Neuromuscular junction

The neuromuscular junction (NMJ) is a specialized structure that works as an interface to translate the action potential of the presynaptic motor neuron (MN) in the contraction of the postsynaptic myofiber. The design of appropriate experimental models is essential to have efficient and reliable approaches to study NMJ development and function, but also to generate conditions that recapitulate distinct features of diseases. Initial studies relied on the use of tissue slices maintained under the same environment and in which single motor axons were difficult to trace. Later, MNs and muscle cells were obtained from primary cultures or differentiation of progenitors and cocultured as monolayers; however, the tissue architecture was lost. Current approaches include self-assembling 3D structures or the incorporation of biomaterials with cells to generate engineered tissues, although the incorporation of Schwann cells remains a challenge. Thus, numerous investigations have established different NMJ models, some of which are quite complex and challenging. Castellanos-Montiel et al. reviewed the in vitro models that have emerged in recent years to coculture MNs and skeletal muscle, trying to mimic the healthy and diseased NMJ [1].

Acetylcholine is the neurotransmitter used at the neuromuscular junction—in other words, it is the chemical that motor neurons of the nervous system release in order to activate muscles.

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Castellanos-Montiel MJ, Velasco I, Escobedo-Avila I. Modeling the neuromuscular junction in vitro: an approach to study neuromuscular junction disorders. Ann N Y Acad Sci. 2020 Oct 10. doi: 10.1111/nyas.14504. Epub ahead of print. PMID: 33040338.