

4.3 Common carboxylic acids with practical uses.

Methanoic acid (formic acid) is an acid found in some ants' sting . The name formic acid comes from the Latin for ant: formica). The pain associated with brushing nettles is also due to formic acid released from the tiny hollow hairs on the surface of the leaves.



Creative commons: Fire ants Author: FangHong USDA

The Ant

*The ant has made himself illustrious
Through constant industry industrious.*

*So what?
Would you be calm and placid
If you were full of [formic acid](#)?*

-- Ogden Nash Thanks to Seth Anthony!

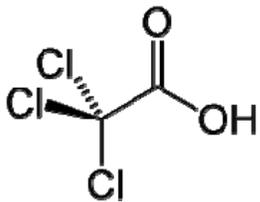
If one rubs a sodium bicarbonate paste on the afflicted surface **quickly**, it will neutralize the formic acid and some of the pain will be eliminated. The equation for the neutralization reaction which occurs is shown below.



What are the names of the two products formed?

Ethanoic acid (acetic acid) is the primary acid in vinegar (the term acetic comes from Latin acetabulum-a shallow cup used in Roman times for vinegar).

Trichloroacetic acid(TCA) is a stronger acid than acetic acid. It is used to chemically burn warts and for facial peels. It is potentially as corrosive as sulfuric acid and needs to be treated with care! As is the case with phenol, the concentration of the trichloroacetic acid and the amount of time the skin is exposed need to be monitored carefully.



A quote from some internet ads given below.

Nomelan Phenol Solution Peels

Photodamage, Hyperpigmentation

● **Phenol Light 60ml**

Indications

Photo types I, II III (blondes) not sensitive

Superficial hyperpigmentation

Acne-prone

Freckles

Key ingredients:

15% TCA

8% Phenol

Retinoic acid

Phytic acid
Glycolic acid
Salicylic acid
Ascorbic acid
Mandelic acid

TCA

TCA removes ageing layers of skin that are damaged by various organic or external processes. It coagulates cutaneous proteins by destroying the epidermal layer, which is later replaced by a new epidermis and new connective tissue.

Phenol

produces a powerful keratolytic effect while destroying cell sulfides of the keratin layer.

Alpha-hydroxyacids mix

Characterized by their humectant, keratoplastic, keratolytic, and sebum-regulating properties. They also improve the quality of the elastin fibers that tend to become longer, less fragmented, and more undulated.

Salicylic acid

Keratolytic properties are directly related to the intercellular cement of the corneocytes. Its comedolytic properties are due to its capacity to mix with the follicle

Phytic acid

Used as a bleaching agent. It blocks iron and receives melanin during its formation.

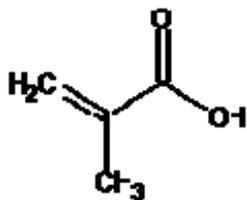
Retinoic acid

Retin-A Regulates keratinization, enhancing the cellular renovation process. Retinoic acid improves the appearance and overall quality of the skin. Retinoic acid nourishes the skin, prevents wrinkles, diminishes the depth of existing wrinkles, and improves the elasticity of aging skin while stimulating fibroblasts. It synthesizes connective tissue molecules, particularly collagen. In addition, it regulates melanocyte activity and attenuates spots caused by excessive exposure to UV rays.

Propanoic acid (propionic acid) is an acid produced by several species of the bacteria genus *Propionibacterium*. *Propionibacterium acnes* grows on people's skins and uses oils from the sebaceous glands as an energy source. It also produces propionic acid as a product and is responsible for causing acne. *Propionibacterium freudenreichii* is a bacterium that produces the CO₂ gas bubbles in Swiss cheese and the propionic acid is partially responsible for the unique flavor of Swiss cheese.

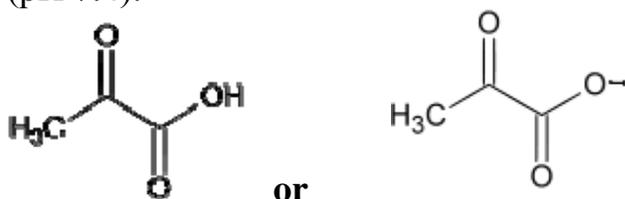
2-propenoic acid

The molecule 2-propenoic acid has the structure:



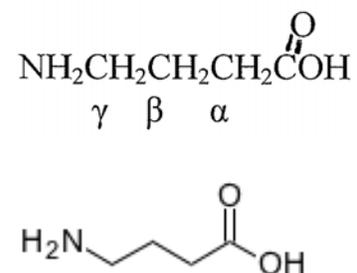
and the common name **methacrylic acid**. It is used for making acrylic polymers such as those that make artificial nails.

Pyruvic acid has both a ketone and a carboxylic acid functional group is formed from the metabolism of glucose and other sugars. As discussed in section 4.2, it actually exists primarily as pyruvate ion at physiological pH (pH 7.4).



Butanoic acid (butyric acid) was first isolated from rancid butter (from the Latin butyrum = butter). It is also found in vomit, Parmesan cheese and is produced by **colonic bacteria** from various types of dietary fiber. A variety of contradictory claims are found in the research literature as to whether butanoic (butyric) acid in the colon increases or decreases the risk of colon cancer.

4-aminobutanoic acid (Gamma aminobutyric acid or GABA)

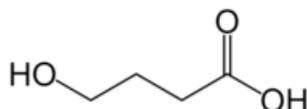


This molecule contains an amine group on the fourth C from the carboxylic acid group. Like the previous example the numbering starts at the carboxylic acid group. The “amine” functional group name is changed to amino when it is part of a bigger molecule. Hence we have 4-aminobutanoic acid.

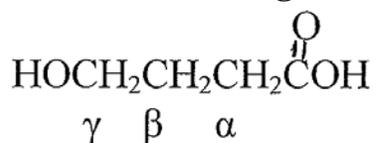
An older naming system names the C atoms “downstream” from the carboxylic acid functional group as alpha(α), beta(β), and gamma(γ) C atoms. The α C is the C adjacent to the C in the carboxylic acid functional group).

Hence the older (but commonly used) name for this molecule is **gamma aminobutyric acid, abbreviated GABA**. This molecule is a very common (and important) neurotransmitter in the brain which can cause **lowering of CNS activity**. It is readily available over the counter as a “dietary supplement” to treat depression, PTSD, anxiety, and many other conditions. GABA does not appear to cross the blood brain barrier, making it questionable whether it has any effect beyond placebo for these various CNS problems.(Valium).

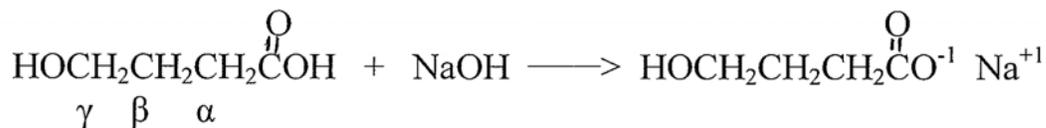
4-hydroxybutanoic acid (gammahydroxybutyric acid, GHB)



4-hydroxybutanoic acid or 4-hydroxybutyric acid is better known by its common name of **gamma hydroxybutyric acid** and its abbreviation, **GHB**.

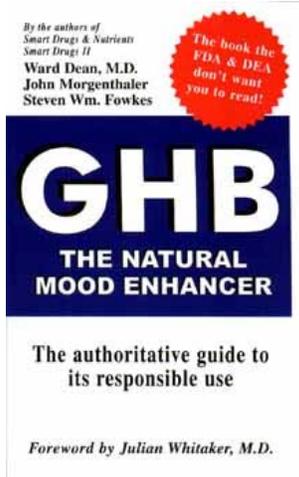


The drug is often neutralized with sodium hydroxide to produce the sodium salt of GHB.

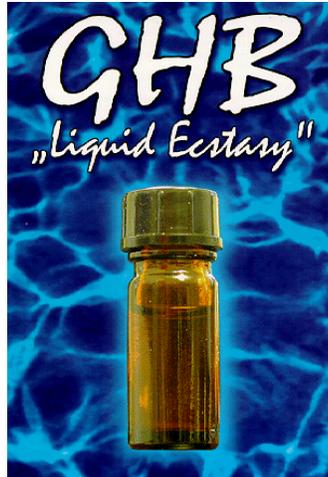


It has been a popular recreational drug with street names such as Juice, Liquid Ecstasy, G, and Fantasy. It can cause feelings of euphoria, increased libido, and sociability. It can also cause amnesia, unconsciousness at higher dosages, leading to its use as a date rape drug. It has a structure very similar

to GABA and acts to decrease the activity of the central nervous system (CNS) and high dosages (or susceptible individuals) can lead to extreme reduction in breathing rate (respiratory depression) which can cause death.



ceri.com



crcadanecountywi.com



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Warning!



GHB (date rape), "Special K" and "Roofies" are "predatory" drugs that can be slipped into your drink easily. Symptoms can include:

- Feeling of rapid drunkenness
- Nausea
- Vomiting
- Loss of inhibition
- Loss of muscle control
- Coma or death

**Don't leave your drink unattended.
Don't accept a freebie from a stranger.**

If you suspect you've been drugged, freeze your pee & call victim's assistance.

The Hill's Responsible Hospitality Group
learning the **BOULDER** way





fnc.org

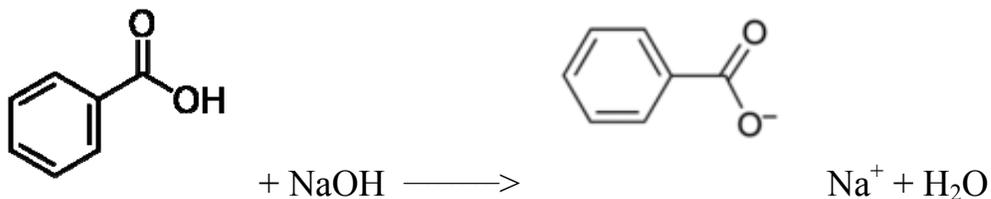
Perfluorooctanoic acid (PFOA)

Perfluorooctanoic acid (PFOA) is a molecule of octanoic acid that has had **all** the H atoms replaced with F atoms.



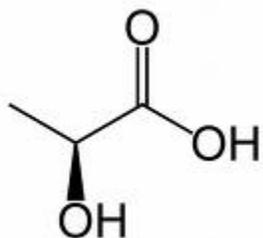
PFOA is used to make grease resistant carpeting, food packaging and Teflon. There is particular concern about its use in packages of microwavable popcorn as the perfluorooctanoic acid can leach into the popcorn at high temperatures. It has been classified as a “likely carcinogen”, meaning that it has been found to be a carcinogen in animal tests although there is not enough data to determine whether it is a carcinogen for humans. Like chlorinated compounds, fluorinated compounds are only very slowly metabolized, and thus have the potential of accumulating in the environment. Dupont, the major manufacturer of Teflon, has agreed to reformulate the way Teflon and grease resistant PFOA are made so as to eliminate emissions into the environment.

Benzoic acid is a mold inhibitor and can be neutralized with NaOH to form sodium benzoate in a neutralization reaction.

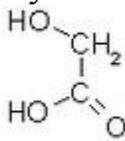


The sodium benzoate is more water soluble than benzoic acid (because the ion wants to be in water even more than the polar OH group). Sodium benzoate is also used as a food preservative, inhibiting mold growth.

Lactic acid (2-hydroxypropanoic acid) is produced by *Lactobacillus acidophilus* in yogurt and by your muscle cells during anaerobic exercise. It is also used in a variety of skin care products.

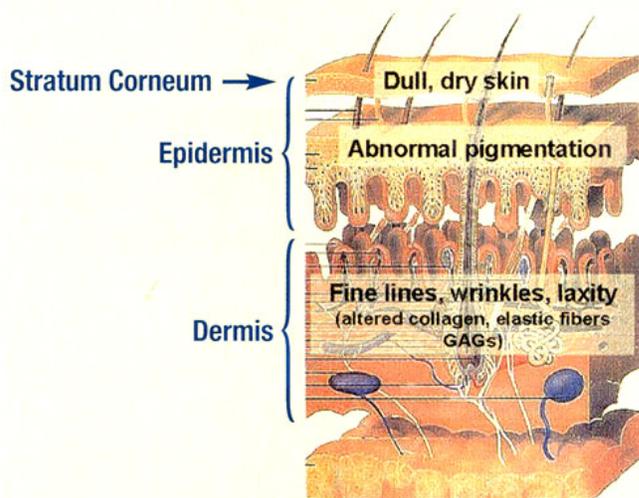


Glycolic acid (2-hydroxy acetic acid) is sold in a variety of skin care products for removing wrinkles and making skin look younger. It works the same way as phenol and trichloroacetic acid, dissolving away the outer layers of skin, but it is milder in its action.



Glycolic acid

Photoaged Skin



botonics.co.uk

Oxalic acid is found in rhubarb (especially the leaves), and in lesser amounts in spinach, beets and some other plants. It has 2 carboxylic acid groups and can be neutralized completely to form the oxalate ion.

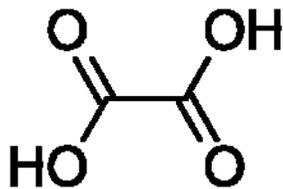


Creative commons: Author Maksim

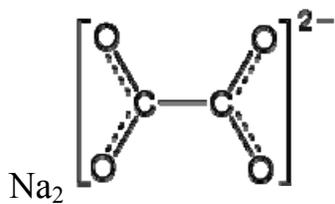


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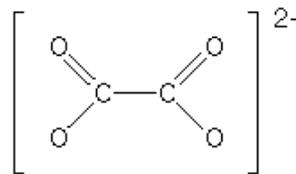
Oxalic acid



sodium oxalate

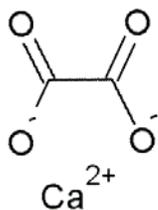


or Na_2



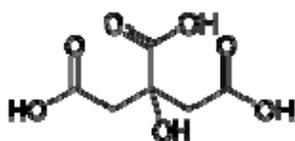
+ 2 H_2O

The oxalate ion can combine with Ca^{+2} ions to form insoluble calcium oxalate, the most common compound in kidney stones.



Patients who have had one kidney stone are at increased risk of additional kidney stones and are advised to avoid foods high in oxalate. Cooking destroys oxalic acid, so cooked rhubarb and spinach do not contain oxalic acid (or at least not as much). In high concentrations oxalic acid (oxalate ion) can form crystals with Ca^{+2} rapidly, causing kidney damage. There have been a few isolated cases of dietary oxalic acid poisoning due to consumption of substantial amounts of raw rhubarb leaves. Oxalic acid is also available in hardware stores for cleaning off iron stains.

Citric acid is found in berries, fruits, especially lemons and oranges; it is found in small quantities in all cells because its a essential component in the citric acid cycle (also called the tricarboxylic acid cycle or Krebs cycle), an essential part of glucose metabolism. Based on the structure of citric acid, why is the Krebs cycle also called the tricarboxylic acid cycle?



10-undecenoic acid (undecylenic acid) is a monounsaturated 11 C carboxylic acid which is used to treat epidermal fungal infections like athlete's foot. It is the active ingredient in several over the counter products



DE VENTA AQUÍ

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