# Linoleic Acid

## 1 Nonproprietary Names

None adopted.

## 2 Synonyms

*Emersol 310*; *Emersol 315*; leinoleic acid; 9-*cis*,12-*cis*-linoleic acid; 9,12-linoleic acid; linolic acid; *cis*,*cis*-9,12-octadecadienoic acid; *Pamolyn*; *Polylin No. 515*; telfairic acid.

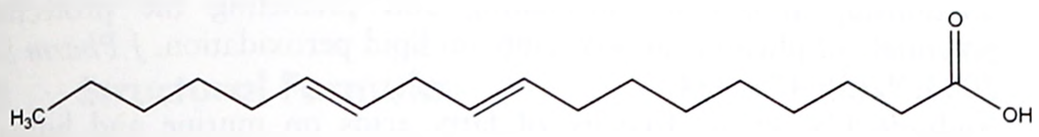
## 3 Chemical Name and CAS Registry Number

(Z,Z)-9,12-Octadecadienoic acid [60-33-3]

## 4 Empirical Formula and Molecular Weight

$C_{18}H_{32}O_2$ 280.45

## 5 Structural Formula




## 6 Functional Category

Emulsifying agent; penetration enhancer; solubilizing agent.

## 7 Applications in Pharmaceutical Formulation or Technology

Linoleic acid is used in topical and transdermal pharmaceutical formulations as an emulsifying agent and penetration enhancer,[1–6] in oral formulations as an absorption enhancer,[7–10] and in intravenous formulations as a solubilizer.[11] It is also used pharmaceutically as a component in hepato-targeting nanoparticles,[12–14] as well as in topical cosmetic formulations.[15]

## 8 Description

Linoleic acid occurs as a colorless to light-yellow-colored oil.

## 9 Pharmacopeial Specifications

*See* Section 18.

## 10 Typical Properties

*Boiling point* 230°C at 16 mmHg
*Density* 0.9007 g/cm$^3$
*Iodine value* 181.1
*Melting point* −5°C
*Refractive index* $n_D^{20}$ = 1.4699
*Solubility* Freely soluble in ether; soluble in ethanol (95%); miscible with dimethylformamide, fat solvents, and oils.

## 11 Stability and Storage Conditions

Linoleic acid is sensitive to air, light, moisture, and heat. It should be stored in a tightly sealed container under an inert atmosphere and refrigerated.

## 12 Incompatibilities

Linoleic acid is incompatible with bases, strong oxidizing agents, and reducing agents.

## 13 Method of Manufacture

Linoleic acid is obtained by extraction from various vegetable oils such as safflower oil.

## 14 Safety

Linoleic acid is widely used in cosmetics and topical pharmaceutical formulations, and is generally regarded as a nontoxic material. On exposure to the eyes, skin, and mucous membranes, linoleic acid can cause mild irritation.

## 15 Handling Precautions

Observe normal precautions appropriate to the circumstances and quantity of material handled. Gloves and eye protection are recommended.

## 16 Regulatory Status

GRAS listed. Approved for use in foods in Europe and the US. Included in the Canadian Natural Health Products Ingredients Database.

## 17 Related Substances

Ethyl linoleate; methyl linoleate.

### Ethyl linoleate

*Empirical formula* $C_{20}H_{36}O_2$
*CAS number* [544-35-4]
*Synonyms* Linoleic acid ethyl ester; 9,12-octadecadienoic acid ethyl ester; vitamin F.
*Comments* Ethyl linoleate is used in pharmaceutical formulations as an emollient and humectant. It is also used as a solvent for fats. The EINECS number for ethyl linoleate is 208-868-4.

### Methyl linoleate

*Empirical formula* $C_{19}H_{34}O_2$
*CAS number* [112-63-0]
*Synonyms* 9,12-Octadecadienoic acid, methyl ester.
*Comments* Methyl linoleate is used in cosmetics as an emollient. The EINECS number for methyl linoleate is 203-993-0.

## 18 Comments

Conjugated linoleic acids are a family of linoleic acid isomers in which the double bonds are conjugated. Antioxidant and anticancer properties have been attributed to conjugated linoleic acids, although the different isomers can have markedly different effects. Studies have shown that conjugated linoleic acid increases paracellular permeability across human intestinal-like Caco-2 cell monolayers, and consequently may also, as a dietary supplement, increase calcium absorption *in vivo*.[10]

Linoleic acid is used in parenteral emulsions for total parenteral nutrition and in nonprescription oral dietary supplements.

Linoleic acid and other polyunsaturated fatty acids have been cited as potential tumor-targeting aids, due to their being readily incorporated into the lipid bilayers of tumor cells. In this capacity, they are believed to play a role in enhancing the therapeutic efficacy of chemotherapy.[16] Similarly, linoleic acid was shown to have a synergistic anti-tumor effect when used as a formulation component in an intraveneous microemulsion of docetaxel.[11]

Linoleic acid has been shown to reduce skin irritation following acute perturbations, exhibiting clinical effects that are comparable to glucocorticoids.[17]