(구두-7)

Modulation of Neuronal Voltage-Dependent Na^+ channel by Ginsenoside Rg_3

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We investigated the effects of ginsenosides, the active ingredients of ginseng, on rat brain Na^+ channel activity expressed in *Xenopus* oocytes after injection of cRNA encoding Nav1.2 and β subunit. Ginsenoside Rg_3 inhibited Na^+ current in oocytes expressing with Nav1.2 and β subunit. The inhibition of Na^+ current by ginsenoside Rg_3 was reversible and dose dependent. The half-inhibitory concentration (IC_{50}) of ginsenoside Rg_3 was 28.2 ± 4.32μM. Other ginsenosides besides ginsenoside Rg_3 also inhibited Na^+ current. The order of potency for the inhibition of Na^+ current was ginsenoside Rg_3 > Metabolite CK > Rh_1> Rb_1 > Rh_2. Interestingly, Rg_3 produced a hyperpolarizing shift (≈11mV) in the voltage-dependence of sodium channel activation and exhibited a marked frequency-dependent component to blockade of sodium channel. Also Rg_3 produced slow activation (from 8.1 ± 1.38 to 15.1± 3.06msec) and current decay(from 5.6± 0.46 to 6.3 ± 0.22msec) at –20mV. Under the inhibition of lidocaine and TTX, Rg_3 inhibited the Na^+ current. These findings demonstrated that inhibition of Rg_3 is different pathway with that of lidocaine and TTX. These results indicate that ginsenoside Rg_3 might regulate neuronal voltage-dependent sodium channel expressed in *Xenopus* oocytes.

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