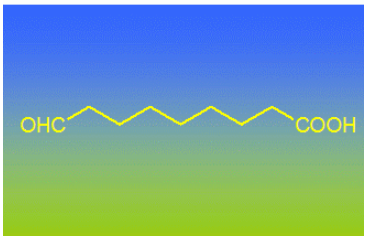
Lipid of the Month: June 2009

9-Oxononanoic acid



Enzymes belonging to the CYP74 family of cytochrome P-450s play important roles in the metabolism of lipoxygenase-generated hydroperoxides in plants (1). The resulting products include jasmonates and green leaf volatiles, which are involved in various developmental processes in plants and in the defense against attacking pathogens. Three pathways of CYP74-catalyzed conversions are established, *i.e.* those involving allene oxide synthase (CYP74A,C), hydroperoxide lyase (CYP74B,C) or divinyl ether synthase (CYP74D). A fourth CYP74-catalyzed pathway consisting of formation of epoxy alcohols has been indicated by recent work (2).

The hydroperoxide lyase product 9-oxononanoic acid is a simple chemical which arises together with 3(*Z*)-nonenal from linoleic acid 9-hydroperoxide or together with 3(*Z*),6(*Z*)-nonadienal from linolenic acid 9-hydroperoxide. Like other hydroperoxide lyase-catalyzed reactions, the conversions involve initial formation of an unstable hemiacetal which undergoes nonenzymatic rearrangement to afford the two chain cleavage fragments, an aldehyde and an aldoacid (3).

Aldehydes formed by the lipoxygenase-hydroperoxide lyase pathway have direct antimicrobial effects on many plant pathogens (4), however, the exact biological role of 9-oxononanoic acid is unknown. Plant tissue contain abundant aldehyde dehydrogenase activity which is important for *e.g.* the α-oxidation pathway (*cf.* "Lipid of the Month", March 2009). It is notable that conversion of 9-oxononanoic acid by such activity will produce azelaic acid, a recently recognized component of the plant systemic aquired resistance (SAR), and an inducer of salicylic acid accumulation (5).
9-Oxononanoic acid (O-1802-24) synthesized by Lipidox is provided as a crystalline solid.

Also alvailable are the 13-hydroperoxide-generated aldoacid, *i.e.* 12-oxo-9(*Z*)-dodecenoic acid (O-1802-25), and its isomerase product, 12-oxo-10(*E*)-dodecenoic acid (traumatin; O-1802-26).

1. Hughes, R.K. *et al.* (2009) Chemibiochem 10, 1122-1133.
2. Lee, D.S. *et al.* (2008) Nature 455, 363-368.
3. Grechkin, A.N.*et al.* (2006) Biochim. Biophys. Acta 1761, 1419-1428.
4. Prost, I. *et al.* (2005) Plant Physiol. 139, 1902-1913.
5. Jung, H.W. *et al.* (2009) Science 324, 89-91.