

Poisons to Drugs

About 80% of the world's population depends entirely on local medicines derived from plant material. Plants produce more toxins than any other type of organism as they can synthesize a wide variety of biochemical protections to defend against infection, herbivores, pests and other plants however, if used in small quantities these chemicals can be used to treat ailments and disease.

Examples of Poisons Used in Drugs:

- ❖ Hemlock (*Conium maculatum*) is a large biennial herb common throughout Europe. It contains the alkaloid coniine which causes gradual muscular paralysis followed by convulsions and untimely death.
 - The dried unripe fruits of hemlock are formally used as a pain reliever and sedative.
- ❖ Henbane (*hyoscyamus niger*) is an annual/biennial flowering plant common in Europe that has poisonous leaves containing a secondary metabolite which is rapidly absorbed in the blood via ingestion/topically and blocks the passage of nerve impulses by competing with acetylcholine for muscarinic sites of the parasympathetic nervous system, causing hallucinations (with visions of flight).
 - The plant can be prepped for medicinal use by collecting the flowering tops and rapidly drying to collect the tropane alkaloids contained. Through extraction additional racemic forms of the alkaloids are derived: atropine (hyoscyamine), which was traditionally used as a sedative in childbirth though is now used to control motion sickness due to the depressant action it has on the central nervous system, and scopolamine (hyoscyamine) which is used to control salivary secretion during surgery.
- ❖ Foxglove (*Digitalis spp.*) is a slender biennial herb common in America & Europe that contains several cardiac glycosides including Digoxin and Digitoxin.
 - Cardiac glycosides inhibit the sodium/potassium pump in the plasma membrane of heart muscle cells, leading to an increase in cardiac output by increasing the force of contraction in the heart.
 - Medically, Digoxin and Digitoxin are used in the treatment of congestive heart failure and atrial fibrillation, though Digoxin is the most widely used as it exhibits rapid action and is eliminated faster than Digitoxin.
- ❖ Sweet Clover (*melilotus officinalis*) is a non-legume plant. If harvested sweet clover is spoilt by microbial fermentation dicoumarol is generated, which causes fatal haemorrhages in animals fed with spoilt sweet clover as their blood loses the ability to clot therefore, minor injuries lead to severe internal bleeding.
 - In medicine dicoumarol can be used as an oral blood anticoagulant in the treatment of thrombosis.
- ❖ Bishop's Lace/Flower (*Ammi majus*) contains a psoralen called methoxsalen (xanthotoxin). Psoralenes are widely distributed in plants as a defence against herbivores. In humans, the handling of fruits can cause phytophotodermatitis due to an increased sensitivity to UV.
 - Psoralen can be used for re-pigmentation of skin in people with vitiligo (by using PUVA- a psoralen and UV-A treatment which consists of an oral dose of methoxsalen followed by a long wave of UV irradiation of skin to induce melanin production)
- ❖ Mexican Yam (*dioscorea spp.*) is an herbaceous, vine like, climbing plant mainly cultivated in Mexico. The steroidal saponins found in Mexican yam have antifertility properties; diosgenin is similar to female reproductive hormones (oestrogen/progesterone)
 - In medicine Mexican yam is used in the development of a female contraceptive pill.
- ❖ Cotton (*gossypium spp.*) contains a sesquiterpene called gossypol which disrupts enzymes in sperm cells that are essential to fertilisation however any antifertility properties are reversible provided consumption is not prolonged.
 - Gossypol is used as an anti-hormonal male contraceptive though effects are irreversible. It also has applications in cancer therapy.