Tissue organization along the neuromuscular axis: laminins match Schwann cell to axon to muscle

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In the developing neuromuscular system, growth and differentiation are coordinated by signals exchanged between skeletal muscle fibres, motor neurons, and Schwann cells. A main repository of these signals is the basal laminae (BL) covering muscle and Schwann cell surfaces. We define nine developmentally regulated BL zones in tbe neuromuscular system, which differ principally in the type of laminin they contain. Here, we show laminin-2 and -8 made by Schwann cells act in autocrine fashion to control Schwann cell differentiaton and proliferation during myelination; laminins 9, 10, and 11 made by muscles act in serial fashion on the innervating population of motor axons to organize the sites of synaptic transmission; and laminin-2 made by muscle recruits specialized components to the costamere complex, which then stabilize the specific sites along the sarcolemma of mature muscle fibres where electrical activity on the muscle surface is transmitted into the myofibre *via* the t-tubule system. The combined actions of Lns 2, 8, 9, 10, and 11 ensure that Schwann cells in the developing nerve match the number and type of axons, that presynaptic terminals are accurately registered with postsynaptic sites on the muscle; that active zone release sites along the presynaptic surface are aligned with folds along the postsynaptic surface; and that action potentials along the sarcolemma are properly transmitted into the depths of the large muscle fibres. Defects in these systems in humans cause amyelinating neuropathy, Pierson’s Syndrome, and Type 1 Congenital Muscular Dystrophy.