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Glycine receptor in hippocampal neurons as a target for lithium ions

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Lithium salts are successfully used to treat bipolar disorder. At the same time, according to recent data lithium may be considered as a candidate medication for the treatment of neurodegenerative disorders. The mechanisms of therapeutic action of lithium have not been fully elucidated. In particular, in the literature there are no data on the effect of lithium on the glycine receptors. In the present study we investigated the effect of Li^+ on glycine-activated chloride current (I_{Gly}) in rat isolated pyramidal hippocampal neurons using patch-clamp technique. Short (600 ms) application of Li^+ caused two effects: (1) an acceleration of desensitization (a decrease in the time of half-decay, or " τ ") of I_{Gly} and (2) a reduction of the peak amplitude of the I_{Gly} . Both effects were not voltage-dependent. Dose-response curves for both effects were N-shaped with two maximums at 100nM and 1mM of Li^+ and a minimum at 1 μM of Li^+ . This complex form of dose-response may indicate that the process activated by high concentrations of lithium inhibits the process that is sensitive to low concentrations of lithium. Longer application (10 min) of Li^+ caused similar effects, but in this case 1 μM lithium was effective and the dose-effect curves were not N-shaped. The inhibitory effect of lithium ions on glycine-activated current suggests that lithium in low concentrations is able to modulate tonic inhibition in the hippocampus. This important property of lithium should be considered when using this drug as a therapeutic agent.

Biography

Elena Solntseva graduated from the Lomonosov Moscow State University (Moscow, Russia) with a degree "neuroscience". She then worked at the Center for Mental Health in Moscow, where she defended her PhD thesis and then a Doctoral thesis. She currently works at the Research Center of Neurology in Moscow. She is the author of dozens of scientific publications.

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