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Transcriptome sequencing of three *Pseudo-nitzschia* species reveals comparable gene sets and the presence of Nitric Oxide Synthase genes in diatoms

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Diatoms are among the most diverse eukaryotic microorganisms on Earth, they are responsible for a large fraction of primary production in the oceans and can be found in different habitats. *Pseudo-nitzschia* are marine planktonic diatoms responsible for blooms in coastal and oceanic waters. We analyzed the transcriptome of three species, *Pseudo-nitzschia arenysensis*, *Pseudo-nitzschia delicatissima* and *Pseudo-nitzschia multistriata*, with different levels of genetic relatedness. These species have a worldwide distribution and the last one produces the neurotoxin domoic acid. We were able to annotate about 80% of the sequences in each transcriptome and the analysis of the relative functional annotations allowed comparison of the main metabolic pathways, pathways involved in the biosynthesis of isoprenoids (MAV and MEP pathways), and pathways putatively involved in domoic acid synthesis. The search for homologous transcripts among the target species and other congeneric species resulted in the discovery of a sequence annotated as Nitric Oxide Synthase (NOS), found uniquely in *Pseudo-nitzschia multistriata*. The predicted protein product contained all the domains of the canonical metazoan sequence. Putative NOS sequences were found in other available diatom datasets, supporting a role for nitric oxide as signaling molecule in this group of microalgae.

Diatoms are a very diverse group of eukaryotic microalgae, estimated to include about 200,000 different species. They can be recorded in a broad range of environments (oceans, freshwaters, soil) where water and light are available and can thrive in a wide variety of temperature, light and nutrient conditions, indicating that a broad range of adaptive strategies evolved in this lineage[1]. As photosynthetic organisms, they have a huge ecological importance, being responsible for approximately 20% of the global photosynthetic carbon fixation, an amount comparable to that of all terrestrial rain forests[2]. Diatoms have complex signaling mechanisms that allow the perception of environmental cues[3], produce signaling molecules such as sexual pheromones[4] and can control their competitors and grazers by synthesizing specific anti-mitotic agents[5,6].

The *de novo* sequencing of diatom genomes showed that this relatively recent eukaryotic lineage harbors a combination of genes and metabolic pathways first thought to be exclusive to plants and animals[7,8]. Diatoms have the urea cycle and the ability to generate chemical energy from the breakdown of lipids that were considered distinctive animal features, and also have the C4 photosynthetic pathway that was recorded only in some plants[8].

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