# Lipid traceability by molecular and isotopic fingerprinting

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**Résumé**

Lipids in dietary supplements, infant food, and cosmetics come from various sources like marine organisms, plants, or synthetic products. Price disparities and resource depletion can drive fraudulent practices, where cheaper lipids are sold as expensive ones. Detecting such fraud is essential for ethical, health, and commercial reasons.
This study explores advances in lipid traceability, combining conventional GC-FID/MS analysis of fatty acids (FA), squalene, and sterols with compound-specific isotope analysis (CSIA) on carbon. A database of molecular and isotopic fingerprints was built from various marine and terrestrial oils.

Molecular fingerprints distinguish unrefined lipid sources, while refined products require CSIA for accurate identification. For instance, $^{13}$C-CSIA on DHA, EPA, and sterols detected microalgal oils mixed with fish oils. Squalene and sterol CSIA, though rarely used, show promise for tracing lipid origins. Hydrogen CSIA may add further value.
The study highlights CSIA as a powerful tool for verifying lipid quality and origin. Building an extensive database with trusted suppliers will be key to establishing reliable lipid sourcing certification.

**Mots-Clés:** Lipid traceability, Marine oil, Fatty acids, Compound Specific Isotope Analysis, Database, Sourcing certification

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