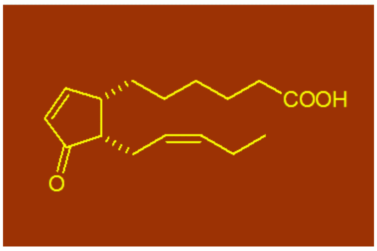
Lipid of the Month: November 2008

2,3-Dinor-12-oxophytodienoic acid



Oxygenation of polyunsaturated fatty acids by plant lipoxygenases produces hydroperoxides which are further converted by secondary enzymes to an array of structurally varied derivatives, socalled oxylipins (1-3). Linoleic and α-linolenic acids serve as the most important precursors of oxylipins in plants, however, also the less common 7(*Z*),10(*Z*),13(*Z*)-hexadecatrienoic acid (dinor-α-linolenic acid) can produce oxylipins. Hexadecatrienoic acid is biosynthesized by the plastidic prokaryotic pathway present in "16:3 plants", a group of plants which include *e.g. Arabidopsis*, potato, tobacco and rape. Weber *et al.* in 1997 reported the presence of the hexadecatrienoic acid-derived oxylipin 2,3-dinor-12-oxo-10,15(*Z*)-phytodienoic acid (dinor-OPDA) in leaves of *Arabidopsis* and potato (4). Biosynthesis of dinor-OPDA takes place via the sequence hexadecatrienoic acid → 11-hydroperoxy-7,9,13-hexadecatrienoic acid → allene oxide → dinor-OPDA catalyzed by the enzymes lipoxygenase, allene oxide synthase and allene oxide cyclase. It was later found that dinor-OPDA occurs in leaves of *Arabidopsis* in form of galactolipids, *i.e.* arabidopsides A and E (5,6). Very high levels of arabidopsides accumulate upon wounding (6,7), and dinor-OPDA and OPDA liberated from such galactolipids serve as the precursors of the plant hormone jasmonic acid. A second hexadecatrienoic acid-derived oxylipin in plant lipid metabolism is the divinyl ether fatty acid 2,3-dinor-ω5(*Z*)-etherolenic acid, which is formed in many *Ranunculaceae* plants in the presence of lipoxygenase and divinyl ether synthase (8).

2,3-Dinor-12-oxo-10,15(*Z*)-phytodienoic acid (O-1803-4e) is synthesized by Lipidox by incubation of 11(*S*)-hydroperoxy-7,9,13-hexadecatrienoic acid with allene oxide synthase and allene oxide cyclase followed by purification by reversed-phase and straight-phase HPLC.

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