Characterization of acetylcholinesterase isoforms from the marine gastropod Tritonia diomedea

Marine gastropods, including *Tritonia diomedea*, are often used as invertebrate models to study the neuronal basis of behavior. The enzyme acetylcholinesterase plays an important role in neurotransmission. It terminates cholinergic signaling by hydrolyzing the neurotransmitter acetylcholine. Surprisingly little is known about acetylcholinesterase from *T. diomedea*.

The gastropods were collected via SCUBA diving. The animals were sacrificed and dissected to yield different tissue samples (hemolymph, brain, and buccal ganglion). A sequential extraction procedure was employed to obtain either fully soluble proteins (FS) or detergent soluble (DS) proteins. Cholinesterase activity was measured with Ellman’s colorimetric procedure using acetylthiocholine (ATCh), propionylthiocholine (PTCh), and butyrylthiocholine (BTCh) as substrates. To further distinguish between true acetylcholinesterase (AChE) and butyrylcholinesterase (BChE), specific inhibitors (BW284c51 and iso-OMPA) were employed. We established that the hemolymph of *T. diomedea* contains a true AChE. Depending on the tissue and solubilization method (FS versus DS) different enzyme kinetic parameters were obtained indicating the presence of at least three, possibly four, different isoforms of AChEs. This finding is further corroborated by comparing the PTCh and ATCh hydrolysis rates.

Similar to mammals, the marine gastropod T. diomedea exhibits an impressive AChE polymorphism. The simpler invertebrate model provides a unique opportunity to explore physiological reasons on why different tissues express different AChE isoforms.

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