CORRIGENDA

Volume 83, April 2003

Pages 475–579: DeCoursey, Thomas E. “Voltage-Gated Proton Channels and Other Proton Transfer Pathways” (http://physrev.physiology.org/cgi/content/full/83/2/475). It has recently come to the review author’s attention that solid evidence (albeit not voltage-clamp proof) existed that voltage-gated proton channels were present in the dinoflagellate Noctiluca miliaris well before their “discovery” in snail neurons in 1982 by Thomas and Meech (9). In 1972, Fogel and Hastings (3) postulated membrane potential-regulated proton flux, and Hastings (4) illustrated this mechanism explicitly as a cartoon proton channel in 1978. Bioluminescent marine creatures like Noctiluca emit light when stimulated, producing nocturnal luminescence (5). This light is emitted from numerous small luciferin- and luciferase-containing organelles called “scintillons” (5, 8) and is triggered by an action potential in the vacuolar membrane (1). The action potential reflects decreased impedance (2) that ion substitution experiments reveal to be mediated by a proton conductance (6). Protons flow from the vacuole at pH 3.5 (6) into the scintillon, where they trigger bioluminescence via luciferase. Thus the action potential opens voltage-gated proton channels (5). The regulation of these vacuolar H\textsuperscript{+} channels by voltage and pH appears to differ markedly from the voltage-gated proton channels described in my review, all of which occur in plasma membranes. In contrast to plasma membrane proton channels that open to allow proton efflux, dinoflagellate proton channels open to allow proton influx from the vacuole (topologically outside) into the cytoplasm (specifically the scintillon compartment). Viewed from this perspective, the tonoplast action potential has normal polarity, the depolarization reflecting cation (proton) influx, just as in excitable cells in multicellular organisms. Whether the inferred properties of these channels are truly distinct from the relatively uniform assortment of channels described in my review, necessitating the designation of a new class, awaits voltage-clamp confirmation. In summary, strong evidence exists for the presence of voltage-gated proton channels in Noctiluca and other dinoflagellates. These primordial H\textsuperscript{+} channels may mediate a proton action potential that triggers bioluminescence.

REFERENCES