

# **BOTANICAL** **TOXICOLOGY.**

*ELZBIETA & HANS BRAND*  
*ELZBIETA COSMETICS BV, THE NETHERLANDS*

***“SPEAK TO PEYOTE WITH YOUR HEART, WITH YOUR MIND, AND PEYOTE WILL SEE YOUR HEART, AND IF THE GODS WANT YOU WILL SEE AND HEAR THINGS”.***

Ernest Hemingway speaks about the Peyotl cactus, *Lophophora Williamsii*. Coming from the Mexican desert it is the source for the famous hallucinogenic drug mescaline, better identified as 3,4,5-trimethoxy phenethylamine. Mescaline is chemically related to hordenine, tyramine, adrenaline and nor-adrenaline. All these chemically interesting molecules belong to the big group of alkaloids. However, extracts of *Lophophora Williamsii* are strictly forbidden to be used in personal care and cosmetic products due to the presence of these alkaloids.



**LOPHOPHORA  
WILLIAMSII**

Alkaloids are organic nitrogen bases, derived from e.g. phenethyl amine, quinoline, isoquinoline, pyridine, etc., but that doesn't make triethanolamine an alkaloid. What's in a name ? Alkaloids are physiologically active, and triethanolamine hardly isn't. Virtually all alkaloids known are from botanical origin, and that is a botanical fact indeed, with all due respect, that is seldom acknowledged. You want us to convince you ?

Mandrake root (*Mandragora officinarum*; Satan's Apple, Dudaim): the root plays a very important role in magic and superstition. In grey medieval times it was believed that the mandrake root was to be found under the gallows after hanging a man high. During excavation the root was bellowing with pain, like the man that was hung at dawn. Mandrake root is also a strong aphrodisiac, the most well-known one in the Ancient World. Witches flying on their broomsticks to attend orgies at their Sabbath were experiencing astral journeys in which their repressed sexuality came vividly to life. In the

Holy Bible in the Book of Genesis mandrake is mentioned as well, and quite extensively indeed.

Mandrake root contains a number of alkaloids: scopolamine, hyos-cyamine and mandragorine (probably the most violent one). These belong to the group of solanaceous alkaloids, the so-called tropane alkaloids. Tropane betrays already the name atropine, the alkaloid found in *Atropa belladonna*, Deadly Nightshade. Blackbirds love the berries, and we have seen them eating 30-40 berries, and still singing their heart out (maybe because of atropine?). However, it doesn't affect them at all, but 2-3 berries will be lethal for humans. The girls on the catwalk like to apply the juice of one of those berries on the eye lids to get those impressively large pupils.

Tropane alkaloids, such as mandragorine, are extremely dangerous substances, although from botanical origin. Granny used to say: "It's from nature, so it must be good". Cocaine, the alkaloid from the Coca Plant *Erythroxylon coca*, is also a tropane alkaloid, originally comes from the Indonesian Archipelago but it is now one of the most significant export products of Colombia. Although cocaine is usefully applied in pharmacy, 1 g is lethal, and the drug is highly addictive. Granny didn't know cocaine, but she liked her Poppy (*Papaver somniferum*, a source for thebaine alkaloids [codeine, morphine, heroine]) together with sunflower seeds (*Helianthus annuus*) & sesame seeds (*Sesamum indicum*), and so do we.

Indian Snakeroot (*Rauwolfia serpentina*, serpentine wood) contains the alkaloid reserpine, a  $\beta$ -carbolin alkaloid. Although reserpine is highly toxic, it is beneficially used in medicine. It is used to lower the blood pressure and as a tranquilliser. It is also used as treat high fever and snake bites. It strongly binds to the vesicles in the peripheral neurons of the adenergetic neural system preventing them to concentrate and store the neurotransmitter noradrenaline. The  $\beta$ -carbolin structure is also found in yohimbine, from the East-African tree Yohimbe tree (*Pausinystalia yohimba*). It is quite surprising indeed that yohimbine containing creams are offered for sales because of the, proven, aphrodisiac properties.

Betel nuts, *Areca catechu*, originate from Southeast Asia and contain a volatile oil with arecoline, an alkaloid derived from nicotinic acid. Chemically arecoline is identified as N-methyl-1,2,5,6-tetrahydropyridine-3-carboxylic acid or its methyl ester. With this product we're not so far away from niacin, vitamin PP, the well-known Pellagra Preventing vitamin, that is so abundantly used in personal care and cosmetics. Arecoline is also medically used. It is a mild central nervous system stimulant. It increases respiration while decreasing the work load on the heart. An overdose arecoline may cause inebriation, dizziness, diarrhea, and may damage the teeth and gums. Arecoline compares to muscarine, another cholinergic alkaloid that occurs in fly agaric (*amanita muscaria*).

Many fungi produce highly toxic substances, especially the amanites.  $\alpha$ -Amanitine, an octapeptide is an example. It causes acute liver damage, jaundice and liver coma. Also the urea depletion (anurie) is ruined and urea poisoning may occurs (uremia). The lethal dosis for humans 0,1- 0,2 mg/kg body weight. Fungi may also have a psycho-activity (paddo's). Ibotinic acid, muscimol and muscazon are thought to be

responsible. Many fungi are used in pharmacy as it is costly to produce the active substances by total synthesis.



Even more notorious are mycotoxins produced by sub-micron fungi such as *Claviceps Purpurea*, as it occurs on rye. The poisoning became manifest either as ergotismus convulsivus or as ergotismus gangraenosus (St. Anthony fire). In the last case complete body parts die off because of permanent damage to the arteries, resulting in loss of toes, legs or arms without losing any blood. Ergotism still asks today for victims, but many mycotoxins are pharmaceutically used. A good example is ergotamine, used for a wide range of disorders or constraints, from migraine to inciting the contractions at baby birth.

Fungal toxins may be either alkaloids or proteins/peptides, and they can be extremely poisonous. Frequently the potential poisonous properties are underestimated, such as in the case of aflatoxine, that is produced by fungi present on peanuts (*Arachis hypogaea*).

The list of products of the European Community that are not allowed to be used in personal care and cosmetic products can be found on [www://pharmacos.eudra.org](http://www://pharmacos.eudra.org), and contains quite a number of botanical extracts. If a particular extract is not listed we may assume that these undesirable alkaloids and/or proteins are absent, and full advantage can be taken from our highly appreciated and functional botanical extracts.