

Organic Acids

Definition of causal agent

The term “Organic Acids” or “Carboxylic Acids” defines chemical compounds characterized by the general formula R-COOH. As a general rule, these molecules are polar and, similarly to alcohols, can create hydrogen bonds with several other similar molecules. Based on their hydrogen content, these compounds can be divided in the subgroups of saturated and unsaturated organic acids. Moreover, based on the characteristics of the molecules, they can be further subdivided in aliphatic and aromatic compounds.

Saturated as well as unsaturated compounds can be used in a variety of applications, mainly in the production of synthetic fibres, resins, plastics, dyestuffs, or as intermediates or solvents in cosmetic or food applications. Some specific uses are described as follows:

Aliphatic organic acids

Formic acid: reducing agent for wool, dyeing and decalcifying, tanning, depilation and treatment of hides, latex coagulation, regeneration of old rubber, electroplating, animal food additive, food preservative and flavour adjuvant, brewing antiseptic, glue in aircraft industry.

Acetic acid: synthetic fibres production, cellulose and acetate, acetate rayon, plastics, printing, food preserving, pharmaceuticals, and photographs.

Unsaturated carboxylic acids: in polymeric materials, as chemical preservatives, as soap and food component.

Oxalic acid: textile finishing, stripping, cleaning, calico printing, dying paint, varnish, rust removal, dye manufacturing, paper, ceramic, photography and rubber industry.

Unsaturated polycarboxylic acids: resin manufacture, edible preservatives, mordant in dyeing.

It is important to underline that most of these compounds are normal constituents of human metabolism.

Aromatic organic acids

This group is very large and includes either nitro or halogen derivatives, and their aromatic esters. These compounds are addressed in the chapter “halogenated derivatives of aromatic hydrocarbons”. Aromatic organic acids are used for the synthesis of dyes, elastomers, medicine, pesticides and several plastic materials.

Local effects

Exposure to organic acids (either aliphatic or aromatic) can cause irritation of the eyes, skin and mucous membranes. Formic, acetic, oxalic, maleic, and malonic acids are irritant also in aqueous solution.

Minimum intensity of exposure: The irritation capacity depends on the strength of the single acid, its water solubility and its capacity of penetrating the intact skin and mucous membranes. It is inversely related to the concentration of the solution.

Exposure criteria:

Occupational exposure confirmed and, if possible, assessed, by history and study of working conditions showing evidence of exposure.

Workplace air monitoring: depending on the compound.

Guide value: atmospheric concentration exceeding STELs, with a particular attention for very high concentrations.

Minimum duration of exposure: a few minutes

Induction period: not applicable. Usually effects are observed after no more than a few hours from exposure/contact.

See section on ***Occupationally caused irritation of the skin and mucous membranes*** in Annex I entry nr. 202.

Allergic effects

Some organic acids may cause, rarely, sensitization. The most known sensitising compound of this group is formic acid: the risk of sensitization is higher in subjects exposed to formaldehyde.

Possible sensitizing agents are also malonic, acrylic, methacrylic and maleic acids.

Eyes and upper respiratory tract are usually involved, but also contact dermatitis has been reported.

Exposure criteria:

At least one previous episode of exposure. This criterion might not apply to subjects previously sensitized to formaldehyde and exposed to formic acid.

See:

- Annex I entry nr. 304.06 on ***Allergic asthmas caused by the inhalation of substances consistently recognised as causing allergies and inherent to the type of work,***
- Annex I entry nr. 304.07 on ***Allergic rhinitis caused by the inhalation of substances consistently recognised as causing allergies and inherent to the type of the work*** and
- section on ***Occupationally caused allergic contact dermatoses*** in Annex I entry nr. 202.

Table***Some common carboxylic acids and their synonyms***

Common name	Synonym/s	Systematic name	Formula
Formic	Formylic Hydrogen carboxylic	Methanoic	HCOOH
Acetic	Ethylic Methanecarboxylic	Ethanoic	CH ₃ COOH
Propionic	Methylacetic Ethanecarboxylic	Propanoic	CH ₃ CH ₂ COOH
Butyric	Ethylacetic 1-propanedicarboxylic	Butanoic	CH ₃ (CH ₂) ₂ COOH
Oxalic	Ethanedionic	Ethanedioic	HOOC-COOH
Malonic	Carboxyacetic Dicarboxymethane	Propanedioic	HOOCCH ₂ -COOH
Acrylic	Acroleic Vinylformic	2-propenoic	CH ₂ CH-COOH
Crotonic	3-methylacrylic	<i>(trans)</i> -2-Butenoic	CH ₃ (CH) ₂ -COOH
Methacrylic	2-methylene-propionic	2-methyl-1-propionic	CH ₂ C(CH) ₃ -COOH
Maleic	<i>Cis</i> -1,2-ethylene- dicarboxylic	<i>(cis)</i> -2-Butenedioic	HOOC-(CH) ₂ -COOH
Fumaric	<i>Trans</i> -1,2- ethylene- dicarboxylic	<i>(trans)</i> -2-Butenedioic	HOOC-(CH) ₂ -COOH
□-naphtoic	□-naphtalene- carboxylic	1-Naphtoic	1-C ₁₂ H ₁₁ -COOH
□-naphtoic	p-naphtalene- carboxylic	2-Naphtoic	2-C ₁₂ H ₁₁ -COOH
Benzoic P- <i>tert</i> -benzoic	Benzenecarboxylic	Benzoic 2- <i>tert</i> -butylbenzoic	C ₆ -H ₅ -COOH p-(CH ₃) ₃ C-COOH