

Chemistry in Everyday Life

- Classification of Drugs used in our daily life

Drugs	Description	Examples
<i>Analgesics</i>	A group of drugs that are used to achieve analgesia i.e. relief from pain selectively without blocking the conduction of nerve impulses; eliminating sensation or affecting consciousness. These are also known as "Pain Killers" and are distinct from anesthetics, which results in temporarily loss of sensation.	<i>Aspirin, Analgen, Saridon etc.*</i>
<i>Tranquilizers/ Antidepressants</i>	These are used for treatment of various neuropsychiatric disorders such as anxiety, fear, tension, agitation, and related states mental disturbances. Tranquilizers fall into two major classes: 1. Major tranquilizers or neuroleptics used for the treatment of major states of mental disturbance in schizophrenics and other psychotic patients. 2. Minor tranquilizer or anxiolytics that are used to treat milder states of anxiety and tension in healthy individuals or people with less serious mental disorders.	<i>Equanil, Calmose, Tofranil, Barbituric Acid, Cocaine and Iproniazids etc..</i>
<i>Antiseptics</i>	They are applied on living tissues to kill or prevent the growth of micro-organisms.	<i>Dettol, Savlon and Acriflavine etc.</i>
<i>Disinfectants</i>	These are applied on floor, instruments or wall etc. to kill microorganisms but are not safe for application on living tissues.	<i>Phenol</i>

Drugs	Description	Examples
Antimicrobial	These are chemical substances of natural or synthetic origin that are used to either kill or stop the growth of microorganisms causing diseases such as bacteria, fungi, helminths, protozoa and viruses. Antimicrobial medicines can be classified according to the microorganisms they act primarily against. For example, antibiotics are used against bacteria, while antifungals are used against fungi. Five bacterial targets have been exploited in the development of antimicrobial drugs: cell wall synthesis, protein synthesis, ribonucleic acid synthesis, deoxyribonucleic acid (DNA) synthesis, and intermediary metabolism.	Salvarsan, Prontosil, Sulphanilamide, Bacteriostatic Drugs: Erythromycin, Tetracycline, Chloramphenicol Bactericidal Drugs: Ofloxacin, Aminoglycosides.
Antipyretics	These drugs bring down the body temperature during fever. Most antipyretics work by inhibiting the enzyme cyclooxygenase (COX), thereby interrupting the synthesis of inflammatory prostaglandins. The body then works to lower the temperature, which results in reduction of fever.	Paracetamol, Analgin and Novalgin.
Antifertility Drugs	Prevent pregnancy in women by controlling menstrual cycle and ovulation.	Norethindrone & Mestranol
Antacids	An antacid is a substance, which neutralizes stomach acidity and is thus, used to relieve heartburn, indigestion or an upset stomach . Typically, metal hydroxides are used as antacids.	Eno, Magnesia [Mg(OH) ₂], Gaviscon, Gelusil, Maalox, Mylanta, Rolaids.

Antibiotics

These are the chemical substances which are produced by microorganisms like bacteria and fungi and can kill or stop the growth of pathogenic microorganisms. The major classes of antibiotics include –

Antibiotics fight bacterial infections either by killing bacteria or slowing and suspending the growth. They do this either by attacking the cell wall or coating surrounding the bacteria or interfering with their reproduction.

Antibiotics are not effective for the treatment of viral infections.

Antibiotic resistance

Antibiotic resistance occurs when germs like bacteria and fungi evolve the mechanism to defend them from the drugs designed to kill them. This means that the germs are not killed and continue to grow. Infections caused by antibiotic-resistant germs are difficult, and sometimes impossible, to treat.

- **Penicillins** – e.g. phenoxymethylpenicillin, flucloxacillin, amoxicillin.
- **Cephalosporins** – e.g. cefaclor, cefadroxil, cefalexin.
- **Tetracyclines** – e.g. tetracycline, doxycycline, lymecycline.
- **Aminoglycosides** – e.g. gentamicin, tobramycin.
- **Macrolides** – e.g. erythromycin, azithromycin, clarithromycin.
- **Sulfonamides and trimethoprim** – e.g. co-trimoxazole, Metronidazole, tinidazole
- **Quinolones** – e.g. ciprofloxacin, levofloxacin, norfloxacin.
- **Nitrofurantoin** – used for urinary infections.

Antihistamins

These drugs compete with histamine for binding sites of receptors and thus

Brompheniramine & Terfenadine

interfere with the natural action of histamine.

**N.B: Classes of pain medications -*

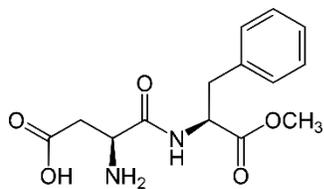
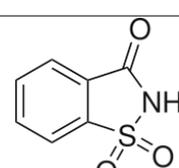
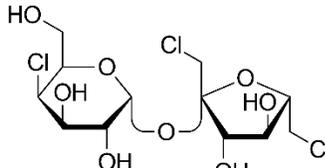
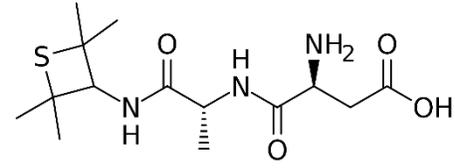
- *Nonsteroidal anti-inflammatory drugs (NSAIDs)* – medicines that are widely used to relieve pain, decrease fever, prevent blood clots, and in higher doses, decrease inflammation
- *Corticosteroids* are often administered as an injection at the site of musculoskeletal injuries. They exert powerful anti-inflammatory effects. They can also be taken orally to relieve pain from arthritis. Corticosteroids can have substantial effects on the body by suppressing the immune system. Doctors prescribe corticosteroids when other treatments are not working, or a rapid response is required.
- *Acetaminophen* increases the body's pain threshold, but it has a nominal effect on inflammation.
- *Opioids*, also known as narcotic analgesics, modify pain messages in the brain.
- *Muscle relaxants* reduce pain from tense muscle groups, most likely through sedative action in the central nervous system.

Bacteriostatic and bactericidal agents – “Bacteriostatic” agents are those which prevent the growth of bacteria (i.e., it keeps them in the stationary phase of growth), whereas “bactericidal” means that it kills bacteria.

- *Artificial Sweetening Agents*

Chemicals that are used to sweeten food are called artificial sweetening agents. They do not add calories to our body and are relatively safe/harmless for patients, suffering from diabetes. Examples include –

- *Aspartame*
- *Saccharin*
- *Sucralose*
- *Alitame.*

Artificial Sweetener	Structural Formula	Sweetness value in comparison to cane sugar/ table sugar.
Aspartame Trade name: NutraSweet, Equal, and Canderel.	 <p>Methyl ester of the aspartic acid/phenylalanine dipeptide</p>	100
Saccharin	 <p>Benzoic sulphimide</p>	550
Sucralose	 <p>Trichloro derivative of sucrose</p>	600
Alitame	 <p>Aspartic acid containing dipeptide sweetener</p>	2000

N.B: Advantame is 20,000 times sweeter, gram per gram, than table sugar, making it the sweetest, by far, of the bunch. It is a white crystalline sweetener that flows freely and dissolves in water.

- Food Preservatives**

Food preservatives refer to chemicals that are added to food products, beverages and pharmaceutical drugs to prevent decomposition by microbial growth or undesirable

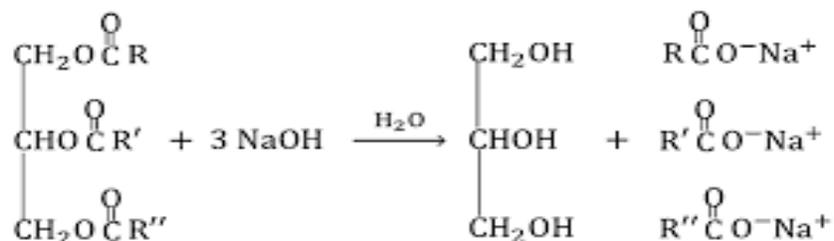
chemical changes. Addition of preservatives prevent undesirable changes in flavor, colour, texture of the food during processing and storage of food.

Some commonly used food preservatives include *table salt, vegetable oil, sugar, potassium metabisulphite and sodium benzoate.*

- Cleansing agents

Cleansing agents, also known as *surfactants*, refer to chemical substances that concentrate on the surface of the solution to form surface films. These surface films decrease surface tension of the solution and aid in removing dirt and dust by emulsifying grease.

Soaps are *sodium or potassium salts of fatty acids* that are produced from the hydrolysis of natural oils or fats in a chemical reaction called *saponification*.



Soaps do not work with hard water as it forms insoluble salts with calcium and magnesium ions present in hard water.

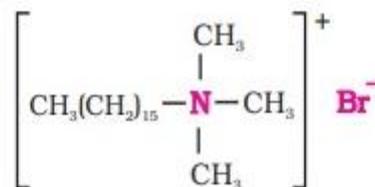
Detergents are sodium or potassium salts of sulphonic acids. These are effective with hard water also.

Anionic Detergents:

- Sodium Salts of sulphonated long chain alcohols or hydrocarbons.
- In anionic detergents, the anionic part of the molecule is involved in cleaning action.
- Mostly used for household work. Also used in toothpaste.

Cationic Detergents:

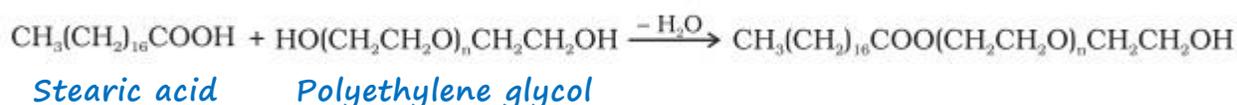
- Quaternary ammonium salts of amines with acetates, chlorates or bromates.
- Cationic part possesses a long hydrocarbon chain and a positive charge on nitrogen atom.
- Have germicidal properties
- Expensive, and therefore, of limited use.



Cetyltrimethylammonium bromide

Non-ionic Detergents:

- They do not contain any ion in their constitution.
- Liquid dishwashing detergents are non-ionic type. Mechanism of cleansing action of this type of detergents is the same as that of soaps.
- Remove grease and oil by micelle formation. Main problem that appears in the use of detergents is that if their hydrocarbon chain is highly branched, then bacteria cannot degrade this easily.
- These days the branching of the hydrocarbon chain is controlled and kept to the minimum. Unbranched chains can be biodegraded more easily and hence pollution is prevented.



Advantages of Synthetic detergents over Soaps

- They can be used with hard water which soap cannot do.
- They can be used in acidic medium unlike soaps.
- They are more soluble in water so form better lather than soaps.
- They have stronger cleaning action than soaps.