TRP (transient receptor potential) channels were first described in Drosophila in 1989, and in mammals, TRP channels comprise six related protein families (TRPC, TRPV, TRPM, TRPA, TRPML, TRPP). One subunit of the TRP channel is composed of six transmembrane domains and a putative pore region with both amino and carboxyl termini on the cytosolic side. It is thought that the subunits form functional channels as homo- or hetero-tetramers. TRP channels are best recognized for their contributions to sensory transduction, responding to temperature, nociceptive stimuli, touch, osmolarity, pheromones and other stimuli from both within and outside the cell. Among the huge TRP super family of ion channels, some have been proven to be involved in thermosensation detecting ambient temperatures from cold to hot. There are now ten thermosensitive TRP channels (TRPV1, TRPV2, TRPV3, TRPV4, TRPM2, TRPM3, TRPM4, TRPM5, TRPM8 and TRPA1) with distinct temperature thresholds for their activation. Because temperature ranges above 43 degree C or below 15 degree C are considered to cause pain sensation in our body, thermosensitive TRP channels whose temperature thresholds are in the range can be viewed as nociceptive receptors as well. Thermosensitive TRP channels work as ‘multimodal receptors’ which respond to various chemical and physical stimuli. TRPV1, the first identified thermosensitive TRP channel, was found as a receptor for capsaicin, and later was found to have thermosensitivity. I would like to talk about the physiological significance of the thermosensitive TRP channels (TRPV1, TRPA1, TRPV4 and TRPM2). Some of the thermosensitive TRP channels are expressed in the tissues not exposed to the dynamic changes in the ambient temperature and activated by warm temperature around our body temperature, suggesting that they have some specific physiological functions. In addition, how structure and functions of thermosensitive TRP channels were changed dynamically in the process of evolution will also be discussed.

Keywords: Thermosensation, TRP channels, Sensory nerve, Skin