Edited for the British Pharmacological Society by

J.F. Mitchell (Chairman)

G.M. Lees (Secretary)

Margaret Day (Press Editor)

EDITORIAL BOARD

D.J. Back Liverpoo

T. Bennett

Nottingham N.J.M. Birdsall

London

A.F. Brading Oxford

C.M. Bradshaw

Manchester

K.T. Bunce Ware

G. Burnstock

London

M.K. Church Southampton

M.G. Collis

Macclesfield

G.A. Cottrell Fife

J.A.J.H. Critchley

Edinburgh T.C. Cunnane

Oxford

A.C. Dolphin

London

W. Feniuk Ware

R.J. Flower

Bath

I G Garland Beckenham

A.R. Green

London

M.C. Harris

Birmingham G. Henderson

Cambridge

C.R. Hiley

Cambridge R.G. Hill

Cambridge

R.W. Horton

London

P.P.A. Humphrey

Ware P.G. Jenner

London

Kathleen A. Kane

Glasgow

W.A. Large

London D. Lodge

London

Papers will be considered for publication on all aspects of pharmacology, including chemotherapy.

Manuscripts (two copies) should be sent to Dr G.M. Lees, Editorial Office, British Journal of Pharmacology, University of Aberdeen, Marischal College, Aberdeen AB91AS. Authors should consult the instructions inside the back cover and Vol. 81, 415--422 (1984).

The British Journal of Pharmacology is published monthly by the Scientific & Medical Division. The Macmillan Press Ltd, Houndmills, Basingstoke, Hampshire RG21 2XS. Telephone: Basingstoke 29242. ISSN 0007-1188.

Registered Office: 4 Little Essex Street, London WC2R 3LF.

The journal is covered by Current Contents and Excerpta Medica.

Annual subscription UK £215. Rest of world, £255 (or equivalent in any other currency). (Orders must be accompanied by remittance. Prices correct at time of publication)

C.V. Wedmore (Assistant Press Editor)

J.C. McGrath

Glasgow

A.T. McKnight Harlow

R.J. Marshall

Newhouse

S.R. Nahorski Leicester

D.A.A. Owen

Welwyn Garden City

C.P. Page

London B.K. Park

Liverpool

M H.T. Roberts

Cardiff

P.J. Roberts Southampton

C. Robinson

Southampton

M.A. Simmonds

London

R.C. Small

Manchester

J.M. Sneddon

London

M. Spedding

Edinburgh

T.L.B. Spriggs

Cardiff

I.P. Stolerman

London

P.V. Taberner Bristol

D.A. Terrar

Oxford

D.R. Tomlinson

Nottingham

M.B. Tyers Ware

R.M. Wadsworth

Glasgow

D.I. Wallis

Cardiff

D.F. Weetman Sunderland

B.J.R. Whittle

Beckenham T.J. Williams

Harrow

G.N. Woodruff

Harlow J.M. Young

Cambridge

Cheques should be made payable to Macmillan Journals Limited. All circulation, subscription or general enquiries should be sent to: The Macmillan Press Ltd, P.O. Box 500, Leicester, LE99

Overseas subscribers may make payments into UK Post Office Giro Account No. 519 2455. Full details must accompany the payment.

Second Class postage paid at New York, NY. US Mailing Agent: Expeditors of the Printed Word Ltd, 515 Madison Avenue, New York, NY 10022

Enquiries concerning advertising space and rates should be addressed to: David R. Guthrie, Advertising Dept., The Macmillan Press Ltd, Brunel Road, Houndmills, Basingstoke, Hampshire, England RG21 2XS. Telephone: 0256 29242 Fax: 0256 479476

CORRESPONDING EDITORS

PR Adams

Stony Brook, U.S.A.

Melbourne Australia

K.P. Bhargava

Lucknow, India C. Bell

F.E. Bloom

La Jolla, U.S.A.

A.L.A. Boura

Clayton, Australia

N.J. Dun

Maywood, 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, F.R.G. R A North

Portland, U.S.A

M. Otsuka

Tokyo, Japan

M.J. Rand Melbourne, Australia

S. Rosell

Södertälje, Sweden

P. Seeman

Toronto, Canada

L. Szekeres Szeged, Hungary

R 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

Publisher: Harry Holt.

Production Services: Nigel McNeil-Smith.

Advertising: David R. Guthrie

Promotion: Richard Gedye. Circulation Services: A.L. Clark. Copyright: Scientific & Medical Division, The Macmillan Press Ltd, 1988. All rights of reproduc-

tion are reserved in respect of all papers, articles illustrations, etc., published in this journal in all

countries of the world. Authorization to photocopy items for internal or personal use, or the internal or personal use of specific clients, is granted by The Macmillan Press Ltd for libraries and other users registered with the Copyright Clearance Center (CCC) Transactional Reporting Service, provided that the base fee of \$1.00 per copy, plus \$0.10 per page is paid directly to CCC, 21 Congress St., Salem, MA 01970, USA.

0007-1188.88 \$1.00 + \$0.10

MEETINGS CALENDAR

3-8 July 1988

Sixth International Conference on Biochemistry and Biophysics of Cytochrome P-450. Vienna, Austria. (I. Schuster, Sandoz Research Institute, Brunnerstrasse 59, A-Vienna, Austria).

6-8 July 1988

British Pharmacological Society Summer Meeting, Dublin, Ireland. (Closed meeting for members and guests.)

9-12 July 1988

European/British Societies for Chronobiology Annual Meeting, Birmingham, U.K. (Dr. E. Morgan, Dept. of Zoology, University of Birmingham, P.O. Box 363, Birmingham, B15 2TT, U.K.)

10-13 July 1988

British Association for Psychopharmacology Summer Meeting, Cambridge, U.K. (Mrs. J. Rowell, 43 Norwich Street, Cambridge, CB2 1ND, U.K.)

18-20 July 1988

Calcium Channels: Structure & Function, London, U.K. (Conference Dept. New York Academy of Sciences, 2 East 63rd Street, New York, NY 10021, U.S.A.)

20-23 July 1988

International Symposium on Tachykinins, Graz, Austria (Prof. F. Lembeck, Tachykinin Symposium, Dept. of Pharmacology, University of Graz, Universitatsplatz 4, A-8010 Graz, Austria.)

22 July 1988

Biochemical Society Joint Colloquium on Alzheimer's Disease, Nottingham, U.K. (Dr. A.J. Cross, Astra Neuroscience Research Unit, 1 Wakefield Street, London, WC1N 1PJ.)

15-19 August 1988

XVIth Congress of the Collegium Internationale Neuro-Psychopharmacologium, Munich, W. Germany. (Congress Management, Letzter Hasenpfad 61, D-6000 Frankfurt 70, Federal Republic of Germany.)

21-24 August 1988

Satellite Symposium of 16th CINP Congress on Neurochemical Correlates of Affective Disorders, Copenhagen, Denmark (Dr. A. Geisler, Dept. of Pharmacology, University of Copenhagen, 20 Juliane Maries Veg, DK-2100 Copenhagen, Denmark.)

22-26 August 1988

International Symposium on the Pharmacology of Thermoregulation, Odense, Denmark (Dr. O.A. Nedergaard, Dept. of Pharmacology, Odense University, J.B. Winslows Vej 19, DK-5000, Odense C, Denmark.)

31 August-3 September 1988

European Behavioural Pharmacology Society, Athens, Greece. (Dr. C. Spyraki, Dept. of Pharmacology, National University of Athens Medical School, Gondi 11529, Athens, Greece.)

1-2 September 1988

Symposium on Genetics, Biochemistry, Physiological Functions and Pharmacology of Alpha-1-Acid Glycoprotein, Lausanne, Switzerland. (P. Baumann, Clînique Psychiatrique Universitaire de Lausanne, CH-1008-Prilly-Lausanne.)

1-3 September 1988

8th CIRD Symposium on Advances in Skin Pharmacology, Pharmacology of Retinoids in the Skin, Cannes, France (Dr. B. Shroot, CIRD, Sophia Antipolis F-06565 Valbonne, France).

5-16 September 1988

NATO-ASI Course: Prostanoids and Drugs, Erice, Italy. (Prof. G. Folco, School of Pharmacy, University of Parma, Via Balzaretti 9, 20133 Milan, Italy)

6-9 September 1988

11th International Subcellular Methodology Forum on Study of Cellular Roles of Calcium, Guildford, U.K. (Dr. E. Reid, Guildford Academic Associates, 72 The Chase, Guildford, U.K.)

7-9 September 1988

British Pharmacological Society Autumn Meeting, Nottingham U.K. (Closed meeting for members and guests.)

16-18 September 1988

MPTP-Sardinia '88: Degeneration and Regeneration Processes in CNS, Cagliari, Italy. (Prof. G.U. Corsini, Dept. of Neuroscience, University of Cagliari, Via Porcell 4, 091124 Cagliari, Italy.)

21-23 September 1988

Biological Determinants of Drug Response in Man, Gothenburg, Sweden (Swedish Academy of Pharmaceutical Sciences, POB 1136, Sp111, 81 Stockholm, Sweden.)

28-30 September 1988

Third International Conference on Drug Absorption, Edinburgh, Scotland. (Secretariat, EEP Consultants Ltd., 26–28 Albany Street, Edinburgh EH1 3QH).

3-5 October 1988

Second International Conference on the Pharmacology of Cerebral Ischaemia, Marburg, FRG (Dr. J. Jennings, M & S Conferences Ltd., The Studio, 12 High Street, Wheathampstead, Herts., U.K.

3-5 October 1988

Symposium on Variability in Pharmacokinetics and Drug Response, Gothenburg, Sweden. (Swedish Academy of Pharmaceutical Sciences, P.O. Box 1136, S-111 81 Stockholm, Sweden.)

5-7 October 1988

International Conference on the Cardiovascular Pharmacology of 5-HT, Amsterdam, Netherlands. (Dr. P. Bevan, 5-HT Congress, P.O. Box 2, 1380 AA Weesp, The Netherlands.)

12-13 November 1988

Symposium on Nausea and Vomiting: a Multidisciplinary Perspective, Ottawa, Canada. (Dr. R.K. Harding, Physiology Dept., Ottawa University, 451 Smyth Road, Ottawa, Ontario, K1H 8M5, Canada.)

19-21 December 1988

British Pharmacological Society Winter Meeting, London, U.K. (Closed meeting for members and guests.)

21 December 1988

Biochemical Society Neurochemical Group Colloquium on Receptor Structure and Gene Expression, London, U.K. (Dr. E.C. Hulme, NIMR, The Ridgeway, Mill Hill, London NW7 1AA).

29 March-1 April 1989

International Symposium on Serotonin, Florence, Italy. (Dr. F.M. Maggi, Institute of Pharmacological Sciences, University of Milan, Via Balzaretti 9, 20133 Milan, Italy).

2-5 April 1989

Seventh National Meeting of the Brain Research Association, Sheffield, U.K. (Dr. N. Payne, Dept. of Anatomy, Sheffield University, Sheffield, U.K.)

5-7 April 1989

British Pharmacological Society Spring Meeting, Bristol, U.K. (Closed meeting for members and guests.)

7 April 1989

British Pharmacological Society. Symposium on the NMDA Receptor, Bristol, U.K. (Dr. G.L. Collingridge, Department of Pharmacology, The Medical School, University of Bristol, Bristol, BS8 1TD, U.K.)

22-26 May 1989

Second Meeting of the International Neurotoxicology Association, Barcelona, Spain. (Dr. E. Rodriquez Farre, Dept. of Pharmacology & Toxicology, CSIC, Jorge Girona Salgado, 18–26, E-08034, Spain).

12-14 July 1989

British Pharmacological Society Summer Meeting. Leeds, U.K. (Closed meeting for members and guests)

16-21 July 1989

Vth International Congress of Toxicology, Brighton, U.K. (IUTOX '89, Congress House, 65 West Drive, Sutton, Surrey SH2 7NB, U.K.)

13-15 September 1989

British Pharmacological Society Autumn Meeting. Manchester, U.K. (Closed meeting for members and guests)

3-5 January 1990

British Pharmacological Society Winter Meeting. London, U.K. (Closed meeting for members and guests)

18-20 April 1990

British Pharmacological Society Spring Meeting. Sheffield, U.K. (Closed meeting for members and guests)

29 May-1 June 1990

Fondazione Giovanni Lorenzini Conference on Prostaglandins and Related Compounds, Florence, Italy (Fondazione Giovanni Lorenzini, Via Monte Napoleone, 23, 20121 Milan, Italy.)

1-6 July 1990

IUPHAR 11th International Congress of Pharmacology, Amsterdam, Netherlands (Contact to be advised.)

The Indices to Volumes 93 and 94 together with the Cumulative Contents will be published with the December 1988 issue

British Journal of Pharmacology

VOLUME 94 NUMBER 3 JULY 1988

PAPERS

- 635 BENOIT, E., CARRATÙ, M.R. & MITOLO-CHIEPPA, D. Interactions between molecules of a steroid anaesthetic (alphaxalone) and ionic channels of nodal membrane in voltage-clamped myelinated nerve fibre
- 647 DONNERER, J. & LEMBECK, F. Neonatal capsaicin treatment of rats reduces ACTH secretion in response to peripheral neuronal stimuli but not to centrally acting stressors
- 653 SCOTT, R.H., McGUIRK, S.M. & DOLPHIN, A.C. Modulation of divalent cation-activated chloride ion currents
- 663 DAFFONCHIO, L., PAYNE, A.N., LEES, I.W. & WHITTLE, B.J.R. Immediate anaphylactic bronchoconstriction induces airway hyperreactivity in anaesthetized guinea-pigs
- 669 WESSLER, I. & ANSCHÜTZ, S. β-Adrenoceptor stimulation enhances transmitter output from the rat phrenic nerve
- 675 DEVILLIER, P., ADVENIER, C., DRAPEAU, G., MARSAC, J. & REGOLI, D. Comparison of the effects of epithelium removal and of an enkephalinase inhibitor on the neurokinin-induced contractions of guinea-pig isolated trachea
- 685 MICHEL, M.C., PINGSMANN, A., BECKERINGH, J.J., ZERKOWSKI, H.-R., DOETSCH, N. & BRODDE, O.-E. Selective regulation of β_1 and β_2 -adrenoceptors in the human heart by chronic β -adrenoceptor antagonist treatment
- 693 DUNN, G., KOSHIKAWA, N., DURCAN, M.J. & CAMPBELL, I.C. An examination of experimental design in relation to receptor binding assays
- 699 MACKENZIE, I., KIRKPATRICK, K.A. & BURNSTOCK, G. Comparative study of the actions of AP₅A and α, β-methylene ATP on nonadrenergic, non-cholinergic neurogenic excitation in the guinea-pig vas deferens
- 707 EKSTRÖM, J., HÁKANSON, R., MÁNSSON, B. & TOBIN, G. Tachykinin involvement in parasympathetic nerve-evoked salivation of the ferret
- 713 ISHAC, E.J.N. & DE LUCA, A. The influence of activation or inhibition of protein kinase C on the release of radioactivity from rat isolated atria labelled with [3H]-noradrenaline
- 721 KARWATOWSKA-PROKOPCZUK, E., CIABAT-TONI, G. & WENNMALM, Å. Effect of adenosine on the formation of prostacyclin in the rabbit isolated heart
- 729 McCAIG, D.J. & RODGER, I.W. Effects of leukotriene D₄ on the mechanical and electrical properties of guinea-pig isolated trachealis

- 737 GUILD, S., FREY, E.A., POCOTTE, S.L. & KEBA-BIAN, J.W. Adenosine 3',5'-cyclic monophosphate-mediated enhancement of calcium-evoked prolactin release from electrically permeabilised 7315c tumour cells
- 745 KEERY, R.J. & LUMLEY, P. AH6809, a prostaglandin DP-receptor blocking drug on human platelets
- 755 TUTTLE, R.S., YAGER, J. & NORTHRUP, N. Age and the antihypertensive effect of aspirin in rats
- 759 BROOKS, D.P., KOSTER, P.F., STASSEN, F.L., ALBRIGHTSON, C.R., HUFFMAN, W.F., WAS-SERMAN, M.A. & KINTER, L.B. Flushing and haemodynamic responses to vasopressin peptides in the rhesus monkey
- 765 HAWGOOD, B.J., SMITH, I.C.H. & STRONG, P.N. Early induction by crotoxin of biphasic frequency changes and giant miniature endplate potentials in frog muscle
- 773 BARR, R.M., KORO, O., FRANCIS, D.M., BLACK, A.K., NUMATA, T. & GREAVES, M.W. The release of prostaglandin D₂ from human skin in vivo and in vitro during immediate allergic reactions
- 781 SZABO, B., HEDLER, L., SCHURR, C. & STARKE, K. Peripheral sympatho-inhibitory cardiovascular effects of opioid peptides in anaesthetized rabbits
- 789 AHN, H.Y. & KARAKI, H. Inhibitory effects of procaine on contraction and calcium movement in vascular and intestinal smooth muscles
- 797 TREHERNE, J.M. & YOUNG, J.M. [+H]-(+)-N-methyl-4-methyldiphenhydramine, a quaternary radioligand for the histamine H₁-receptor
- 811 TREHERNE, J.M. & YOUNG, J.M. Temperaturedependence of the kinetics of the binding of [³H]-(+)-N-methyl-4-methyldiphenhydramine to the histamine H₁-receptor: comparison with the kinetics of [³H]mepyramine
- 823 ALLEN, J.M., McCARRON, J.G., McHALE, N.G. & THORNBURY, K.D. Release of [3H]-noradrenaline from the sympathetic nerves to bovine mesenteric lymphatic vessels and its modification by α-agonists and antagonists
- 834 HEY, J.A., ITO, T. & KOSS, M.C. α-Methyldopa produces mydriasis in the rat by stimulation of CNS α,-adrenoceptors
- 839 ROWAN, E.G. & HARVEY, A.L. Potassium channel blocking actions of β-bungarotoxin and related toxins on mouse and frog motor nerve terminals
- 848 DONNERER, J., YAN, Z. & LEMBECK, F. Effects of clonidine and yohimbine on a C-fibre-evoked blood pressure reflex in the rat

continued on inside back cover

- 853 TAYLOR, S.G., SOUTHERTON, J.S., WESTON, A.H. & BAKER, J.R.J. Endothelium-dependent effects of acetylcholine in rat aorta: a comparison with sodium nitroprusside and cromakalim
- 864 WAHLSTRÖM, A., PACIFICI, G.M., LINDSTRÖM, B., HAMMAR, L. & RANE, A. Human liver morphine UDP-glucuronyl transferase enantioselectivity and inhibition by opioid congeners and oxazepam
- 871 ERECIŃSKA, M., NELSON, D. & SILVER, I.A. Interactions of benztropine, atropine and ketamine with veratridine-activated sodium channels: effects on membrane depolarization, K+-efflux and neutrotransmitter amino acid release
- 882 HISHINUMA, S. & UCHIDA, M.K. Short-term desensitization of guinea-pig taenia caecum induced by carbachol occurs at intracellular Ca stores and that by histamine at H₁-receptors
- 890 BOGNAR, I.T., PALLAS, S., FUDER, H. & MUS-CHOLL, E. Muscarinic inhibition of [3H]-noradrenaline release on rabbit iris in vitro: effects of stimulation conditions on intrinsic activity of methacholine and pilocarpine
- 901 OTTOSSON, A., JANSEN, I. & EDVINSSON, L. Characterization of histamine receptors in isolated human cerebral arteries
- 908 VAN OOSTERHOUT, A.J.M., WOUTERSEN-VAN NIJNANTEN, F.M.A., FOLKERTS, G. & NIJKAMP, F.P. Effects of anterior hypothalamic lesions and shamoperations on bacterial endotoxin-induced non-specific airway hyperreactivity in vivo and in vitro
- 917 OHUCHI, K., SUGAWARA, T., WATANABE, M., HIRASAWA, N., TSURUFUJI, S., FUJIKI, H., CHRISTENSEN, S.B. & SUGIMURA, T. Analysis of the stimulative effect of thapsigargin, a non-TPA-type

- tumour promoter, on arachidonic acid metabolism in rat peritoneal macrophages
- 924 STAMFORD, J.A., KRUK, Z.L. & MILLAR, J. Actions of dopamine antagonists on stimulated striatal and limbic dopamine release: an in vivo voltammetric study
- 993 McDOWELL, J. & KITCHEN, I. Perinatal lead exposure alters the development of δ but not μ -opioid receptors in rat brain
- 938 HOLROYDE, M.C. & NORRIS, A.A. The effect of ozone on reactivity of upper and lower airways in guinea-pigs
- 947 BARLOW, R.B., SHEPHERD, M.K., TYDEMAN, H. & VEALE, M.A. The affinity of some acetylenic analogues of 4-DAMP methobromide for muscarinic receptors in guinea-pig ileum and atria
- 952 PERNOW, J., KAHAN, T. & LUNDBERG, J.M. Neuropeptide Y and reserpine-resistant vasoconstriction evoked by sympathetic nerve stimulation in the dog skeletal muscle
- 961 DALZIEL, H.H. & SNEDDON, P. The mechanism of action of AMP-induced inhibition of sympathetic neurotransmission in the isolated vas deferens of the rat and guinea-pig
- 968 HARBORNE, A.J. & SMITH, M.E. Effect of soluble factors from nerve and muscle on α-bungarotoxin binding sites in isolated sarcolemmal membranes of the rat
- 977 RANDALL, M.D. & HILEY, C.R. Effect of phenobarbitone pretreatment upon endothelium-dependent relaxation to acetylcholine in rat superior mesenteric arterial bed

MEETINGS CALENDAR

The Indices to Volumes 93 and 94 together with the Cumulative Contents will be published with the December 1988 issue