

Lipids and lipid metabolism in eukaryotic algae

- [Irina A. Guschina](#),
- [John L. Harwood](#)

<http://www.sciencedirect.com/science/article/pii/S0163782706000026>

Abstract

Eukaryotic algae are a very diverse group of organisms which inhabit a huge range of ecosystems from the Antarctic to deserts. They account for over half the primary productivity at the base of the food chain. In recent years studies on the lipid biochemistry of algae has shifted from experiments with a few model organisms to encompass a much larger number of, often unusual, algae. This has led to the discovery of new compounds, including major membrane components, as well as the elucidation of lipid signalling pathways. A major drive in recent research have been attempts to discover genes that code for expression of the various proteins involved in the production of very long-chain polyunsaturated fatty acids such as arachidonic, eicosapentaenoic and docosahexaenoic acids. Such work is described here together with information about how environmental factors, such as light, temperature or minerals, can change algal lipid metabolism and how adaptation may take place.

Abbreviations

- AA, arachidonic acid (C20:4 n -6);
- APCI-MS, atmospheric pressure chemical ionization mass spectrometry;
- ASQD, 2'-*O*-acyl-sulfoquinovosyldiacylglycerol;
- BTA1_{Cr}, betaine lipid synthase (from *Chlamydomonas reinhardtii*);
- DAG, diacylglycerol;
- DGCC, diacylglyceryl carboxyhydroxymethylcholine;
- DGGA, diacylglyceryl glucuronide;
- DGDG, digalactosyldiacylglycerol;
- DGTA, diacylglyceryl hydroxymethyl-*N,N,N*-trimethyl- β -alanine;
- DGTS, diacylglyceryltrimethylhomoserine;
- DHA, docosahexaenoic acid (C22:6 n -3);
- DI, inhibiting dose;
- DPA, docosapentaenoic acid (C22:5 n -6);
- EDA, eicosadienoic acid (C20:2 n -6);
- EPA, eicosapentaenoic acid (C20:5 n -3);
- ESI-ITMS, electrospray ionization ion trap mass spectrometry;
- ETrA, eicosatrienoic acid (C20:3 n -3);
- FAD, fatty acid desaturase;
- HETE, hydroxyeicosatetraenoic acid;
- HEPE, hydroxyeicosapentaenoic acid;
- HPETE, hydroperoxyeicosatetraenoic acid;
- GC-EIMS, gas chromatography-electron impact mass spectrometry;
- GL, galactosylglycerides (mainly MGDG, DGDG);

- Kcs, β -ketoacyl-coenzyme A synthase (of fatty acid elongation);
- LOX, lipoxygenase;
- LPA, lyso-phosphatidic acid;
- MGDG, monogalactosyldiacylglycerol;
- PA, phosphatidic acid;
- PAR, photosynthetically active radiation;
- PC, phosphatidylcholine;
- PE, phosphatidylethanolamine;
- PHEG, phosphatidyl-*O*-[*N*-(2-hydroxyethyl) glycine];
- SAM, *S*-adenosyl-*l*-methionine;
- SQDG, sulphoquinovosyldiacylglycerol;
- PG, phosphatidylglycerol;
- PI, phosphatidylinositol;
- PIP, phosphatidylinositolphosphate;
- PIP₂, phosphatidylinositol**bis**phosphate;
- PLD, phospholipase D;
- TAG, triacylglycerol

Keywords

- Algae;
- Oxylipins;
- *Chlamydomonas reinhardtii*;
- Arachidonic acid;
- Eicosapentaenoic acid;
- Docosahexaenoic acid;
- Fatty acid synthesis;
- Environmental effects

Corresponding author. Tel.: +(0)44 2920874108; fax: +(0)44 2920874116.

Copyright © 2006 Elsevier Ltd. All rights reserved.