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★令和3年度(2021年)卒業生「豊田亮君」の研究成果が、国際的疼痛学専門誌”Journal of Pain”に掲載されました!!!

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Suppression of the Excitability of Rat Nociceptive Primary Sensory Neurons Following Local Administration of the Phytochemical, Quercetin



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Abstract: Although the modulatory effect of quercetin on voltage-gated Na, K, and Ca channels has been studied *in vitro*, the *in vivo* effect of quercetin on the excitability of nociceptive primary neurons remains to be determined. The aim of the present study was to examine whether acute local quercetin administration to rats attenuates the excitability of nociceptive trigeminal ganglion (TG) neurons in response to mechanical stimulation *in vivo*. Extracellular single unit recordings were made from TG neurons of anesthetized rats in response to orofacial non-noxious and noxious mechanical stimulation. The mean firing frequency of TG neurons in response to both non-noxious and noxious mechanical stimuli was dose-dependently inhibited by quercetin, and maximum inhibition of the discharge frequency of both non-noxious and noxious mechanical stimuli was seen within 10 min. The inhibitory effect of quercetin lasted for 15 minutes and was reversible. The mean magnitude of inhibition on TG neuronal discharge frequency with 10 mM quercetin was almost equal to that of the local anesthetic, 2% lidocaine. These results suggest that local injection of quercetin into the peripheral receptive field suppresses the excitability of nociceptive primary sensory neurons in the TG, possibly via inhibition of voltage-gated Na channels and opening voltage-gated K channels.

Perspective: Local administration of the phytochemical, quercetin, as a local anesthetic may provide relief from trigeminal nociceptive pain with smallest side effects, thus contributing to the area of complementary and alternative medicines.

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Key Words: Alternative medicine, extracellular single unit recording, lidocaine, quercetin, trigeminal pain.

Abbreviations: CAM, complementary and alternative medicine; Cav, voltage-gated calcium; Kv, voltage-gated potassium; Nav, voltage-gated sodium; SpVc, trigeminal spinal nucleus caudalis; TG, trigeminal ganglion; TMJ, temporomandibular joint; WDR, wide-dynamic range. *E₁*, Estrogen α ; *E₂*, Estrogen β , CYP450, cytochrome P450.

ハイライト: これまでに果物や野菜に含まれるフィトケミカルの一つ「ケルセチン」は *in vitro* の実験では電位依存性Na⁺・K⁺チャネルを修飾することで一次感覚ニューロンの興奮性を変調させることは判明していましたが、*in vivo* での効果は不明でした。今回我々は、一次感覚ニューロンの細胞外記録法を開発して「ケルセチン」が既存の局所麻酔酔薬と同等の効果を発揮することを明らかとして補完代替医療に応用できる可能性を指摘致しました。