Role of Cav1 channelsy in sensory neurons

Voltage-gated calcium channels (VGCCs) provide depolarization-induced Ca^{2+} signals for many important physiological functions such as muscle contraction, secretion, neurotransmission, and gene expression. Like other ion channels they form part of signaling complexes together with other signaling molecules, such as receptors, kinases, phosphatases and calmodulin. Most VGCCs exist as hetero-oligomeric assemblies of several subunits, with a so-called α1-subunit forming the Ca^{2+}-selective channel pore. Ten different α1-subunit isoforms exist, that can associate with one of four different β-subunit isoforms and one of four different α2-δ subunits. The α1-subunits determine most of the channel's biophysical and pharmacological properties. L-type calcium channels (LTCCs, Cav1 family) were first described in muscle cells but are found in most electrically excitable tissues. In contrast, expression of members of the Cav2 family is largely restricted to neurons and endocrine cells. In neurons Cav2 channels form the presynaptic channels providing Ca^{2+} for fast neurotransmitter release. In contrast, neuronal Cav1 channels in the central nervous system are located postsynaptically whereas they are expressed presynaptically in (neuronal) sensory cells. I will focus on the physiological role of LTCCs in sensory cells present in the inner ear and the retina. We will discuss special structural features that stabilize functional properties required for proper function in these cells and allow fine-tuning of channel function. I also summarize our current knowledge about their role for human hearing and visual disorders.