

EDITORIAL

Purinergic Signalling in Epilepsy

The purines ATP and adenosine play important roles to modulate the brain's susceptibility to seizures. Dysregulation of purinergic signalling has recently been identified as a major contributing factor in the genesis of epilepsy. Conversely, reconstitution of purinergic signalling offers promising therapeutic approaches. This supplement highlights purinergic mechanisms in seizure generation and novel therapeutic approaches. The first five chapters of this issue provide a more general overview of the status of the field, whereas the remaining five articles discuss specific topics in more detail.

Purinergic signalling was first discovered in 1972 by **Geoffrey Burnstock** who provides the first introductory chapter to this issue. In his article *Purinergic Signalling in the CNS* he provides a general overview on the role purines and their receptors play in the regulation of CNS activity. After this general introduction into the purine field **Mike Dragunow** focuses on purinergic mechanisms in epilepsy with a specific focus on the brain's endogenous anticonvulsant adenosine. The following article by **Maria José da Silva Fernandes** highlights the role of ATP in temporal lobe epilepsy with a specific focus on the ATP-gated P2X channels. The synaptic availability of the purines ATP and adenosine depends on ectonucleotidases, which are covered in an article by **Carla Denise Bonan**. In the following article **Bertil B. Fredholm** provides a thought-provoking overview on physiological and pathophysiological roles of adenosine and its receptors.

Susan Masino's article *Purines and the Anti-Epileptic Actions of Ketogenic Diets* is based on new findings suggesting that the anticonvulsant effects of the ketogenic diet are based on purinergic mechanisms that lead to increased activation of the anticonvulsant adenosine A₁ receptor. Seizure control is not only mediated by A₁ receptors, but A_{2A} receptors play an additional more complex role, that is critically discussed by **Rodrigo Cunha**. Although neuronal hyperexcitability is responsible for seizure generation, glial cells – in particular microglia and astrocytes – play important roles in modulating neuronal physiology by purinergic mechanisms that are discussed by **Kazuhide Inoue**. New findings by **Detlev Boison** further highlight the role of astrocytes in epileptogenesis and their role in regulating adenosine *via* the expression of the enzyme adenosine kinase. Finally, **Diogo Souza** presents an overview of the role of the purines GTP and guanosine in epilepsy.

Together, the assembled articles provide a concise overview of purine-based molecular mechanisms involved in seizure generation. Detailed understanding of the mechanisms involved has led to the translation of those principles into novel and promising therapeutic approaches that are also discussed here and may lead to novel purine-based therapeutics for epilepsy in the future.

Detlev Boison

Robert Stone Dow Neurobiology Laboratories
Legacy Research,
Portland OR,
USA
Tel: (503) 413-1754;
Fax: (503) 413-5465
E-mail: dboison@downeurobiology.org

Geoffrey Burnstock

Autonomic Neuroscience Centre,
University College Medical School,
Royal Free Campus, Rowland Hill Street,
London NW3 2PF
UK
Tel: +44 (0)20 7830 2948
Fax: +44 (0)20 7830 2949
E-mail: g.burnstock@ucl.ac.uk

© Boison and Burnstock; Licensee *Bentham Open*.

This is an open access article licensed under the terms of the Creative Commons Attribution Non-Commercial License (<http://creativecommons.org/licenses/by-nc/3.0/>) which permits unrestricted, non-commercial use, distribution and reproduction in any medium, provided the work is properly cited.