



ACETYLCHOLINE IN THE CEREBRAL CORTEX

Volume 145

Laurent Descarries &
Krešimir Krnjević

PROGRESS IN BRAIN RESEARCH

VOLUME 145

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ACETYLCHOLINE IN THE CEREBRAL CORTEX

EDITED BY

LAURENT DESCARRIES

*Departments of Pathology and Cellular Biology and of Physiology, Centre de Recherche en Sciences
Neurologiques, Université de Montréal, C.P. 6128, Succ. Centre-ville, Montreal, QC H3C 3J7, Canada*

KREŠIMIR KRNJEVIĆ

*Anaesthesia Research Unit and Department of Physiology, McGill University, McIntyre Building,
3655 Promenade Sir William Osler, Montreal, QC H3G 1Y6, Canada*

MIRCEA STERIADE

*Laboratory of Neurophysiology, Department of Anatomy and Physiology, Faculty of Medicine, Université
Laval, Pavillon Ferdinand-Vandry, Quebec, QC G1K 7P4, Canada*



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List of Contributors

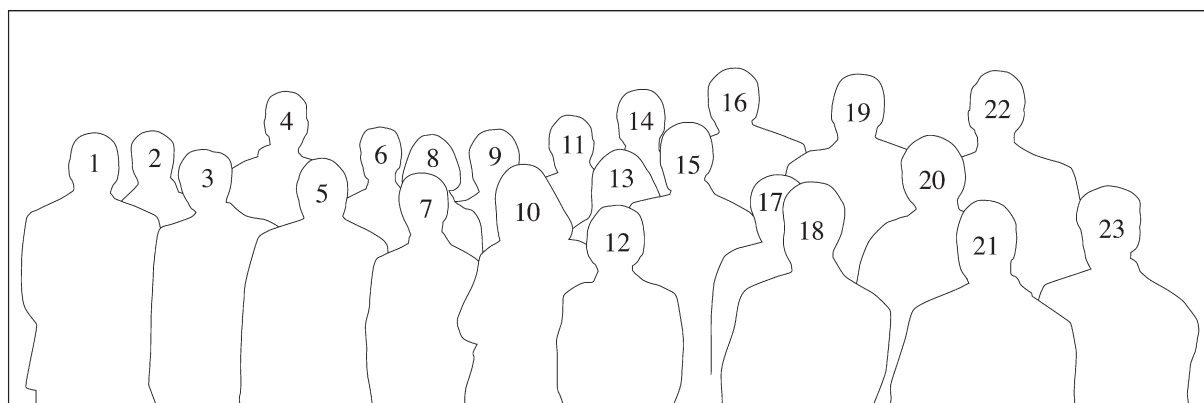
- E.X. Albuquerque, Departamento de Farmacologie Básica e Clínica, Instituto de Ciências Biomédicas, Centro de Ciências da Saúde, Universidade Federal do Rio de Janeiro, Rio de Janeiro, RJ 21944, Brazil
- M. Alkondon, Department of Pharmacology and Experimental Therapeutics, University of Maryland School of Medicine, Baltimore, MD 21201, USA
- N. Aznavour, Departments of Pathology and Cell Biology and Physiology, Université de Montréal, C.P. 6128 Succ. Centre-ville, Montreal, QC H3C 3J7, Canada
- S.B. Backman, Department of Anaesthesia, Royal Victoria Hospital, 687 Pine Avenue W., Montreal, QC H3A 1A1, Canada
- D.P. Calderon, Department of Neuroscience, Albert Einstein College of Medicine, 1300 Morris Park Avenue, Bronx, NY 10461, USA
- N. Champiaux, Laboratoire de Neurobiologie Moléculaire, Centre de la Recherche Scientifique, Unité de Recherche Associée 2182 'Récepteurs et Cognition', Institut Pasteur 75724, Paris Cedex 15, France
- J.-P. Changeux, Laboratoire de Neurobiologie Moléculaire, Centre de la Recherche Scientifique, Unité de Recherche Associée 2182 'Récepteurs et Cognition', Institut Pasteur 75724, Paris Cedex 15, France
- P.B.S. Clarke, Department of Pharmacology and Therapeutics, McGill University, 3655 Promenade Sir William Osler, Montreal QC, H3G 1Y6 Canada
- L. Descarries, Departments of Pathology and Cell Biology and Physiology, Université de Montréal, C.P. 6128 Succ. Centre-ville, Montreal, QC H3C 3J7, Canada
- P. Fiset, Department of Anaesthesia, Royal Victoria Hospital, 687 Pine Avenue W., Montreal, QC H3A 1A1, Canada
- D.D. Flynn, Department of Molecular and Cellular Pharmacology, University of Miami School of Medicine, P.O. Box 016189, Miami, FL 33101, USA
- E. Hamel, Laboratory of Cerebrovascular Research, Department of Neurology and Neurosurgery, Montreal Neurological Institute, McGill University, 3801 University Street, Montreal, QC H3A 2B4, Canada
- M.E. Hasselmo, Department of Psychology, Center for Memory and Brain and Program in Neuroscience, Boston University, 2 Cummington Street, Boston, MA 02215, USA
- C. Hsieh, Department of Neurobiology and Behavior, University of California, Irvine, 2205 McGaugh Hall, Irvine, CA 92697-4550, USA
- B.E. Jones, Department of Neurology and Neurosurgery, McGill University, Montreal Neurological Institute, Montreal, QC H3A 2B4, Canada
- S. Kar, Douglas Hospital Research Center, Department of Psychiatry, McGill University, Montreal, QC H4H 1R3 Canada
- K. Krnjević, Anaesthesia Research Unit and Physiology Department, McIntyre Building Room 1215, McGill University, 3655 Promenade Sir William Osler, Montreal, QC H3G 1Y6, Canada
- A.I. Levey, Department of Neurology and Center for Neurodegenerative Disease, Emory University School of Medicine, Whitehead Biomedical Research Building, Suite 505, 615 Michael Street, Atlanta, GA 30322, USA

- J.-S. Liang, Department of Molecular and Cellular Pharmacology, University of Miami School of Medicine, P.O. Box 016189, Miami, FL 33101, USA
- M.H. McCollum, Department of Molecular and Cellular Pharmacology, University of Miami School of Medicine, P.O. Box 016189, Miami, FL 33101, USA
- J. McGaughy, Department of Psychology, Center for Memory and Brain and Program in Neuroscience, Boston University, 2 Cummington Street, Boston, MA 02215, USA
- N. Mechawar, Departments of Pathology and Cell Biology and Physiology, Université de Montréal, C.P. 6128 Succ. Centre-ville, Montreal, QC H3C 3J7, Canada
- M.-M. Mesulam, Cognitive Neurology and Alzheimer's Disease Center, Departments of Neurology and Psychiatry, Feinberg Medical School, Northwestern University, Chicago, IL 60611, USA
- R. Metherate, Department of Neurobiology and Behavior, University of California, Irvine, 2205 McGaugh Hall, Irvine, CA 92697-4550, USA
- A. Nordberg, Karolinska Institute, Neurotec Department, Division of Molecular Neuropharmacology, Huddinge University B84, S-141 86 Stockholm, Sweden
- A. Peinado, Department of Neuroscience, Albert Einstein College of Medicine, 1300 Morris Park Avenue, Bronx, NY 10461, USA
- E.K. Perry, Development in Clinical Aging, MRC Building, Newcastle General Hospital, Westgate Road, Newcastle upon Tyne, NE4 6BE, UK
- R.H. Perry, Development in Clinical Aging, MRC Building, Newcastle General Hospital, Westgate Road, Newcastle upon Tyne, NE4 6BE, UK
- G. Plourde, Department of Anaesthesia, Royal Victoria Hospital, 687 Pine Avenue W., Montreal, QC H3A 1A1, Canada
- L.T. Potter, Department of Molecular and Cellular Pharmacology, University of Miami School of Medicine, P.O. Box 016189, Miami, FL 33101, USA
- R. Quirion, Douglas Hospital Research Center, Department of Psychiatry, McGill University, Montreal, QC H4H 1R3, Canada
- K. Semba, Department of Anatomy and Neurobiology, Faculty of Medicine, Dalhousie University, Halifax, NS B3H 1X5, Canada
- Z. Shao, Laboratory of Signal Transduction, National Institute of Environmental Health Sciences, N.I.H., P.O. Box 12233, 111 T.W. Alexander Drive, Research Triangle Park, NC 27709, USA
- O.K. Steinlein, Institute of Human Genetics, University Hospital Bonn, Friedrich-Wilhelms-University, Wilhelmstr. 31, D-53111 Bonn, Germany
- M. Steriade, Laboratoire de Neurophysiologie, Faculté de Médecine, Université Laval, Laval, QC G1K 7P4, Canada
- L.A. Volpicelli, Department of Neurology and Center for Neurodegenerative Disease, Emory University School of Medicine, Whitehead Biomedical Research Building, Suite 505, 615 Michael Street, Atlanta, GA 30322, USA
- K.C. Watkins, Departments of Pathology and Cell Biology and Physiology, Université de Montréal, C.P. 6128 Succ. Centre-ville, Montreal, QC H3C 3J7, Canada
- P.J. Whitehouse, Case Western Reserve University, 12200 Fairhill Road, Suite C357, Cleveland, OH 44120-1013, USA
- J.L. Yakel, Laboratory of Signal Transduction, National Institute of Environmental Health Sciences, N.I.H., P.O. Box 12233, 111 T.W. Alexander Drive, Research Triangle Park, NC 27709, USA

XXIVth International Symposium of the Centre de recherche en sciences neurologiques
Acetylcholine in the Cerebral Cortex, held at the Université de Montréal,
May 6 and 7, 2002



Speakers from left to right (see number key below). 1. Jean-Pierre Changeux; 2. Paul B.S. Clarke; 3. Kazuo Semba; 4. Michael E. Hasselmo; 5. Laurent Descarries; 6. Raju Metherate; 7. Manickavasagam Alkondon; 8. Barbara E. Jones; 9. Agneta Nordberg; 10. Ortrud K. Steinlein; 11. M.-Marsel Mesulam; 12. Edith Hamel; 13. Elaine K. Perry; 14. Rémi Quirion; 15. Krešimir Krnjević; 16. Lincoln T. Potter; 17. Mircea Steriade; 18. Allan I. Levey; 19. Peter J. Whitehouse; 20. Robert H. Perry; 21. Steven B. Backman; 22. Jerrel L. Yakel; 23. Alejandro Peinado.



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Preface

Each year, the *Centre de recherche en sciences neurologiques (CRSN)* of the *Université de Montréal* hosts an international symposium gathering leaders of the scientific community on a particular topic of the neurosciences. In 2002 (May 6 and 7), the XXIVth International Symposium of the *CRSN*, organized jointly by Laurent Descarries (Université de Montréal), Krešimir Krnjević (McGill University) and Mircea Steriade (Université Laval) was devoted to ‘Acetylcholine in the Cerebral Cortex’. The two-day meeting consisted of 22 presentations on all aspects of this fascinating subject, ranging from its most elementary, at the molecular and cellular levels, to its systemic and holistic implications, including its role in cognition and involvement in human diseases and therapeutics. This effort to integrate current knowledge at all levels of organization of the nervous system, from the basic to the applied neurosciences, was greatly appreciated by an audience of students, scientists and clinicians from diverse disciplinary horizons.

It was most appropriate to hold this meeting in Montreal, where so much of the history of ‘Acetylcholine in the Cerebral Cortex’ has been written. For example, one can cite the pioneering studies demonstrating ACh release in the cortex. The ‘cortical cup’ technique, originally developed in 1949 by H.H. Jasper and K.A.C. Elliott at the Montreal Neurological Institute, allowed the first convincing demonstrations by Elliott and then F.C. MacIntosh that ACh is released in the brain *in situ*. Working in Sir Henry Dale’s lab in London, MacIntosh had confirmed that ACh release in ganglia is a physiological, and not a pathological process. In separate experiments, both he and Jasper demonstrated a clear correlation between changes in cortical ACh release and the behavioral (waking–sleep) state of the animal. This opened up the possibility that ACh was a key element controlling thalamocortical interactions and their putative role in sleep–waking, a major focus of further studies by Jasper, J.P. Cordeau and their many collaborators in Montreal.

Acetylcholine has been a canonical neurotransmitter/modulator in both senses of the word. First to be discovered, hence the most ancient, it also served as a model, setting the rules for other chemical messengers. As illustrated by the present monograph, the constitutive elements of the cholinergic system are among the best known in the central nervous system. Following their immunocytochemical identification in brain, some 20 years ago, many of the molecular and cellular processes, properties and mechanisms governing their functioning have been elucidated. Their involvement in cortical functions has led to the beginning of an understanding of complex and refined behaviors and capacities previously unamenable to neurobiological exploration and characterization. Cholinergic neurons, receptor sites and effector mechanisms have been recognized as major players in pathological ageing, and as targets for new diagnostic or therapeutic procedures. Natural or synthetic compounds capable of mimicking or modifying

their actions have been developed, raising the hope of being one day able to improve cognitive performance!

Like the presentations at the meeting, the chapters in this book have been grouped under four headings: I. The Acetylcholine Innervation of Cerebral Cortex; II. Modes of Action of Acetylcholine in the Cerebral Cortex; III. Cortical Properties and Functions Modulated by Acetylcholine, and IV. Clinical, Pathological and Therapeutic Implications. These somewhat arbitrary subdivisions should not detract from the effort made by all authors (and the editors) to integrate their topics in the broader framework of a global perspective on the subject. It is a pleasure to thank them all for participating in such a challenging endeavor.

Laurent Descarries, Krešimir Krnjević and Mircea Steriade

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This monograph is the 24th in a series of reports based on the proceedings of an annual international symposium organized by the *Centre de recherche en sciences neurologiques (CRSN)* of the Université de Montréal (UdeM). The cost of this annual meeting is partly defrayed by an operating grant of the University to the Groupe de recherche sur le système nerveux central (GRSNC). We also gratefully acknowledge the complementary financial support received from the Fonds de la recherche en santé du Québec (FRSQ), the Ministère de la Recherche de la Science et de la Technologie du Québec, the Canadian Institutes of Health Research (CIHR), the Savoy Foundation/Epilepsy, Merck-Frosst Canada, Servier Canada, AstraZeneca Canada, and the Fonds Michel Bergeron. For their help in the organization of the symposium, we also wish to thank the secretarial and technical staffs of the CRSN and of the Department of Physiology at UdeM, and especially Chantal Nault and Daniel Cyr.

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SECTION I

The acetylcholine innervation of cerebral cortex