生物物理学Ⅰ Handout No. 8

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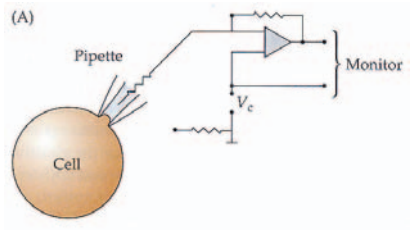
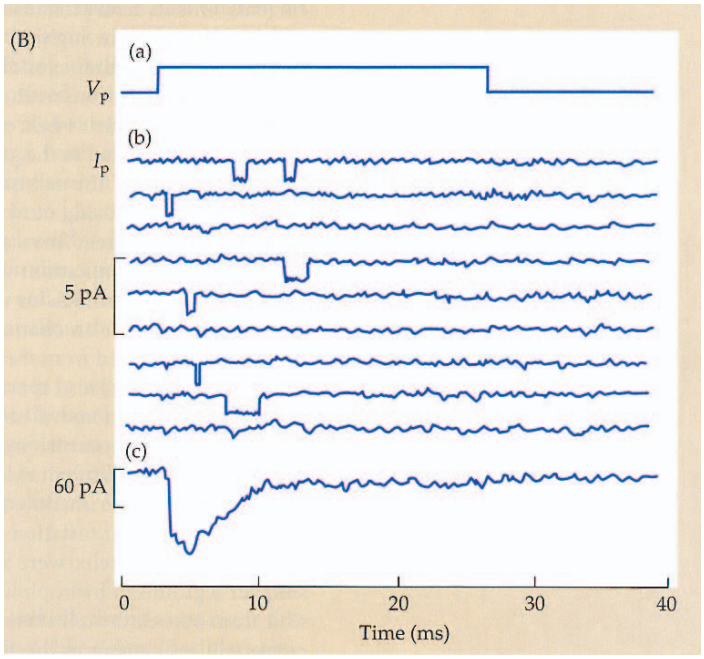


FIGURE 6.10 Sodium Channel Currents recorded from cell-attached patch on a cultured rat muscle cell. (A) Recording arrangement. V_c = the command potential applied to the membrane patch. (B) Repeated depolarizing voltage pulses applied to the patch, with the waveform shown in (a), produce single-channel currents (downward deflections) in the nine successive records shown in (b). The sum of 300 such records (c) shows that channels open most often in the initial 1 to 2 ms after the onset of the pulse, after which the probability of channel opening declines with the time constant of inactivation. (After Sigworth and Neher, 1980.)



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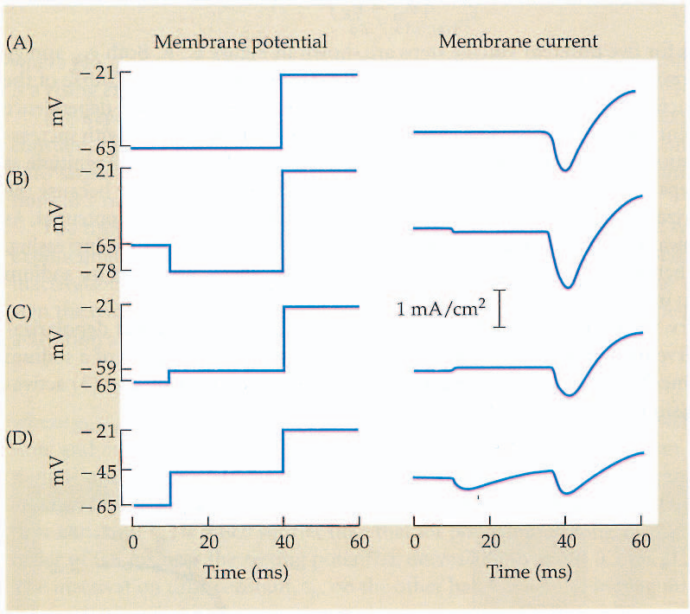

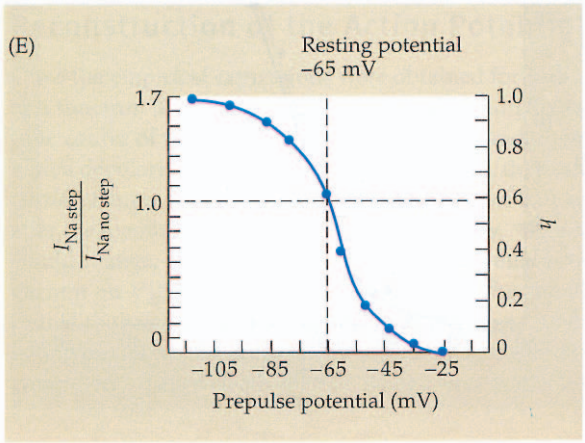

FIGURE 6.6 Effect of Membrane Potential on Sodium Currents. (A) A depolarizing step from -65 to -21 mV produces inward sodium current, followed by outward potassium current. (B) When the depolarizing step is preceded by a 30 ms hyperpolarizing step, the sodium current is increased. Prior depolarizing steps (C and D) reduce the size of the inward current. (E) The fractional increase or reduction of the sodium current as a function of membrane potential during the preceding conditioning step. The maximum current with a hyperpolarizing step to -105 mV is about 1.7 times larger than the control value. A depolarizing step to -25 mV reduces the subsequent response to zero. Full range of the sodium current is scaled from zero to unity by the *h* ordinate.

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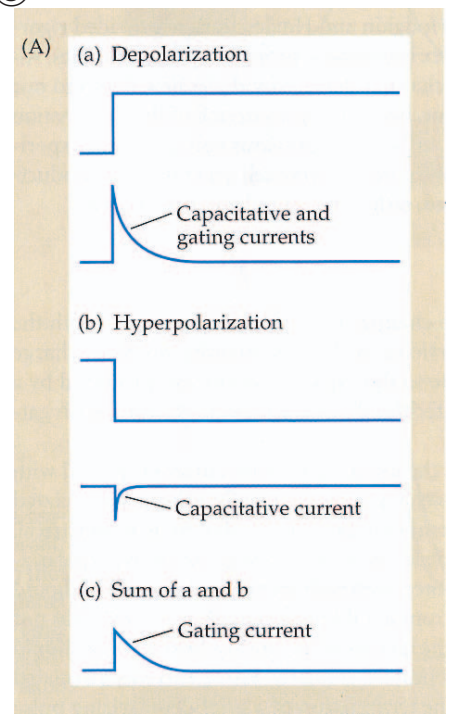

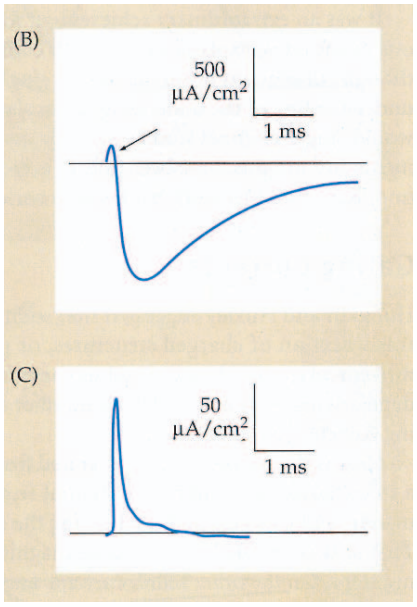

FIGURE 6.9 Sodium Channel Gating Current. (A) Method of separating gating current from capacitative current. A depolarizing pulse (a) produces capacitative current in the membrane, plus gating current. A hyperpolarizing pulse of the same amplitude (b) produces capacitative current only. When the responses to a hyperpolarizing and a depolarizing pulse are summed (c), capacitative currents cancel out and only gating current remains. (B) Record of current from a squid axon in response to a depolarizing pulse, after cancellation of capacitative current. Inward sodium current was reduced by lowering extracellular sodium to 20% of normal. The small outward current (arrow) preceding the inward current is the sodium channel gating current. (C) Response to depolarization from the same preparation after adding TTX to the bathing solution, recorded at higher amplification. Only the gating current remains. (B and C after Armstrong and Bezanilla, 1977.)