

Demonstration of ion channel synthesis by isolated squid giant axon provides functional evidence for localized axonal membrane protein translation

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© 2018 The Author(s). Local translation of membrane proteins in neuronal subcellular domains like soma, dendrites and axon termini is well-documented. In this study, we isolated the electrical signaling unit of an axon by dissecting giant axons from mature squids (*Dosidicus gigas*). Axoplasm extracted from these axons was found to contain ribosomal RNAs, ~8000 messenger RNA species, many encoding the translation machinery, membrane proteins, translocon and signal recognition particle (SRP) subunits, endomembrane-associated proteins, and unprecedented proportions of SRP RNA (~68% identical to human homolog). While these components support endoplasmic reticulum-dependent protein synthesis, functional assessment of a newly synthesized membrane protein in axolemma of an isolated axon is technically challenging. Ion channels are ideal proteins for this purpose because their functional dynamics can be directly evaluated by applying voltage clamp across the axon membrane. We delivered in vitro