

Polyketide synthases (PKS) in dinoflagellates: New Insights into Their Cellular Localization and Functionality

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Polyketides are a large family of secondary metabolites that are synthesized from acyl- CoA precursors by polyketide synthase enzymes (PKSs). These enzymes are multi-domain complexes that structurally and functionally resemble the fatty acid synthases (FASs). To date, approximately 25 species of dinoflagellates have been found to produce polyketides. Recently, several putative PKS genes encoding ketosynthase (KS), ketoreductase (KR), and both acyl carrier protein (ACP) and KS domains were identified from *K. brevis* (Monroe and Van Dolah 2007). Their structure is unique in that their sequence is most similar to Type I PKS, but separate catalytic domains reside on separate polypeptides, like Type II. Their altered expression in a non-toxic isolate of *K. brevis* suggested their involvement in brevetoxin biosynthesis (Monroe et al., 2010); however, their chloroplast localization resembles FAS. Since no information exists on PKS proteins of other toxic dinoflagellates, we used antibodies developed against *K. brevis* PKS proteins to probe for the expression and intracellular localization of PKS domains in three harmful dinoflagellates (*Karenia brevis*, *Ostreopsis ovata*, *Coolia monotis*), one non-toxic species (*Karenia mikimotoi*) and a raphidophyte (*Fibrocapsa japonica*) which is known to produce high concentrations of free fatty acids (FFA). All species, including the raphidophyte expressed proteins cross-reactive with one or more *K. brevis* antibodies. These results lead us hypothesize that either (1) these proteins are FAS or (2) single PKS units could be cobbled together to form complexes that synthesize different polyketide compounds and/or fatty acids in different species.

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