A filamentous fungus, *Mortierella alpina* produces a large quantity of polyunsaturated fatty acids, such as arachidonic acid (C(20:4, n-6)).

The fatty acid desaturases and the elongases involved in the biosynthesis pathway of the arachidonic acid in *M. alpina* utilize different acyl carriers as the substrates, phospholipids or acyl-CoAs. Acyltransferase can be involved in the transfer of acyl groups between phospholipids and acyl-CoAs yet to be cloned. To clone the acyltransferase genes, we searched membrane bound O-acetyltransferase (MBOAT) homologs from the *M. alpina* genome database. Two MBOAT homologs, *MalPLAT5* and *MalPLAT6*, were found and were cloned from *M. alpina*.

*MalPLAT5* and *MalPLAT6* were overexpressed in the arachidonic acid-producing yeast strains which were transformed with the delta-12 desaturase gene, the delta-6 desaturase gene, the GLELO elongase gene and the delta-5 desaturase gene from *M. alpina*. The ratio of the arachidonic acid to total fatty acid were increased in both of the *MalPLAT5* and the *MalPLAT6* overexpressed yeast strains.

RNA interference of the *MalPLAT6* gene in *M. alpina* was carried out. The *MalPLAT6* gene silenced strain accumulated dihomo-γ-linolenic acid (DGLA, C(20:3, n-6)). The enzyme encoded by the *MalPLAT6* gene appears to be involved in the biosynthesis from DGLA to arachidonic acid in *M. alpina*.