生物物理学 II　Handout No. 6

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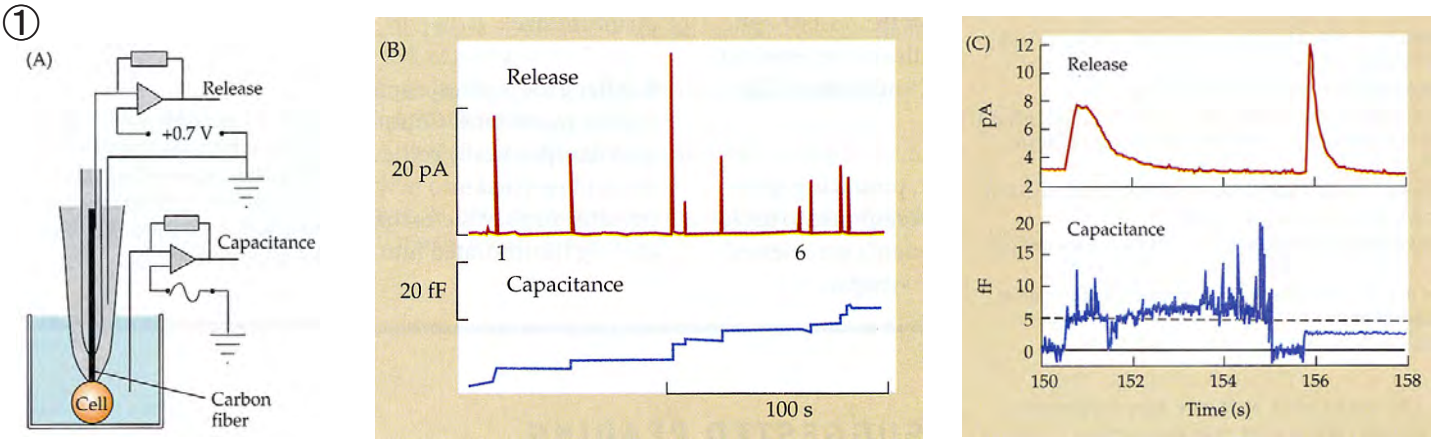

FIGURE 11.25 Coincident In- creases in Membrane Capaci- tance and Release of Catecholamines from chromaffin cells. (A) A carbon fiber electrode inside the patch pipette measures catecholamine release by amperometry, while at the same time the electrode is used to measure capaci- tance within the patch. (B) Simultaneous recording of catecholamine release (top trace) and capacitance (bottom trace). All exocytic events detected by catechol- amine release coincide with increases in capacitance. (C) The sixth and seventh exocytic events in part B, displayed on an expanded scale. The sixth exocytic event coincides with a transient, flickering increase in capacitance that lasts about 5 s. The seventh exocytic event coincides with an abrupt and long-lasting increase in capacitance. (D) Transient increases in capacitance may correspond to exo- cytosis through a temporary fusion pore that rapidly closes, allowing the vesicle to pinch back off into the cytoplasm without ever becoming incorporated into the plasma membrane. Under such cir- cumstances small molecules may be released while larger proteins are retained in the vesicle. (After Albinos et al., 1997.)

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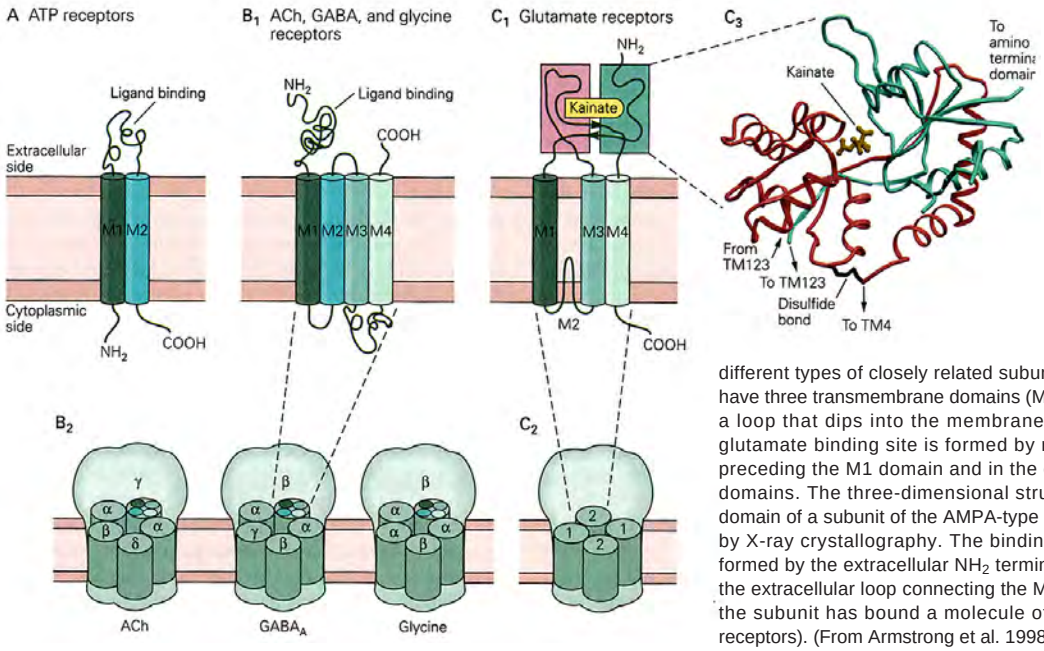

Figure 12-10 The three families of ligand-gated channels.
A. The ATP-gated channels possess two membrane-spanning domains (M1 and M2) and a large extracellular loop. Their subunit stoichiometry is not known.
B_1. The nicotinic ACh, $GABA_A$, and glycine receptor-channels are all pentamers composed of several types of related subunits (**B_2**). As shown here (**B_1**), each subunit has four transmembrane domains (M1-M4). The M2 domain lines the channel pore.
C. The glutamate receptor-channels are thought to be tetramers composed of two different types of closely related subunits (here denoted 1 and 2) (**C_2**). The subunits have three transmembrane domains (M1, M3, and M4) and one region (M2) that forms a loop that dips into the membrane. The M2 loop lines the channel pore. The glutamate binding site is formed by residues in the extracellular amino terminus preceding the M1 domain and in the extracellular loop connecting the M3 and M4 domains. The three-dimensional structure of the extracellular glutamate binding domain of a subunit of the AMPA-type of glutamate receptor ($GluR_2$) has been solved by X-ray crystallography. The binding site is a bilobed "clamshell" structure (**C_3**) formed by the extracellular NH_2 terminal portion of a subunit (domain 1, **green**) and the extracellular loop connecting the M3 and M4 segments (domain 2, **purple**). Here the subunit has bound a molecule of kainate (which is a weak agonist at AMPA receptors). (From Armstrong et al. 1998.)

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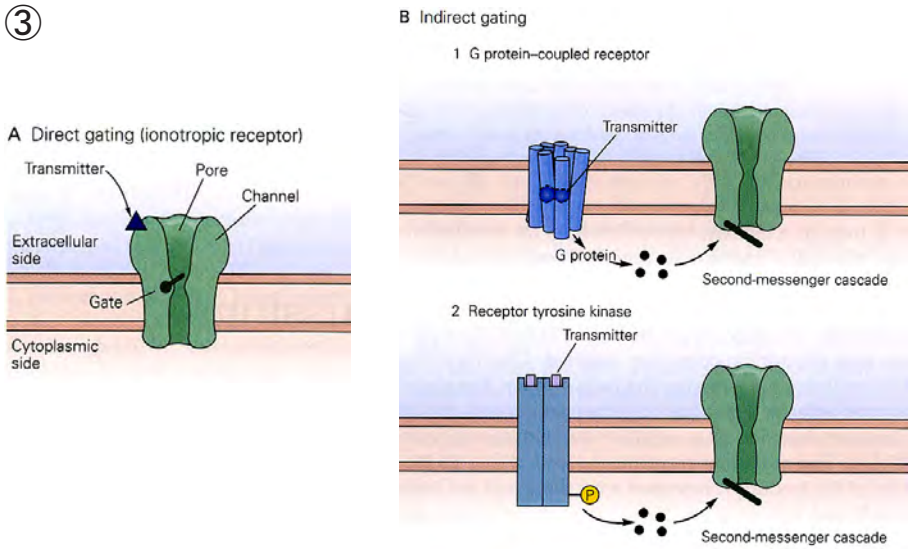

Figure 13-1 All known neurotransmitter receptors can be divided into two groups according to the way in which receptor and effector functions are coupled.
A. Ionotropic receptors directly gate ion channels as part of a single macromolecule that also forms the ion channel. The receptor, located on the extracellular side, and the ion channel pore, embedded in the cell membrane, are formed within the same protein.
B. Receptors that indirectly gate ion channels fall into two families. 1. Metabotropic G protein-coupled receptors activate ion channels and other substrates indirectly by activating a GTP-binding protein that often engages a second-messenger cascade. 2. Receptor tyrosine kinases modulate the activity of ion channels indirectly through a cascade of protein phosphorylation reactions, beginning with autophosphorylation of the kinase itself on tyrosine residues.