**Kᵥ Currents in Identified Muscle Afferents**

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**Background:** The exercise pressor reflex controls the cardiovascular response to exercise and is mediated by group III/IV muscle afferents neurons. This reflex can be inappropriately activated in disease states, such as peripheral vascular disease, leading to increased risk of myocardial infarction. We are investigating the expressed voltage-gated potassium (Kᵥ) channels to determine their potential role in controlling excitability of the neurons mediating the exercise pressor reflex.

**Method:** Muscle afferent neurons in the L4-5 dorsal root ganglia were labeled with DiI injected into the gastrocnemius muscle of adult rats. The neurons were enzymatically dissociated prior to whole-cell patch clamp recording.

**Results:** We identified two neuronal classes based on Kᵥ current inactivation, a non-inactivating (Kᵥ–N) current and an inactivating (Kᵥ–I) current. There was no difference in neuronal diameter between these two groups. The different inactivating properties suggested differences in the channel composition between these two groups. Kᵥ channel blockers were used to determine the channel types comprising whole-cell Kᵥ current. The sequentially applied blockers were 100 nM dendrotoxin (Kᵥ1.1, 1.2), 3 mM TEA (Kᵥ3.1), 150 µM 4-AP (Kᵥ1.4), and 300 nM stromatoxin (Kᵥ2) (n = 13). Of these, only dendrotoxin sensitive current was significantly different between Kᵥ–N (14 ± 10%, n=6) vs. Kᵥ–I neurons (4 ± 3 %, n = 7). The other blockers inhibited current in Kᵥ–N vs. Kᵥ–I neurons by 7 ± 4% vs. 4 ± 3% for stromatoxin (Kᵥ2), 11 ± 2 % vs. 15 ± 8% for 4-AP (Kᵥ1.4), and, 26 ± 5% vs. 27 ± 12% for TEA (Kᵥ3.1), respectively. Approximately 41% of Kᵥ current in Kᵥ–N and 50% of Kᵥ current in Kᵥ–I neurons was insensitive to all blockers. We are examining potential sources for the resistant current.

**Discussion:** These results suggest that the group III/IV muscle afferents express Kᵥ3.1 > Kᵥ1.4 > Kᵥ2. The Kᵥ–N vs. Kᵥ–I neurons were distinguished only by dendrotoxin block, which suggests differential expression of Kᵥ1.1 and/or 1.2 channels in these neurons. The differential activation and inactivation properties of the expressed Kᵥ channels combine to contribute to the excitability of the muscle afferents. It will be interesting to determine if down regulation of Kᵥ channels contributes to muscle afferent hyperactivity in diseases that enhance the exercise pressor reflex.

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