

Readings in Neuroinformatics – Exam

Slaven Cvijetic, 17.12.2018

Single-channel currents recorded from membrane of denervated frog muscle fibres, Neher Erwin, Sakmann Bert, Nature Vol. 260, p. 799-801.

Abstract

The cholinergic system dominates the modulation of skeletal muscles. The acetylcholine (ACh) receptor occurs in great numbers at the neuromuscular junction of skeletal muscles, which contributes to proper contraction of these muscles. Albeit one of the best described receptors to date, there are still open questions regarding its specific properties. Past experiments did not produce definite results due to excessive background noise during their recordings and assumptions about the properties of ACh receptors. In this paper, we used a modified known method to reduce background noise by limiting the membrane area from where the current was measured for a detailed characterization of ACh receptors. We applied a glass pipette with 3-5 micrometres in diameter filled with cholinergic agonists to the membrane to isolate the surface and we performed a two-microelectrode voltage-clamp to characterise single-channel currents. Based on our current recordings, we calculated amplitude histograms to estimate the current pulses (3.4 pA). We obtained slightly different results depending on temperature and agonists used for channel conductance (22.4 ± 0.3 pmhos for SubCh at -120 V) and channel opening times (28 ± 3 ms for SubCh at 8 °C and -120 V). Thus, our results allow for better discernment between factors influencing the properties of single channels or the modifying populations of channels.

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