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Editorial

Purinergic signalling and the autonomic nervous system in health and disease

Purinergic signalling, ATP acting as an extracellular signalling molecule, was proposed in 1972 (Burnstock, 1972). Separate families of purinergic receptors were recognised, named P1 receptors for adenosine and P2 receptors for ATP and ADP (Burnstock, 1978). Two subtypes of P2 receptors were shown in 1985, based on pharmacology (Burnstock and Kennedy, 1985) and in the early 1990s P1, P2X and P2Y receptor subtypes were cloned and characterised: four subtypes of P1 receptors (A_1, A_{2A}, A_{2B} and A_3), seven subtypes of P2X ion channel receptors (P2X1–7) and eight subtypes of P2Y G protein-coupled receptors ($P2Y_1$, $P2Y_2$, $P2Y_4$, $P2Y_6$, $P2Y_{11}$, $P2Y_{12}$, $P2Y_{13}$ and $P2Y_{14}$) (Burnstock, 2007a; Ralevic and Burnstock, 1998).

In this special issue, the focus is on purinergic signalling and the autonomic nervous system (see Burnstock, 2009; Gourine et al., 2009). ATP was first described as a neurotransmitter in non-cholinergic, non-adrenergic (NANC) inhibitory nerves in the guinea pig taenia coli (Burnstock et al., 1970) and later in NANC parasympathetic excitatory nerves supplying the urinary bladder (Burnstock et al., 1972). ATP was later shown to be a cotransmitter in sympathetic as well as parasympathetic enteric nerves (Burnstock, 1976). Purinergic signalling was initially slow to be accepted, but after the cloning of the receptors the field has exploded in many different directions concerning the physiological and pathophysiological roles of purinergic signalling (see Burnstock, 2007b, 2012).

The opening chapter by Charles Kennedy describes the evidence for ATP as a cotransmitter in sympathetic, parasympathetic, enteric and sensory-motor nerves. The second chapter by Anthony Ford and colleagues is concerned with the involvement of P2X3 receptors on autonomic reflex activities. Chapter 3 by Jean Sévigny and colleagues deals with the impact of ectonucleotidases in autonomic nerve functions. The roles of purinergic signalling in the airways are described by Jean-Pierre Timmermans and his colleagues in Chapter 4. Vera Ralevic and William Dunn describe purinergic neurotransmission to blood vessels in health and disease in Chapter 5. The roles of purinergic signalling in the development of the autonomic nervous system are described by Cristina Giaroni in Chapter 6. Chapter 7 by Karl-Eric Andersson deals with purinergic signalling in the urinary bladder. Purinergic signalling in the reproductive system is described by George Gorodeski in Chapter 8 and in the endocrine system by Stanko Stojilkovic in Chapter 9. The impact of purinergic signalling on the immune system in inflammatory disorders and cancer in autonomically-innervated organs is discussed in Chapter 10 by Francesco Di Virgilio. The effects of purinergic signalling on bone, cartilage and muscle are described by Isabel Orriss in Chapter 11, on the kidney by Matt Bailey and colleagues in Chapter 12 and by Brian King on the gut in Chapter 13.

References

Burnstock, G., 1972. Purinergic nerves. Pharmacol. Rev. 24, 509–581.
Burnstock, G., 1976. Do some nerve cells release more than one transmitter? Neuroscience 1, 239–248.
Burnstock, G., 1978. A basis for distinguishing two types of purinergic receptor. In: Straub, R.W., Bolis, L. (Eds.), Cell Membrane Receptors for Drugs and Hormones: A Multidisciplinary Approach. Raven Press, New York, pp. 107–118.
Burnstock, G., 2007a. Purine and pyrimidine receptors. Cell. Mol. Life Sci. 64, 1471–1483.
Burnstock, G., 2007b. Physiology and pathophysiology of purinergic neurotransmission. Physiol. Rev. 87, 659–797.
Burnstock, G., 2009. Autonomic neurotransmission: 60 years since Sir Henry Dale. Annu. Rev. Pharmacol. Toxicol. 49, 1–30.
Burnstock, G., 2012. The Gaddum Lecture. Discovery of purinergic signalling, the initial resistance and current explosion of interest. Br. J. Pharmacol. 167, 238–255.
Burnstock, G., Kennedy, C., 1985. Is there a basis for distinguishing two types of P_2-purinoceptor? Gen. Pharmacol. 16, 433–440.
Burnstock, G., Campbell, G., Satchell, D., Smythe, A., 1970. Evidence that adenosine triphosphate or a related nucleotide is the transmitter substance released by non-adrenergic inhibitory nerves in the gut. Br. J. Pharmacol. 40, 668–688.
Burnstock, G., Dumsday, B., Smythe, A., 1972. Atropine resistant excitation of the urinary bladder: the possibility of transmission via nerves releasing a purine nucleotide. Br. J. Pharmacol. 44, 451–461.
Gourine, A.V., Wood, J., Burnstock, G., 2009. Purinergic signalling in autonomic control. Trends Neurosci. 32, 241–248.
Ralevic, V., Burnstock, G., 1998. Receptors for purines and pyrimidines. Pharmacol. Rev. 50, 413–492.

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