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Background K^+ channel currents in WEHI-231 cells, immature B lymphocytes

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In our previous study, WEHI-231, an immature B cell line, showed intractable increase in $[Ca^{2+}]_c$ after the B-cell receptor (BCR) ligation and treatment with 2-aminoethoxydiphenylborate (2-APB), which was never observed in Bal-17, a mature B cell line (Nam et al., 2003, FEBS Lett). In this study, a whole cell voltage clamp study revealed a specific expression of a novel type of K^+ current, namely voltage-independent background-type K^+ channels (IK-bg), in WEHI-231 cells. IK-bg was dramatically increase by the application of 2-APB (50 □M), which induced severe hyperpolarization of WEHI-231 from –45 mV to –90 mV. When dialyzed with Mg^{2+} and ATP-free pipette solution, a spontaneous development of IK-bg and membrane hyperpolarization were observed. IK-bg was insensitive to classical K^+ channel blockers (TEA, glibenclamide, Ba^{2+} (1 mM)), whereas blocked by quinine and quinidine in a voltage-dependent manner (IC_{50}=6~9 □M at +60mV). Phorbol myrstate, a PKC activator, decreased the amplitude of IK-bg. Extracellular acidification (pH 6.5) slightly inhibited IK-bg. Arachidonic acid, riluzole, or hyposmotic stress could not affect the IK-bg after the full development by the intracellular dialysis with Mg-ATP-free solution.In a cell-attached mode of single channel recording from WEHI231, we found two types of voltage-independent K^+ channels with unitary conductance of 300 pS and 120 pS, respectively. Both channels showed very short mean open times and their open probabilities were increase by the application of 2-APB. In Bal-17 cells, no such K^+ current was observed in 50 cells tested. In summary, WEHI-231 immature B cells express background K^+ channels. The pharmacological properties and the large unitary conductance suggest that novel types of two-pore domain K^+ channels (2-P-K channels) might be expressed in WEHI-231, which may provide an intriguing targets of signal transduction in the immature B lymphocytes.