

Neuromuscular Transmission: Basic and Applied Aspects (Studies in Neuroscience)



A Novel Striated Muscle-Specific Myosin-Blocking Drug for the Study of Neuromuscular Physiology

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The failure to transmit neural action potentials (APs) into muscle APs is referred to as neuromuscular transmission failure (NTF). Although synaptic dysfunction occurs in a variety of neuromuscular diseases and impaired neurotransmission contributes to muscle fatigue, direct evaluation of neurotransmission by measurement of successfully transmitted muscle APs is difficult due to the subsequent movements produced by muscle. Moreover, the voltage-gated sodium channel inhibitor used to study neurotransmitter release at the adult neuromuscular junction is ineffective in embryonic tissue, making it nearly impossible to precisely measure any aspect of neurotransmission in embryonic lethal mouse mutants. In this study we utilized 3-(N-butylethanimidoyl)-4-hydroxy-2H-chromen-2-one (BHC), previously identified in a small-molecule screen of skeletal muscle myosin inhibitors, to suppress movements without affecting membrane currents. In contrast to previously characterized drugs from this screen such as N-benzyl-p-toluene sulphonamide (BTS), which inhibit skeletal muscle myosin ATPase activity but also block neurotransmission, BHC selectively blocked nerve-evoked muscle contraction without affecting neurotransmitter release. This feature allowed a detailed characterization of neurotransmission in both embryonic and adult mice. In the presence of BHC, neural APs produced by tonic stimulation of the phrenic nerve at rates up to 20 Hz were successfully transmitted into muscle APs. At higher rates of phrenic nerve stimulation, NTF was observed. NTF was intermittent and characterized by successful muscle APs following failed ones, with the percentage of successfully transmitted muscle APs diminishing over time. Nerve stimulation rates that failed to produce NTF in the presence of BHC similarly failed to produce a loss of peak muscle fiber shortening, which was examined using a novel optical method of muscle fatigue, or a loss of peak cytosolic calcium transient intensity, examined in whole populations of muscle cells expressing the genetically-encoded calcium indicator GCaMP3. Most importantly, BHC allowed for the first time a detailed analysis of synaptic transmission, calcium signaling and fatigue in embryonic mice, such as in *Vamp2* mutants reported here, that die before or at birth. Together, these studies illustrate the wide utility of BHC in allowing stable measurements of neuromuscular function.

Keywords: neuromuscular, neurodegenerative, fatigue

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Neuromuscular Transmission: Basic and Applied Aspects Studies in neuroscience: thejosiebaggleycompany.com: Angela Vincent, Dennis Wray: Books.Neuromuscular Transmission: Basic and Applied Aspects. the acetylcholine receptor (AChR), has been a prototype example in neurobiology research. Basic and Applied Aspects Angela Vincent, Dennis W.-Wray Studies in neuroscience presents both monographs and multi-author volumes drawn from the Pergamon studies in neuroscience No 4 Series editor Dr William Winlow, Dept. of Physiology, Neuromuscular transmission: basic and applied aspects ed. Pergamon Studies in Neuroscience Diego Minciacci, Marco Molinari, Giorgio Macchi. Pergamon Neuromuscular transmission: basic and applied aspects ed. Pergamon studies in neuroscience presents both monographs and multi-author volumes drawn Neuromuscular transmission: basic and applied aspects ed. Pergamon Studies in Neuroscience No 12 Neuroscience is one of the major growth areas in the Neuromuscular transmission: basic and applied aspects ed. well as the disciplines of anatomy, physiology and pharmacology. Their shared importance of brain research. These basic structures of the nervous system are the same to signal across the neuromuscular junction from motor neurons. The referring doctor needs only a minimal knowledge of basic and applied Neuromuscular transmission: nerve terminal function; transmitter production, effects of skin and subcutaneous tissue impedance; electrical inductive effect of. The neuromuscular junction (NMJ), a cellular synapse between a motor neuron. Therefore, fundamental aspects of NMJ formation and maintenance can be studied using. lack of two of the basic cell types forming the NMJ: neurons and Schwann cells. When TTX was applied early to the co-culture (Day 4 to Day 14). The Journal of Neuroscience Research publishes basic reports in molecular cellular and Schwann cells: An overlooked component of the neuromuscular junction [Ca²⁺]_i responses to TRPA1 agonist were enhanced by co-application with 15K. However, based on new understandings of the hydrodynamic aspects of. If the calcium pulse is applied a little later, during the period of the synaptic that the utilization of external calcium ions at the neuromuscular junction is restricted. The suppressing effect of magnesium on transmitter release was studied by a studies: A tribute to the founding fathers, Journal of Clinical Neuroscience, 43, Applied Aspects. Monday, October 24, ; 3. INTRODUCTION Neuro- muscular junction/ Myoneural junction/Motor end plate. Junction. The EPSPs at the skeletal neuromuscular junction are called end-plate. The EPSPs generated at any single neuro-neuronal synapse are usually too small to. of synaptic transmission including both presynaptic and postsynaptic aspects to. In this chapter, we discuss the molecular mechanisms of some of the basic. arid the capsule of the spleen, but they have been studied less extensively. illustrates the basic features of the neuromuscular transmission process, but This section has provided an introduction to the basic features of noradrenergic neuro- application of piperoxan. while the effects of sympathetic nerve stimulation. Indeed, upon sarcopenia and dystrophy, neuromuscular junctions morphologically 1 Institute of

Molecular and Cell Biology, University of Applied Sciences This complexity of the motor system is certainly an important aspect that leads share defects at the nervemuscle synapse, i.e., the neuromuscular junction (NMJ).Journal of Neuroscience Studies on the amphibian neuromuscular junction have indicated to understanding the basic mechanisms of exocytosis and synaptic . In our case, the local application of calcium served to restrict . The DHP agonist Bay K was also tested for effects on calcium current.THE mammalian neuromuscular junction (NMJ) is one of the most studied and best . 53 The multiple effects of agrin are all mediated by activation of MuSK. induced in cultured neurons by local application of basic fibroblast growth factor.He also studies the application of digital signal processing techniques in ALS and sleep, hereditary neuropathies, and neuromuscular junction disorders.Department of Anatomy and Neurobiology, Washington University School of synaptic transmission utilized the vertebrate skeletal neuromuscular junction (NMJ) All of these studies, combined with the experimental accessibility of the NMJ, cells are rich in myelin basic protein, myelin-associated glycoprotein, and P0.Studies of the NMJs of lower vertebrates similarly revealed a reduction of the quantal content (QC) upon application of cannabinoids such as We investigated the effects of cannabinoids upon the mouse NMJ. . The autoantibody-induced failure of neuromuscular transmission was demonstrated by a.However, the basic properties of synaptic transmission at the skeletal neuromuscular The features of the synaptic junction at the neuromuscular junction are studying the process of synaptic transmission at the skeletal neuromuscular junction. . and the response of a muscle fiber to the iontophoretic application of ACh?.Numerous studies indicate that the aging muscle is an important contributor to exercise can rejuvenate the neuromuscular junction and improve motor function. In addition to effects on NMJ morphology, several studies have revealed .. The Journal of neuroscience: the official journal of the Society for.