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Research

Capsaicin- resistant arterial baroreceptors

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Abstract

Background: Aortic baroreceptors (BRs) comprise a class of cranial afferents arising from major arteries closest to the heart whose axons form the aortic depressor nerve. BRs are mechanoreceptors that are largely devoted to cardiovascular autonomic reflexes. Such cranial afferents have either lightly myelinated (A-type) or non-myelinated (C-type) axons and share remarkable cellular similarities to spinal primary afferent neurons. Our goal was to test whether vanilloid receptor (TRPV1) agonists, capsaicin (CAP) and resiniferatoxin (RTX), altered the pressure-discharge properties of peripheral aortic BRs.

Results: Periaxonal application of 1 μM CAP decreased the amplitude of the C-wave in the compound action potential conducting at <1 m/sec along the aortic depressor nerve. 10 μM CAP eliminated the C-wave while leaving intact the A-wave conducting in the A-δ range (<12 m/sec). These whole nerve results suggest that TRPV1 receptors are expressed along the axons of C- but not A-conducting BR axons. In an aortic arch – aortic nerve preparation, intralumenal perfusion with 1 μM CAP had no effect on the pressure-discharge relations of regularly discharging, single fiber BRs (A-type) – including the pressure threshold, sensitivity, frequency at threshold, or maximum discharge frequency ($n = 8$, $p > 0.50$) but completely inhibited discharge of an irregularly discharging BR (C-type). CAP at high concentrations (10–100 μM) depressed BR sensitivity in regularly discharging BRs, an effect attributed to non-specific actions. RTX (≤ 10 μM) did not affect the discharge properties of regularly discharging BRs ($n = 7$, $p > 0.18$). A CAP-sensitive BR had significantly lower discharge regularity expressed as the coefficient of variation than the CAP-resistant fibers ($p < 0.002$).

Conclusion: We conclude that functional TRPV1 channels are present in C-type but not A-type (A-δ) myelinated aortic arch BRs. CAP has nonspecific inhibitory actions that are unlikely to be related to TRV1 binding since such effects were absent with the highly specific TRPV1 agonist RTX. Thus, CAP must be used with caution at very high concentrations.

Background

Sensory information from visceral organs enters the central nervous system via separate pools of primary afferents that synapse at either the spinal cord or the brain stem [1,2]. Cranial primary afferents that synapse first within the brain stem have cell bodies in the nodose ganglia (NG) and share many general morphological, cellular and molecular properties with the somatic and visceral sen-