P3L-38 Activation of cationic channels by diacylglycerol in mouse ileal smooth muscle cells

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In intestinal smooth muscle cells, stimulation of M_3 subtype of muscarinic receptors activates 70 pS and 120 pS cationic channels (*J. Physiol.*, 582, 41-61, 2007). To test if diacylglycerol (DAG) is involved in the M_3-mediated cation channel activation as an intermediate, membrane current responses to 1-oleoyl-2-acetyl-*sn*-glycerol (OAG), a membrane permeable analogue of DAG, were recorded in mouse ileal smooth muscle cells. In whole-cell clamp mode, extracellular application of OAG (0.1-100 μM) at a holding potential of -40 mV activated a sustained cationic currents (I_{Cat}) with EC_{50} value of 2.4 μM and maximum conductance of 1 nS. The OAG-induced I_{Cat} had a reversal potential of 0 mV and displayed a linear current-voltage relationship. Single channel analysis in outside-out patch mode revealed that OAG activated a single type of cationic channel of which current amplitude, unitary conductance and mean open time were 4.7 pA, 118 pS and 0.2 msec, respectively. These properties of whole-cell and single channel currents closely resembled those of the 120-pS cationic channel activated by M_3 receptor stimulation, suggesting that DAG generated via pthe Gq protein/phospholipase C pathway is involved in the M_3-induced cation channel activation.