## Alkaloids

## Physical Properties

1. Most alkaloids contain oxygen; those compounds are usually colorless crystals at ambient conditions.
2. Oxygen-free alkaloids, such as [nicotine](http://en.wikipedia.org/wiki/Nicotine)[[146]](http://en.wikipedia.org/wiki/Alkaloid#cite_note-146) or [coniine](http://en.wikipedia.org/wiki/Coniine),[[22]](http://en.wikipedia.org/wiki/Alkaloid#cite_note-BSE:_koniin-22) are typically volatile, colorless, oily liquids.[[147]](http://en.wikipedia.org/wiki/Alkaloid#cite_note-ref222-147)
3. Some alkaloids are colored, like [berberine](http://en.wikipedia.org/wiki/Berberine) (yellow) and [sanguinarine](http://en.wikipedia.org/wiki/Sanguinarine) (orange).[[147]](http://en.wikipedia.org/wiki/Alkaloid#cite_note-ref222-147)
4. Most alkaloids have a bitter [taste](http://en.wikipedia.org/wiki/Taste). It is believed that plants evolved the ability to produce these bitter substances, many of which are poisonous, in order to protect themselves from animals; however, animals in turn evolved the ability to detoxify alkaloids.[[149]](http://en.wikipedia.org/wiki/Alkaloid#cite_note-149)

**Chemical Properties**

1. Most alkaloids are weak bases, but some are [amphoteric](http://en.wikipedia.org/wiki/Amphoteric), for example [theobromine](http://en.wikipedia.org/wiki/Theobromine) and [theophylline](http://en.wikipedia.org/wiki/Theophylline).[[148]](http://en.wikipedia.org/wiki/Alkaloid#cite_note-ref225-148)
2. Most alkaloids are poorly soluble in water but readily dissolve in [organic solvents](http://en.wikipedia.org/wiki/Organic_solvent), such as [diethyl ether](http://en.wikipedia.org/wiki/Diethyl_ether), [chloroform](http://en.wikipedia.org/wiki/Chloroform) and [1,2-dichloroethane](http://en.wikipedia.org/wiki/1,2-dichloroethane). However, [caffeine](http://en.wikipedia.org/wiki/Caffeine) dissolves well in boiling water.[[148]](http://en.wikipedia.org/wiki/Alkaloid#cite_note-ref225-148)
3. With [acids](http://en.wikipedia.org/wiki/Acid), alkaloids form salts of various strengths. Those salts are usually soluble in water and [alcohol](http://en.wikipedia.org/wiki/Alcohol) and poorly soluble in most organic solvents. Exceptions include [scopolamine](http://en.wikipedia.org/wiki/Scopolamine) hydrobromide, which is soluble in organic solvents and water-soluble quinine sulfate.[[147]](http://en.wikipedia.org/wiki/Alkaloid#cite_note-ref222-147)

Some alkaloids can produce developmental defects in the offspring of animals that consume them but cannot detoxify them. A characteristic example is the alkaloid [cyclopamine](http://en.wikipedia.org/wiki/Cyclopamine), which is present in the leaves of [corn lily](http://en.wikipedia.org/wiki/Veratrum_californicum). During the 1950s, up to 25% lambs born by sheep that had grazed on corn lily suffered serious facial defects. Those defects ranged from deformed jaws to [cyclopia](http://en.wikipedia.org/wiki/Cyclopia) (see picture). After decades of research, in 1980s, the substance that was responsible for the deformities was identified as the alkaloid 11-deoxyjervine, which was renamed cyclopamine.[[150]](http://en.wikipedia.org/wiki/Alkaloid#cite_note-150)