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Thermal Stress-Induced Expression of CB1 Cannabinoid Receptors in the Rat Rostral Pons

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Endocannabinoids are a family of biologically active lipids in the brain that mediate the psychoactive effects of cannabis by two distinct receptors, cannabinoid receptor type I (CB1) and type II (CB2). It has been shown that the CB1 is the major cannabinoid receptor in the brain and is highly expressed in areas that are involved in pain modulation. There is also recent evidence that its activation reduces nociceptive processing in acute and chronic animal pain models. In this study, we demonstrate that thermal stress induces the expression of CB1 cannabinoid receptors in certain brainstem regions associated with pain sensation in the rat rostral pons, using light microscopic immunohistochemistry with a subtype-specific antibody. In particular, we were able to reveal that the pontine gray matter, the locus coeruleus, the parabrachial nuclear complex and the pontine raphe nuclei show high levels of CB1 cannabinoid receptors with a possible role in specific brain functions, such as nociception. The present results suggest that in addition to their known expression in excitatory glutamatergic and inhibitory GABAergic neuronal subpopulations, the CB1 receptors are also present in a subset of noradrenergic, cholinergic and serotonergic neurons in the rat rostral pons. It can be inferred that CB1 receptors may have divergent roles in nociceptive processing in a broad brainstem area, depending on the exact neurotransmitter system they modulate.

Key words: cannabinoid receptors, endocannabinoids, locus coeruleus, parabrachial nuclear complex, periventricular gray, pontine raphe nuclei, rat.