jb/mvn017)

Tadashi Nakai, Seiki Kuramitsu and Nobuo Kamiya: Structural bases for the specific interactions between the E2 and E3 components of the *Thermus thermophilus* 2-oxo acid dehydrogenase complexes (Vol. 143, No. 6, 747–758, doi:10.1093/jb/mvn033)

Takafumi Shintani and Masaharu Noda: Protein Tyrosine Phosphatase Receptor Type Z Dephosphorylates TrkA Receptors and Attenuates NGF-dependent Neurite Outgrowth of PC12 Cells (Vol. 144, No. 2, 259–266, doi:10.1093/jb/mvn064)

Rihito Morita, Noriko Nakagawa, Seiki Kuramitsu and Ryoji Masui: An *O*⁶-methylguanine-DNA Methyltransferase-like Protein from *Thermus thermophilus* Interacts with a Nucleotide Excision Repair Protein (Vol. 144, No. 2, 267–277, doi:10.1093/jb/mvn065)

Keisuke Yamamoto, Natsumi Suzuki, Tadashi Wada, Tetsuya Okada, Hiderou Yoshida, Randal J. Kaufman and Kazutoshi Mori: Human HRD1 Promoter Carries a Functional Unfolded Protein Response Element to Which XBP1 but not ATF6 Directly Binds (Vol. 144, No. 4, 477–486, doi:10.1093/jb/mvn091)

Takaomi Nomura, Masato Nakatsuchi, Daiyu Sugita, Mamoru Nomura, Tatsuya Kaminishi, Chie Takemoto, Mikako Shirouzu, Tomohiro Miyoshi, Shigeyuki Yokoyama, Akira Hachimori and Toshio Uchiumi: Biochemical Evidence for the Heptameric Complex L10(L12)₆ in the *Thermus thermophilus* Ribosome: *In Vitro* Analysis of its Molecular Assembly and Functional Properties (Vol. 144, No. 5, 665–673, doi:10.1093/jb/mvn113)

Hidetaka Fukushima, Masashi Mizutani, Koji Imamura, Kazuhiko Morino, Jun Kobayashi, Katsuzumi Okumura, Kanta Tsumoto and Tetsuro Yoshimura: Development of a Novel Preparation Method of *Recombinant* Proteoliposomes Using Baculovirus Gene Expression Systems (Vol. 144, No. 6, 763–770, doi:10.1093/jb/mvn125)

JB Reviews published in volumes 145 and 146 (2009)

JB Minireviews—Quality Control of the Cellular Protein Systems

Quality Control of Cytoplasmic Membrane Proteins in *Escherichia coli*

Yoshinori Akiyama*

Institute for Virus Research, Kyoto University, Kyoto 606-8507, Japan (Vol. 146, No. 4, pp. 449–454)

Protein Quality Control in Mitochondria

Takashi Tatsuta*

Institute for Genetics, University of Cologne, Cologne, Germany (Vol. 146, No. 4, pp. 455–461)

Protein Quality Control in Chloroplasts: A Current Model of D1 Protein Degradation in the Photosystem II Repair Cycle

Yusuke Kato and Wataru Sakamoto*

Research Institute for Bioresources, Okayama University, 2-20-1 Chuo, Kurashiki, Okayama 710-0046, Japan (Vol. 146, No. 4, pp. 463–469)

Disulfide Bond Formation System in *Escherichia coli*

Kenji Inaba*

Division of Protein Chemistry, Post-Genome Science Center, Medical Institute of Bioregulation, Kyushu University, 3-1-1 Maidashi, Higashi-ku, Fukuoka 812-8582, Japan (Vol. 146, No. 5, pp. 591–597)

Disulphide Bond Formation in the Intermembrane Space of Mitochondria

Marcel Deponte and Kai Hell*

Butenandt Institute for Physiological Chemistry, Ludwig-Maximilians University, D-81377 Munich, Germany (Vol. 146, No. 5, pp. 599–608)

Quality Control Against Misfolded Proteins in the Cytosol: A Network for Cell Survival

Hiroshi Kubota*

Department of Life Science, Faculty of Engineering and Resource Science, Akita University, Akita 010-8502, Japan (Vol. 146, No. 5, pp. 609–616)

Signalling Pathways in the Unfolded Protein Response: Development from Yeast to Mammals

Kazutoshi Mori*

Department of Biophysics, Graduate School of Science, Kyoto University, Kitashirakawa-Oiwake, Sakyo-ku, Kyoto 606-8502, Japan (Vol. 146, No. 6, pp. 743–750)

Molecular Pathogenesis of Protein Misfolding Diseases: Pathological Molecular Environments Versus Quality Control Systems Against Misfolded Proteins

Hironobu Naiki^{1,*} and Yoshitaka Nagai²

¹*Division of Molecular Pathology, Department of Pathological Sciences, Faculty of Medical Sciences, University of Fukui, Fukui 910-1193; and* ²*Department of Degenerative Neurological Diseases, National Institute of Neuroscience, National Center of Neurology and Psychiatry, Tokyo 187-8502, Japan* (Vol. 146, No. 6, pp. 751–756)

JB Reviews

Protein Tyrosine Kinase, Syk: A Key Player in Phagocytic Cells

Yumi Tohyama¹ and Hirohei Yamamura²

¹*Division of Biochemistry, Faculty of Pharmaceutical Sciences, Himeji Dokkyo University, Himeji; and* ²*Hyogo Prefectural Institute of Public Health and Environmental Sciences, Kobe, Japan* (Vol. 145, No. 3, pp. 267–273)

Cellular Signal Transduction of the Hypoxia Response

Koh Nakayama*

Medical Top Track program, Medical Research Institute, Tokyo Medical and Dental University, 1-5-45, Yushima, Bunkyo-ku, Tokyo 113-8510, Japan (Vol. 146, No. 6, pp. 757–765)

The people who were concerned with the reviewing of manuscripts in 2009 were as follows:

ABBAS Tarek	GODA Shuichiro	IMAMURA Takeshi
ABE-DOHMAE Sumiko	GOTO Yuji	IMATAKA Hiroaki
AIZAWA Shin-Ichi	GU Jianguo	IMMENSCHUH Stephan
AJITKUMAR Parthasarathi	GUERARDEL Yann	INADA Toshifumi
AKITA Mitsuru	HABUCHI Osami	INAGAKI Masaki
AKUTSU Hideo	HAGA Tatsuya	INAGAKI Minoru
ANGATA Takashi	HAGIHARA Yoshihisa	INOKUCHI Jin-Ichi
AOKI Junken	HALTIWANGER Robert	INOUE Hideshi
ARAI Munehito	HAMADA Daizo	INOUE Hirofumi
ARAKAWA Tsutomu	HAMAKUBO Takao	INOUE Kuniyo
ARATA Yoichiro	HARA Akira	INUI Takashi
ARITA Makoto	HASE Toshiharu	ISHIDA Norio
ASAHI Michio	HASHIMOTO Yasuhiro	ISHIDA Tatsuhiko
ASO Yoichi	HATA Shoji	ISHIDOH Kazumi
ASOU Hiroaki	HATA Yutaka	ISHII Satoshi
BANIAHMAD Aria	HATAKEYAMA Shigetsugu	ISHII Tetsuro
BHATTACHARYYA	HATANAKA Yasumaru	ISHIMI Yukio
Bhabatarak	HAYASHI Hideyuki	ISHIMIZU Takeshi
BITO Haruhiko	HAYASHI Nobuhiro	ISHIMORI Koichiro
BRUNNER Eike	HEMMI Hisashi	ISHINO Yoshizumi
CHEN Rita	HIMENO Seiichiro	ISHITANI Toru
CHIBA Yasunori	HIRABAYASHI Jun	ISHIZAKI Yasuki
CHIMNARONK Sarin	HIRAO Ichiro	ISHIZUKA Morio
CHO Hyun-Soo	HIRASAWA Noriyasu	ISONO Naoto
COONROD Scott	HIRASHIMA Akinori	ITABE Hiroyuki
CRESCENZO Gregory	HIRATAKE Jun	ITO Kazuo
CZIEPLUCH Celina	HIRATANI H.	ITO Kiyoshi
DOI Nobuhide	HIRAYAMA Jun	ITO Kosei
DRUBE Sebastian	HIROSE Junzo	ITO Makoto
DULIN Nikolai	HIROTA Shun	ITO Takuhiro
EBIHARA Akio	HIROTA Toru	ITOH Ken
ENDO Kazutoyo	HIROTSU Ken	ITOH Susumu
ENDO Tamao	HIROTSUNE Shinji	IWAMORI Masao
ENDO Toshiya	HITOMI Kenichi	IWAMOTO Hiroyuki
ENDOH Masao	HONDA Shinya	IWAMOTO Ryo
FUJII Junichi	HONKE Koichi	IZUMORI Ken
FUJII Yoichi	HORI Hiroyuki	JASO-FRIEDMANN Liliana
FUJIMURA Tatsuya	HORIIKE Kihachiro	JIA Zongchao
FUJITA Hiroyoshi	HOSHINO Masaru	JIGAMI Yoshifumi
FUJIWARA Noriko	HOSHINO Shin-Ichi	JIN You-Xin
FUJIYAMA Kazuhito	HWANG Deog Su	JULIN Douglas A.
FUKAI Tohru	ICHIJO Hidenori	KADOMATSU Kenji
FUKAMI Yasuo	ICHINOSE Hiroshi	KAKUTA Yoshimitsu
FUKAMIZU Akiyoshi	IDE Hiroshi	KAMATA Hideaki
FUKUMORI Yoshihiro	IGARASHI Junsuke	KAMITORI Shigehiro
FUNAKOSHI-TAGO Megumi	IGARASHI Kazuei	KAMIYA Hiroyuki
FURUKAWA Takahisa	IGARASHI Kazuhiko	KAMIYA Noriho
FURUKAWA Yusuke	IKAWA Shuntaro	KANAI Akio
FURUSE Mikio	IKEDA Mitsunori	KANAYA Shigenori
FURUYAMA Kazumichi	IKEDA Yoshitaka	KANEKO Satoshi
FUTAI Eugene	IKEGAMI Takahisa	KANGAWA Kenji
GENNIS Robert	IKEGAYA Yuji	KANNAGI Reiji
GLAESER Robert	IKENOUCHI Junichi	KARIYA Ken-Ichi

KASAI Ken-Ichi
KATAGIRI Takenobu
KATAYAMA Tsutomu
KATAYAMA Yoshiki
KATSUKI Hiroshi
KAWABATA Shun-Ichiro
KAWAI Gota
KAWASAKI Hiroshi
KAWASHIMA Hiroto
KAWATA Yasushi
KIKKAWA Ushio
KIKUCHI Hideaki
KITAGAWA Hiroshi
KITAGAWA Masatoshi
KLECZKOWSKI L. A.
KOBAYASHI Takayasu
KOBAYASHI Yoshiro
KOHDA Daisuke
KOHNO Masahiro
KOJIMA Shuichi
KOJIMA-AIKAWA Kyoko
KOKAME Koichi
KONDO Hiroki
KOYAMA Yoshinori
KOZUTSUMI Yasunori
KUDOU Motonori
KUGE Shusuke
KUMAZAKI Takashi
KURAMITSU Seiki
KURANAGA Erina
KURIHARA Tatsuo
KURODA Shun'Ichi
KURUMIZAKA Hitoshi
KUSHI Yasunori
LEE Young-Ho
LI Xiaoxia
MAEDA Masatomo
MAEDA Shingo
MAENAKA Katsumi
MAJ Mary
MAJIMA Hideyuki
MAKABE Koki
MANDAL Amritlal
MARUYAMA Kei
MASUDA Taro
MASUI Ryoji
MASUTANI Hiroshi
MATOZAKI Takashi
MATSUBARA Minoru
MATSUMOTO Akio
MATSUSHITA Kazunobu
MATSUURA Tomoaki
MIHARA Hisaaki
MIHARA Katsuyoshi
MIKAWA Tsutomu

MIMA Joji
MINAMINO Tohru
MIURA Nobuhiko
MIURA Retsu
MIURA Satoshi
MIYAZAKI Kentaro
MIYAZAWA Atsuo
MIYAZAWA Keiji
MIYAZONO Kohei
MIYOSHI Hideto
MIZUSHIMA Tsunehiro
MOGAMI Tomoko
MORI Kazutoshi
MORII Takashi
MORIMOTO Sachio
MORIOKA Hiroshi
MORISHIMA Nobuhiro
MORITA Takashi
MORIYAMA Akihiko
MOTOYAMA Noboru
MUKAI Hidehito
MURAKAMI Makoto
MURAMOTO Koji
MURAOKA Masatoshi
MURATA Shigeo
NAGAFUCHI Akira
NAGAMORI Shushi
NAGAOKA Isao
NAGASAWA Takashi
NAGATA Koji
NAGATA Kyosuke
NAIKI Hironobu
NAITO Mikihiro
NAKAGAWA Hidehiko
NAKAGAWA Noriko
NAKAGAWA Toshiyuki
NAKAJIMA Osamu
NAKAKITA Shin-Ichi
NAKAMURA Akira
NAKAMURA Ikuo
NAKAMURA Kazuo
NAKAMURA Kouji
NAKAMURA Nobuhumi
NAKASHIMA Takashi
NAKATA Takao
NAKAYAMA Toru
NATSUKA Shunji
NAWROT Barbara
NIKI Hironori
NISHIDA Teruo
NISHINA Hiroshi
NISHINO Kunihiro
NISHINO Takeshi
NISHIYAMA Ken-Ichi
NISHIYAMA Makoto

NISHIZAWA Naoko
NOMURA Kazuya
OCHIYA Takahiro
ODA Masayuki
ODA Yoshiya
OGAWA Haruko
OGAWA Yuko
OGINO Hiroyasu
OHSHIMA Toshihisa
OHTA Shigeo
OJIMA Takao
OKAJIMA Toshihide
OKAMOTO Takashi
OKANO Yukio
OKINO Nozomu
OKUDA Akihiko
OKUNO Hiroyuki
OMA Yoko
ORELLANA Ariel
ORIHARA Yutaka
OSHIMA Masanobu
OSUMI Takashi
RAM Sanjay
RAMAKRISHNAN Boopathy
RAO Mohan
RUBIO Ignacio
SADA Kiyonao
SAEKI Kazuhiko
SAKAMOTO Junshi
SAKURAI Hidetoshi
SAKURAI Kazumasa
SANO Emiko
SANO Toshio
SATO Ryuichiro
SATO Takeshi
SAUDEK Christopher
SAWADA Hitoshi
SEIFERT Georg
SEKI Masayuki
SEKIMIZU Kazuhisa
SEVERSON David
SHIBA Kiyotaka
SHIMADA Ichio
SHIMOHIGASHI Yasuyuki
SHINDO Heisaburo
SHINOHARA Yasuo
SHIRAKAWA Masahiro
SHOUN Hirofumi
SIMPSON Melanie
SIOMI Haruhiko
SUGAWARA Shunji
SUGIMOTO Koichi
SUGIMURA Haruhiko
SUGIYAMA Hiroshi
SUZUKI Akemi

SUZUKI Tadashi
SUZUKI Toshiharu
SUZUKI Yutaka
TABUCHI Akiko
TADAKUMA Hisashi
TAHARA Hidetoshi
TAKADA Ichiro
TAKAHASHI Masami
TAKAHASHI Motoko
TAKAHASHI Satoru
TAKAHASHI Takayuki
TAKAHASHI Toru
TAKAI Toshiyuki
TAKAIWA Fumio
TAKAMIYA Shinzaburo
TAKAMURA Toshinari
TAKASHIMA Akihiko
TAKASHIMA Seiji
TAKAYA Naoki
TAKEDA Kiyoshi
TAKEDA Shigeki
TAKEDA Shinichi
TAKETANI Shigeru
TAKEUCHI Yasuhiro
TAMADA Taro
TAMAKOSHI Masatada
TANAKA Tamotsu
TANAKA Yoshikazu
TANIGUCHI Hisaaki
TANIGUCHI Naoyuki
TANIZAWA Katsuyuki
TERACHI Toru
TERAUCHI Ryohei

TILLEY Wayne
TKACHUK Natalia
TOCHIO Hidehito
TODO Takeshi
TOIDA Toshihiko
TOKUMURA Akira
TOMARI Yukihide
TOMIOKA Kenji
TONOZUKA Takashi
TOYOSHIMA Fumiko
TSUBAKI Motonari
TSUBOI Kazuhito
TSUGE Hideaki
TSUJIMOTO Yoshihide
TSUKIYAMA Tadasuke
TSUMOTO Kouhei
TSURIMOTO Toshiki
UEDA Hiroshi
UEDA Kazumitsu
UEDA Tadashi
ULBRICH-HOFMANN Renate
UMEDA Masato
UMETSU Mitsuo
UNO Tadayuki
URANO Yasuteru
USHIO-FUKAI Masuko
UTSUMI Toshihiko
VANDAMME Erick
VOLK Tilmann
WADA Yoh
WADA Yoshinao
WAGA Shou
WAKABAYASHI Katsuzo

WAKASUGI Keisuke
WAKIYAMA Motoaki
WATABE Tetsuro
WATANABE Keiichi
WATANABE Toshiki
WATANABE Toshio
WHITELAW Murray L.
WONDISFORD Fredric
YADA Rickey
YAMADA Masashi
YAMAGUCHI Kei-Ichi
YAMAMOTO Kazuo
YAMAMOTO Keizo
YAMAMOTO Kenji
YAMAMOTO Norio
YATOMI Yutaka
YOHDA Masafumi
YOKOGAWA Takashi
YOKOYAMA Kenji
YOSHIDA Yasukazu
YOSHIIKE Yuji
YOSHIKAWA Ayumu
YOSHIKAWA Hirofumi
YOSHIMURA Akihiko
YOSHIMURA Tohru
YOSHINARI Kouichi
YOSHIZAKI Kazuyuki
YUTANI Katsuhide
ZANNONI Davide
ZHANG Qisen
ZHANG Qiu-Mei