# **BRITISH JOURNAL OF PHARMACOLOGY**

The British Journal of Pharmacology welcomes contributions in all fields of experimental pharmacology including neuroscience, biochemical, cellular and molecular pharmacology. The Board of Editors represents a wide range of expertise and ensures that well-presented work is published as promptly as possible, consistent with maintaining the overall quality of the journal.

# Edited for the British Pharmacological Society by

A.T. Birmingham (Chairman)

R.W. Horton W.A. Large (Secretaries)

#### **Editorial Board**

P.I. Aaronson London J.A. Angus Melbourne, Australia G.W. Bennett Nottingham T.P. Blackburn Harlow N.G. Bowery London W.C. Bowman Glasgow S.D. Brain London K.D. Butler Horsham M. Caulfield London R. Chess-Williams Sheffield T. Cocks Melbourne, Australia S.J. Coker Liverpool R.A. Coleman Ware Helen M. Cox London A.J. Cross London V. Crunelli Cardiff T.C. Cunnane Oxford F. Cunningham London A. Dickenson London J.R. Docherty Dublin A. Dray London L. Edvinsson Lund, Sweden G. Edwards Manchester J.M. Edwardson Cambridge R.M. Eglen Palo Alto, USA P.C. Emson Cambridge A.C. Foster San Diego, USA J.R. Fozard Basle, Switzerland Allison D. Fryer Baltimore, USA

J.P. Gallagher Galveston, USA Sheila M. Gardiner Nottingham C.J. Garland Bristol A. Gibson London M.A. Giembycz London W.R. Giles Calgary, Canada R.G. Goldie Perth, Australia R.J. Griffiths Connecticut, USA R.W. Gristwood Cambridge Judith M. Hall London D.W.P. Hay Philadelphia, USA P.G. Hellewell London P.E. Hicks Edinburgh S.J. Hill Nottingham K. Hillier Southampton S.M.O. Hourani Guildford J.C. Hunter Palo Alto, USA E.J. Johns Birmingham R.S.G. Jones Oxford C.C. Jordan Ware P.A.T. Kelly Edinburgh D.A. Kendall Nottingham C. Kennedy Glasgow P. Leff Loughborough A.T. McKnight Cambridge C.A. Maggi Florence, Italy Janice M. Marshall Birmingham G. Martin Beckenham W. Martin Glasgow

A. Mathie London D.N. Middlemiss Harlow P.K. Moore London C.D. Nicholson Oss. The Netherlands H. Osswald Tübingen, Germany F.L. Pearce London J.D. Pearson London A.G. Renwick Southampton P.J. Roberts Bristol G.J. Sanger Harlow W.C. Sessa Connecticut, USA P. Sneddon Glasgow K. Starke Freiburg, Germany R.J. Summers Melbourne, Australia P.V. Taberner Bristol J. Tamargo Madrid, Spain C. Thiemermann London M.D. Tricklebank Basle, Switzerland T.J. Verbeuren Suresnes, France R.R. Vollmer Pittsburgh, USA K.J. Watling Boston, USA A.H. Weston Manchester J. Westwick Bath Eileen Winslow Riom, France E.H.F. Wong Milan, Italy B. Woodward Bath

## **Corresponding Editors**

P.R. Adams Stony Brook, U.S.A.
C. Bell Dublin
F.E. Bloom La Jolla, U.S.A.
A.L.A. Boura Newcastle, Australia
N.J. Dun Toledo, U.S.A.
R.F. Furchgott New York, U.S.A.
T. Godfraind Brussels, Belgium
S.Z. Langer Paris, France

R.J. Miller Chicago, U.S.A.
R.C. Murphy Denver, U.S.A.
E. Muscholl Mainz, Germany
R.A. North Geneva, Switzerland
M. Otsuka Tokyo, Japan
M.J. Rand Melbourne, Australia
S. Rosell Södertalje, Sweden
P. Seeman Toronto, Canada

L. Szekeres Szeged, Hungary
B. Uvnas Stockholm, Sweden
P.A. Van Zwieten Amsterdam, Netherlands
V.M. Varagič Belgrade, Yugoslavia
G. Velo Verona, Italy
Wang Zhen Gang Beijing, China
M.B.H. Youdim Haifa, Israel

Submission of manuscripts: Manuscripts (two copies) should be sent to The Editorial Office, British Journal of Pharmacology, St. George's Hospital Medical School, Cranmer Terrace, London SW17 0RE.

Authors should consult the Instructions to Authors and the Nomenclature Guidelines for Authors in Vol. 114, 245-255. These Instructions and Guidelines also appear with the journal Index for Volumes 111-113, 1994. A checklist of the essential requirements is summarised in each issue of the journal, or as the last page of the issue.

Whilst every effort is made by the publishers and editorial committee to see that no inaccurate or misleading data, opinion or statement appears in this Journal, they and the British Pharmacological Society wish to make it clear that the data and opinions appearing in the articles and advertisements herein are the responsibility of the contributor or advertiser concerned. Accordingly, the British Pharmacological Society, the publishers and the editorial committee and their respective employees, officers and agents accept no liability whatsoever for the consequences of any such inaccurate or misleading data, opinion or statement.

- C.H. Davies, V.R.J. Clarke, D. E. Jane & G. L. Collingridge. Pharmacology of postsynaptic metabotropic glutamate receptors in rat hippocampal CA1 pyramidal neurones 1859
- L.C. Chiou, J.Y. Ling & C.C. Chang. Enhancement by benzodiazepines of the inhibitory effect of adenosine on skeletal neuromuscular transmission.
- M. Parramón, M.P. González & M.J. Oset-Gasque. Pharmacological modulation of adrenal medullary GABA<sub>A</sub> receptor: consistent with its subunit composition 1875
- L.V. Baidan, A.V. Zholos & J.D. Wood. Modulation of calcium currents by G-proteins and adenosine receptors in myenteric neurones cultured from adult guinea-pig small intestine 1882
- N. Nagano, Y. Imaizumi & M. Watanabe. Modulation of calcium channel currents by arachidonic acid in single smooth muscle cells from vas deferens of the guinea-pig 1887
- K. Satoh, A. Yamato, T. Nakai, K. Hoshi & K. Ichihara. Effects of 3-hydroxy-3-methylglutaryl coenzyme A reductase inhibitors on mitochondrial respiration in ischaemic dog hearts

  1894
- F. Oury-Donat, O. Thurneyssen, N. Gonalons, P. Forgez, D. Gully, G. Le Fur & P. Soubrie. Characterization of the effect of SR48692 on inositol monophosphate, cyclic GMP and cyclic AMP responses linked to neurotensin receptor activation in neuronal and non-neuronal cells

- M.J. Rand & C.G. Li. Discrimination by the NO-trapping agent, carboxy-PTIO, between NO and then itrergic transmitter but not between NO and EDRF 1906
- I.H. Ulus, B.Y. Arslan, V. Savci & B.K. Kiran. Restoration of blood pressure by choline treatment in rats made hypotensive by haemorrhage 1911
- P. Karoon, A. Rubino & G. Burnstock. Enhanced sympathetic neurotransmission in the tail artery of 1,3-dipropyl-8-sulphophenylxanthine (DPSPX)-treated rats
- S. Prisco & E. Esposito. Differential effects of acute and chronic fluoxetine administration on the spontaneous activity of dopaminergic neurones in the ventral tegmental area 1923
- I. von Kügelgen, B. Krumme, U. Schaible, P.J. Schollmeyer & L.C. Rump. Vasoconstrictor responses to the  $P_{2X}$ -purinoceptor agonist  $\beta$ ,  $\gamma$ -methylene-L-ATP in human cutaneous and renal blood vessels 1932
- N.M.J. Rupniak, J.K. Webb, A.R Williams, E. Carlson, S. Boyce & R.G. Hill. Antinociceptive activity of the tachykinin NK<sub>1</sub> receptor antagonist, CP-99,994, in conscious gerbils 1937

The British Journal of Pharmacology is published by Stockton Press, a division of Macmillan Press Ltd. It is the official publication of the British Pharmacological Society.

Scope The British Journal of Pharmacology is published twice a month. It welcomes contribution in all fields of experimental pharmacology including neuroscience, biochemical, cellular and molecular pharmacology. The Board of Editors represents a wide range of expertise and ensures that well-presented work is published as promptly as possible, consistent with maintaining the overall quality of the journal.

This journal is covered by Current Contents, Excerpta Medica, BIOSIS, CABS, CINAHL and Index Medicus.

Editorial Manuscripts (plus two copies) and all editorial correspondence should be sent to: The Editorial Office, British Journal of Pharmacology, St George's Hospital Medical School, Cranmer Terrace, London SW17 ORE, UK. Tel: +44 (0)181 767 6765; Fax: +44 (0)181 767 5645.

Advertisements Enquiries concerning advertisements should be addressed to: Michael Rowley, Hasler House, High Street, Great Dunmow, Essex CM6 1AP, UK. Tel: +44 (0)1371 874613; Fax: +44 (0)1371 872273.

Publisher All business correspondence, supplement enquiries and reprint requests should be addressed to British Journal of Pharmacology, Stockton Press, Houndmills, Basingstoke, Hampshire RG21 2XS, UK. Tel: +44 (0)1256 29242; Fax: +44 (0)1256 810526. Publisher: Marija Vukovojac. Production Controller: Nicci Crawley.

Subscriptions – EU/Rest of World Subscription price per annum (3 volumes, 24 issues) £620, rest of world £820 (Airmail), £685 (Surface mail) or equivalent in any other currency. Orders must be accompanied by remittance. Cheques should be made payable to Macmillan Magazines and sent to: The Subscription Department Macmillan Press Ltd, Houndmills, Basingstoke, Hampshire RG21 2XS, UK. Where appropriate, subscribers may make payments into UK Post Office Giro Account No. 519 2455. Full details must accompany the payment. Subscribers from EC territories should add sales tax at the local rate.

Subscriptions – USA USA subscribers call toll free 1-800-221-2123 or send check/money order/credit card details to: Stockton Press, 49, West 24th Street, New York, NY 10010; Tel: 212 627 5757, Fax: 212 627 9256. USA annual subscription rates: \$1230 Airmail; \$1030 Surface (Institutional/Corporate); \$225 (Individual making personal payment).

British Journal of Pharmacology (ISSN 0007-1188) is published twice a month by Macmillan Press Ltd, c/o Mercury Airfreight International Ltd, 2323 Randolph Avenue, Avenel, NJ 07001, USA. Subscription price for institutions is \$1030 per annum (surface). 2nd class postage is paid at Rahway NJ. Postmaster: send address corrections to Macmillan Press Ltd, c/o Mercury Airfreight International Ltd, 2323 Randolph Avenue, Avenel NJ 07001.

Reprints of any article in this journal are available from Stockton Press, Houndmills, Basingstoke, Hampshire RG21 2XS, UK.
Tel: +44 (0)1256 29242; Fax: +44 (0)1256 810526.

Copyright © 1995 Stockton Press ISSN 0007-1188

All rights of reproduction are reserved in respect of all papers, articles, illustrations, etc., published in this journal in all countries of the world. All material published in this journal is protected by copyright, which covers exclusive rights to reproduce and distribute the material. No material published in this journal may be reproduced or stored on microfilm or in electronic, optical or magnetic form without the written authorisation of the Publisher.

Authorisation to photocopy items for internal or personal use of specific clients, is granted by Stockton Press for libraries and other users registered with the Copyright Clearance Center (CCC) Transaction Reporting Service, provided that the base fee of \$12.00 per copy is paid directly to CCC, 21 Congress St., Salem, MA 01970, USA. 0007 – 1188/95 \$12.00 + \$0.00.

Apart from any fair dealing for the purposes of research or private study, or criticism or review, as permitted under the Copyright, Designs and Patent Act 1988, this publication may be reproduced, stored or transmitted, in any form or by any means, only with the prior permission in writing of the publishers, or in the case of reprographic reproduction, in accordance with the terms of licences issued by the Copyright Licensing Agency.

### PREPARATION OF MANUSCRIPTS

Authors are strongly recommended to read the full *Instructions to Authors* and *Nomenclature Guidelines for Authors* (Br. J. Pharmacol. 1995, 114, 245-255) before submitting a manuscript for publication in the *British Journal of Pharmacology*. The manuscript and cover letter should be checked against the following list before mailing.

The original and one copy of the manuscript must be supplied. Manuscripts must be typed in double-line spacing on one side of A4 paper, in type not smaller than 12 characters per inch or 10 point. Both copies to include Tables and a set of labelled Figures. One set of Figures without numbers or letters is also to be included. The text to be arranged in the following subsections:

- Title—To have no more than 150 characters on a separate page, which should also include a Short Title (50 characters maximum) and the name and address of the author for correspondence.
- 2. Summary—To be arranged in numbered paragraphs (Full Papers) or a single paragraph (Special Reports).
  - to include aims, principal results and conclusions.
    to include Key words (10 maximum) at end of sum-
- 3. **Introduction**—To contain concise statements of the problem and the aims of the investigation.
- 4. Methods—To have brief but adequate account of the procedures; full names of drugs (including those referred to by manufacturer's code), sources of drugs and statistical tests to be stated.
- Results To have no repetition of data in Figures, Tables and text.
- Discussion Findings and conclusions to be placed in context of other relevant work.
   NB Simple repetition of results and unwarranted speculation are not acceptable.
- Acknowledgements Sources of support. Sources of drugs not widely available commercially.
- 8. **References**—All references in the text to be included in the Reference List and *vice versa*. References in alphabetical order with complete citations; Journals publishing 'in press' papers identified.

References to manuscripts submitted to other journals but not yet accepted are not allowed.

- 9. **Tables**—Each on a separate page and prepared in accordance with current requirements of the Journal.
- Figures Both labelled and non-labelled Figures to be prepared in accordance with current requirements of the Journal (see *Instructions to Authors*, 1994, 114, 245-251) and provided with Figure Number and Authors' names on back (in pencil).
  - —each legend to be typed on a separate page and carrying keys to symbols.
  - —keys to symbols and histograms must not appear on the figures themselves, but in the respective legends.
  - —'box style' figures are not in keeping with the Journal style; line drawings etc must have only left-hand and bottom axes.
- 11. Manuscripts—To be accompanied by a declaration signed by each author that
  - (a) results are original
  - (b) approval of all persons concerned has been given to submit manuscripts for consideration (see also 12b)
  - (c) the same material is neither 'in press' (i.e. is in proof or has definitely been accepted for publication) nor under consideration elsewhere. Furthermore it will not be submitted or published elsewhere before a decision has been reached by the Editorial Board of the *British Journal of Pharmacology* and will not be submitted elsewhere if accepted by the *British Journal of Pharmacology*.
  - (d) Copyright assignment is included.
- 12. Cover letter To state clearly
  - (a) Corresponding author's full postal address, telephone, telex or Fax number
  - (b) where appropriate, that *either* ethical approval has been given for investigation or Company or Institutional permission to publish work has been received.
- Reminder Packaging to be sufficiently robust to protect Figures and to withstand mailing.

Failure to comply with *Instructions to Authors* may lead to substantial delays in processing, review and publication and may even jeopardize acceptance of the manuscript.

### **NOMENCLATURE**

Authors are reminded that accepted receptor and associated terminology is laid out in Nomenclature Guidelines for Authors, as published in the British Journal of Pharmacology, Br. J. Pharmacol., 1995, 114, 253-255.

#### SPECIAL REPORTS

The purpose of *Special Reports* is to provide rapid publication for **new** and **important** results which the Editorial Board considers are likely to be of special pharmacological significance. *Special Reports* will have publication priority over all other material and so authors are asked to consider carefully the status of their work before submission.

In order to speed publication there is normally no revision allowed beyond very minor typographical or grammatical corrections. If significant revision is required, the Board may either invite rapid re-submission or, more probably, propose that it be re-written as a Full Paper and be re-submitted for consideration. In order to reduce delays, proofs of *Special Reports* will be sent to authors but **essential corrections must reach the Production Office within 48 hours of receipt**. Authors should ensure that their submitted material conforms exactly to the following requirements.

Special Reports should normally occupy no more than two printed pages of the Journal; two illustrations (Figures or Tables, with legends) are permitted. As a guideline, with type face of 12 pitch and double-line spacing, a page of A4 paper could contain about 400 words. The absolute maximum length of the Special Report is 1700 words. For each Figure or Table, please deduct 200 words. The manuscript should comprise a Title page with key words (maximum of 10), a Summary consisting of a single short paragraph, followed by Introduction, Methods, Results, Discussion and References (maximum of 10). In all other respects, the requirements are the same as for Full Papers (see current 'Instructions to Authors').

#### SPECIAL REPORTS

- G. Sowa & R. Przewłocki. Enhancing effect of staurosporine on NO production in rat peritoneal macrophages via a protein kinase C-independent mechanism 1711
- S. Mariotto, M. Menegazzi, A. Carcereri de Prati, L. Cuzzolin, A. Adami, H. Suzuki & G. Benoni. Protective effect of NO on gastric lesions and inhibition of expression of gastric inducible NOS by flurbiprofen and its nitro-derivative, nitroflurbiprofen 1713
- J.F.X. Jones, G.R. Martin & A.G. Ramage. Evidence that 5-HT<sub>1D</sub> receptors mediate inhibition of sympathetic ganglionic transmission in anaesthetized cats 1715
- S.M. Gardiner, P.A. Kemp, J.E. March & T. Bennett. Enhancement of the hypotensive and vasodilator effects of endotoxaemia in conscious rats by the endothelin antagonist, SB 209670 1718
- J.W. Dear, G.K. Scadding & J.C. Foreman. Reduction by N<sup>G</sup>-nitro-Larginine methyl ester (L-NAME) of antigen-induced nasal airway plasma extravasation in human subjects in vivo 1720

#### **PAPERS**

- A.B. Tobin, G.B. Willars, N.T. Burford & S.R. Nahorski. Relationship between agonist binding, phosphorylation and immunoprecipitation of the m<sub>3</sub>-muscarinic receptor, and second messenger responses 1723
- A.C. MacKinnon, W.S. Redfern & C.M. Brown. [ $^3$ H]-RS-45041-190: a selective high-affinity radioligand for  $I_2$  imidazoline receptors 1729
- C.M. Brown, A.C. MacKinnon, W.S. Redfern, A. Williams, C. Linton, M. Stewart, R.U. Clague, R. Clark & M. Spedding. RS-45041-190: a selective, high-affinity ligand for I<sub>2</sub> imidazoline receptors 1737
- J.G. Filep, A. Fournier & É. Földes-Filep. Effects of the  $ET_A/ET_B$  receptor antagonist, bosentan on endothelin-1-induced myocardial ischaemia and oedema in the rat 1745
- I.K. Anderson, G.R. Martin & A.G. Ramage. Evidence that activation of 5-HT<sub>2</sub> receptors in the forebrain of anaesthetized cats causes sympathoexcitation 1751
- S.H. Lui, T.J. Sheu, R.H. Lin & S.Y. Lin-Shiau. The *in vivo* effect of lipopolysaccharide on the spontaneous release of transmitter from motor nerve terminals

  1757
- **B.A. Orser, M. Bertlik, L.-Y. Wang & J.F. MacDonald.** Inhibition by propofol (2,6 di-isopropylphenol) of the N-methyl-D-aspartate subtype of glutamate receptor in cultured hippocampal neurones
- C. Allgaier, P. Warnke, A.P. Stangl & T.J. Feuerstein. Effects of 5-HT receptor agonists on depolarization-induced [<sup>3</sup>H]-noradrenaline release in rabbit hippocampus and human neocortex 1769
- T. Nawada, Y. Tanaka, I. Hisatome, N. Sasaki, A. Ohtahara, H. Kotake, H. Mashiba & R. Sato. Mechanism of inhibition of the sodium current by bepridil in guinea-pig isolated ventricular cells 1775
- L.J. Steward, J. Ge, K. R. Bentley, P.C. Barber, A.G. Hope, J.J. Lambert, J.A. Peters, T.P. Blackburn & N.M. Barnes. Evidence that the atypical 5-HT<sub>3</sub> receptor ligand, [<sup>3</sup>H]-BRL46470, labels additional 5-HT<sub>3</sub> binding sites compared to [<sup>3</sup>H]-granisetron 1781
- S.J. Williams & M.E. Parsons. Nitric oxide, an enteric nonadrenergicnoncholinergic relaxant transmitter: evidence using phosphodiesterase V and nitric oxide synthase inhibition 1789
- D. Smart, A. Wandless & D.G. Lambert. Activation of phospholipase C in SH-SY5Y neuroblastoma cells by potassium-induced calcium entry
- F.-N. Ko, S.-M. Yu, Y.-F. Kang & C.-M. Teng. Characterization of the thromboxane (TP-) receptor subtype involved in proliferation in cultured vascular smooth muscle cells of rat

  1801

- S.J. Hollingsworth, E.M. Anderson & A. Bennett. The effect of folate on the methotrexate/indomethacin interaction in a murine cancer cell line

  1809
- T. Suzuki, T. Sekikawa, T. Nemoto, H. Moriya & H. Nakaya. Effects of nicorandil on the recovery of reflex potentials after spinal cord ischaemia in cats

  1815
- C. Plumpton, W.G. Haynes, D.J. Webb & A.P. Davenport. Phosphoramidon inhibition of the *in vivo* conversion of big endothelin-1 to endothelin-1 in the human forearm 1821
- E. Pipili-Synetos, A. Papageorgiou, E. Sakkoula, G. Sotiropoulou, T. Fotsis, G. Karakiulakis & M.E. Maragoudakis. Inhibition of angiogenesis, tumour growth and metastasis by the NO-releasing vasodilators, isosorbide mononitrate and dinitrate 1829
- E. Cerbai, L. Guerra, K. Varani, M. Barbieri, P.A. Borea & A. Mugelli. β-Adrenoceptor subtypes in young and old rat ventricular myocytes: a combined patch-clamp and binding study

  1835
- D. Lamarque & B.J.R. Whittle. Involvement of superoxide and xanthine oxidase in neutrophil-independent rat gastric damage induced by NO donors 1843
- B. Everill & M.S. Berry. Differential modulation of voltage-activated conductances by intracellular and extracellular cyclic nucleotides in leech salivary glands

  1849
- C.H. Davies, V.R.J. Clarke, D. E. Jane & G.L. Collingridge. Pharmacology of postsynaptic metabotropic glutamate receptors in rat hippocampal CA1 pyramidal neurones 1859
- L.C. Chiou, J.Y. Ling & C.C. Chang. Enhancement by benzodiazepines of the inhibitory effect of adenosine on skeletal neuromuscular transmission 1870
- M. Parramón, M.P. González & M.J. Oset-Gasque. Pharmacological modulation of adrenal medullary GABA<sub>A</sub> receptor: consistent with its subunit composition 1875
- L.V. Baidan, A.V. Zholos & J.D. Wood. Modulation of calcium currents by G-proteins and adenosine receptors in myenteric neurones cultured from adult guinea-pig small intestine

  1882
- N. Nagano, Y. Imaizumi & M. Watanabe. Modulation of calcium channel currents by arachidonic acid in single smooth muscle cells from vas deferens of the guinea-pig 1887
- K. Satoh, A. Yamato, T. Nakai, K. Hoshi & K. Ichihara. Effects of 3hydroxy-3-methylglutaryl coenzyme A reductase inhibitors on mitochondrial respiration in ischaemic dog hearts 1894
- F. Oury-Donat, O. Thurneyssen, N. Gonalons, P. Forgez, D. Gully, G. Le Fur & P. Soubrie. Characterization of the effect of SR48692 on inositol monophosphate, cyclic GMP and cyclic AMP responses linked to neurotensin receptor activation in neuronal and non-neuronal cells
- M.J. Rand & C.G. Li. Discrimination by the NO-trapping agent, carboxy-PTIO, between NO and the nitrergic transmitter but not between NO and EDRF 1906
- I.H. Ulus, B.Y. Arslan, V. Savci & B.K. Kiran. Restoration of blood pressure by choline treatment in rats made hypotensive by haemorrhage 1911
- P. Karoon, A. Rubino & G. Burnstock. Enhanced sympathetic neurotransmission in the tail artery of 1,3-dipropyl-8-sulphophenylxanthine (DPSPX)-treated rats
- S. Prisco & E. Esposito. Differential effects of acute and chronic fluoxetine administration on the spontaneous activity of dopaminergic neurones in the ventral tegmental area

  1923
- I. von Kügelgen, B. Krumme, U. Schaible, P.J. Schollmeyer & L.C. Rump. Vasoconstrictor responses to the  $P_{2X}$ -purinoceptor agonist  $\beta$ ,  $\gamma$ -methylene-L-ATP in human cutaneous and renal blood vessels 1932
- N.M.J. Rupniak, J.K. Webb, A.R Williams, E. Carlson, S. Boyce & R.G. Hill. Antinociceptive activity of the tachykinin NK<sub>1</sub> receptor antagonist, CP-99,994, in conscious gerbils 1937

