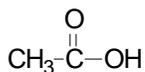
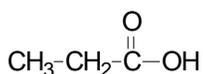


Formic acid. (from Latin "formica"=ant) (IUPAC methanoic acid). Up to 10% of body weight of some kinds of ants is formic acid; a corrosive, irritating liquid partly responsible for sensation caused by ant and bee stings. Isolated by distillation of ants. Commercially, however, it's usually made by oxidation of formaldehyde.

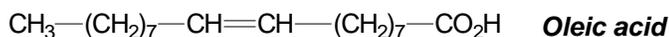
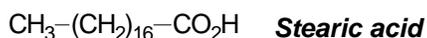
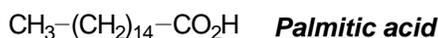


Acetic acid. (IUPAC ethanoic acid). Vinegar is a ca 5% solution of acetic acid. Acetic acid equivalents are key building block in metabolism of living cells.

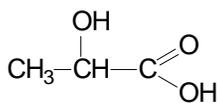


Propionic acid. (IUPAC propanoic acid). An anti-fungal agent often used in athlete's foot salves. The sodium and calcium salts (e.g. calcium propionate) are food additives – frequently added to bread to inhibit mold formation.

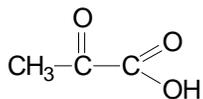
The fatty acids – The glyceride esters of these acids are fats (lipids). The most common include:



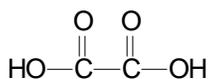
Almost all long chain acids found in living cells (whether or not they contain one or more C=C bonds) have an even number of carbon atoms. Why? You'll find out in Biochemistry!



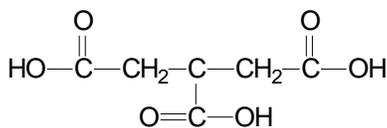
Lactic acid. Found in milk, cheese, sauerkraut. Small amounts found in human blood and cells – generated by breakdown of carbohydrates. Muscle cramps during exercise are caused by presence of high concentrations of lactic acid in muscle tissue. The high concentration is due to lack of sufficient oxygen to oxidize and thus get rid of this acid from muscle. Commercially lactic acid is added to many food products to make them more acidic – e.g.: olives, beer, cheese, soft drinks.



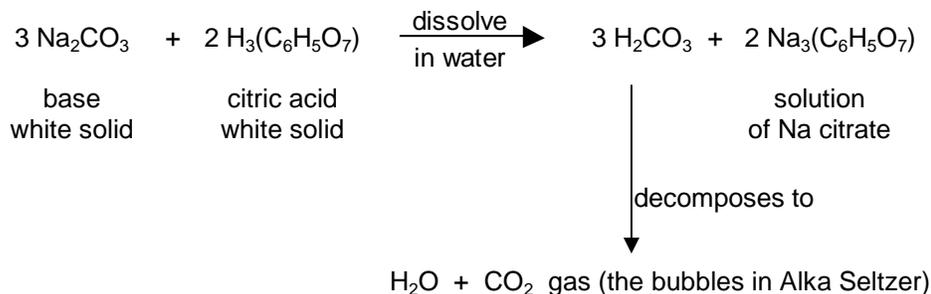
Pyruvic acid. Key intermediate in sugar metabolism. In muscle, pyruvic acid is reduced to lactic acid during exertion. Not easy to isolate because it decomposes on standing.

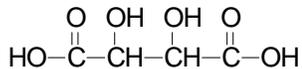


Oxalic acid. Occurs as the water insoluble calcium salt in spinach, rhubarb, etc. Kidney stones in people are usually calcium oxalate. Large amounts of oxalic acid are toxic. Up to 50% of the dry weight of certain leaves is oxalic acid. Such plants are harmful to animals. Rhubarb is boiled before being eaten to decompose the oxalate. Oxalate is the product of metabolism of many molds, e.g. penicillium. Oxalic acid is used in industry as a bleaching agent, radiator cleaner, and spot remover. Potassium oxalate is used in clinical laboratories to prevent blood coagulation – blood Ca^{2+} precipitates as the oxalate and none is left in solution to promote coagulation.

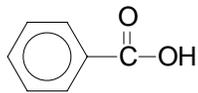


Citric acid. A *tricarboxylic acid*. One of the most widely distributed plant acids – citrus fruits. Commercially, made by fermentation using a specific bacterium. Used in soft drinks, sherbet, and many other foods to provide flavor. Also a blood anticoagulant because it complexes Ca^{2+} . Also acts as a buffer; e.g., in Alka Seltzer and other effervescing powders.

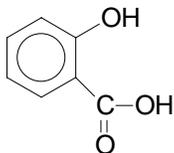




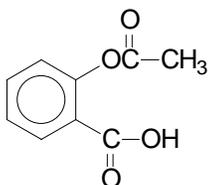
Tartaric acid. In foods, effervescent powders as above. The mono potassium salt is used in baking powders as the acid to cause formation of CO₂ bubbles (same principle as above) from the carbonate formed by bacteria or chemically during heating. This is how the so called air bubble spaces in cakes and breads are created. Tartaric acid is also used as a laxative.



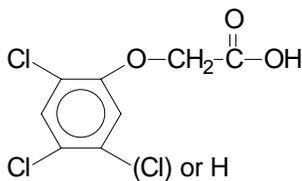
Benzoic acid. The Na⁺ salt (sodium benzoate) is a common food preservative, especially in soft drinks, catsup, pickles, pie fillings, jams, margarine. The salt is odorless, tasteless, nontoxic and an effective bactericide at conc. of 0.1%. Also used for this purpose in cosmetics. **NOTE:** the average American consumes 3 lbs of food additives (for preservation, flavor, color, etc) per year.



Salicylic acid. This is a better disinfectant than phenol. It's used in many topical ointments. The top layer of skin flakes off – the underlying skin is unharmed – used to remove corns and other horny tissue (1850-1890 Pre-Aspirin – also Na⁺ salt).

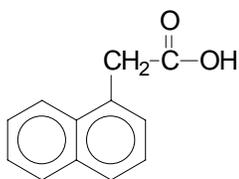


Acetylsalicylic acid. Aspirin. Introduced in 1899 – used to relieve pain (analgesic), as an anti-inflammatory (arthritis, rheumatic conditions), to reduce fever (antipyretic), and uric acid reducer (gout treatment, a uricosuric). In U.S. ca. 100 (5 grain) tablets used per person per year (40 tons a day in U.S.). Mechanism of action still partly unknown.

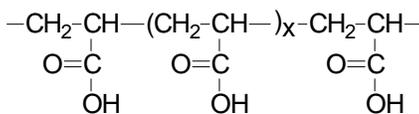


2,4-Dichlorophenoxy acetic acid (2,4-D)

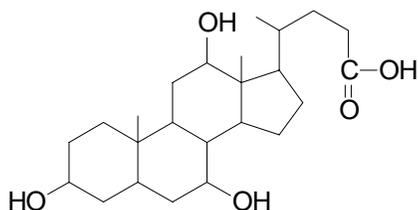
2,4,5-Trichlorophenoxyacetic acid (2,3,5-T). Plant hormones. Used in excessive amounts, they overstimulate the plant and kill it. Were used as defoliants in Vietnam.



α-Naphthylacetic acid. Used to reduce premature dropping of apples.



Polyacrylic acid. Remember polymerization of acrylic acid CH₂=CH-CO₂H. Polymer used in preparation of "ion free water". Used in diets of heart patients to control concentration of Na⁺ ion. The ion exchanger used in water softening systems – exchange between Na⁺ salt and Ca²⁺, Fe³⁺, and Mg²⁺ salts.



Cholic acid. One of the principal acids in bile. Derivatives of these are used to solubilize fats (emulsify) – to permit passage through intestinal wall and assimilation. Note relationship to cholesterol from which it is made in the cell.