Novel ionic current measurement method and system for drug screening

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Ion channel proteins play important roles in controlling various cell functions by regulating the ion permeability of cell membranes in response to stimuli. Dysfunctions of ion channels cause severe diseases; therefore, ion channels are important drug targets. However, it is difficult to measure the detailed effects of drugs on ion channels efficiently, and drug discovery affecting ion channel proteins has been lacking as compared to that affecting other proteins such as enzymes. This study describes the development of a novel electrophysiological method that significantly increases the measurement efficiency for the ion channels. The method is based on the artificial lipid bilayer method. By contacting a gold electrode containing channels with a lipid-solution interface, the channels are incorporated into the membrane simultaneously with the formation of lipid bilayers. Using this method, ionic currents were detected in less than 1 minute; moreover, some channel properties could be measured at the single channel level. In addition, we developed an automated system based on this novel method. In this system, a driving device automatically moves the gold electrode, depending on the current detected. This automation could be the basis of a system that makes multiple measurements.