29.39 - Alkaloids, natural or reproduced by synthesis, and their salts, ethers, esters and other derivatives.

- Alkaloids of opium and their derivatives; salts thereof :

2939.11 - - Concentrates of poppy straw; buprenorphine (INN), codeine, dihydrocodeine (INN), ethylmorphine, etorphine (INN), heroin, hydrocodone (INN), hydromorphone (INN), morphine, nicomorphine (INN), oxycodone (INN), oxymorphone (INN), pholcodine (INN), thebacon (INN) and thebaine; salts thereof

2939.19 - - Other

2939.20 - Alkaloids of cinchona and their derivatives; salts thereof

2939.30 - Caffeine and its salts

- Ephedrines and their salts :

2939.41 - - Ephedrine and its salts

2939.42 - - Pseudoephedrine (INN) and its salts

2939.43 - - Cathine (INN) and its salts

2939.44 - - Norephedrine and its salts

2939.49 - - Other

- Theophylline and aminophylline (theophylline-ethylenediamine) and their derivatives; salts thereof :

2939.51 - - Fenetylline (INN) and its salts

2939.59 - - Other

- Alkaloids of rye ergot and their derivatives; salts thereof :

2939.61 - - Ergometrine (INN) and its salts

2939.62 - - Ergotamine (INN) and its salts

2939.63 - - Lysergic acid and its salts

2939.69 - - Other

- Other, of vegetal origin :

2939.71 - - Cocaine, ecgonine, levometamfetamine, metamfetamine (INN), metamfetamine racemate; salts, esters and other derivatives thereof

2939.79 - - Other

2939.80 - Other

These alkaloids are complex organic bases; they have a strong physiological action. Some are obtained by synthesis. They are all more or less poisonous.

This heading covers **unmixed** alkaloids and **natural mixtures** of alkaloids (e.g., **veratrine** or the total alkaloids of opium); but deliberate intermixtures or preparations are **excluded**. The heading also **excludes** saps and vegetable extracts, such as dried saps of opium (**heading 13.02**).

This heading includes hydrogenated, dehydrogenated, oxygenated and deoxygenated alkaloid derivatives and, in general, any alkaloid derivative the structure of which is to a large extent the same as that of the natural alkaloid from which it is obtained.

(A) ALKALOIDS OF OPIUM AND THEIR DERIVATIVES; SALTS THEREOF

(1) **Morphine***, present in opium; colourless crystals; a powerful narcotic; very poisonous.

(2) **Dihydromorphine, desomorphine** (INN) (dihydrodeoxymorphine), **hydromorphone** (INN) (dihydromorphinone) and **metopon** (INN) (5-methyldihydromorphinone).

(3) **Diacetylmorphine** (heroin), crystalline white powder; used as a sedative in place of codeine and morphine.

(4) **Ethylmorphine**, crystalline white powder, odourless; used internally as a hypnotic and analgesic, externally as a local anaesthetic.

(5) **Codeine** (methylmorphine, monomethyl ether of morphine). Present in opium together with morphine. Crystals; used as a sedative in replacement of morphine.

(6) **Dihydrocodeine** (INN), **hydrocodone** (INN) (dihydrocodeinone), **oxycodone** (INN) (dihydrohydroxycodeinone).

(7) **Narceine**, secondary alkaloid in opium; crystals; a hypnotic and an analgesic.

(8) **Noscapine** (INN) (narcotine), secondary alkaloid in opium; crystals; less potent than morphine and only slightly toxic.

(9) **Cotarnine and hydrocotarnine**, derived from narcotine.

(10) **Papaverine**, secondary alkaloid in opium; crystals; narcotic and sedative action, but less intense than that of morphine.

(11) **Ethaverine hydrochloride** (INNM)(1-(3,4-diethoxybenzyl)-6,7-diethoxyisoquinoline hydrochloride).

(12) **Thebaine**, secondary alkaloid in opium; crystals; odourless; toxic.

(13) **Concentrates of poppy straw**. A natural mixture of alkaloids obtained from parts of the poppy plant (*Papaver somniferum*) by extraction, followed by purification, and containing not less than 50 % by weight of alkaloids.

Derivatives of the alkaloids of opium are classified in this heading provided they retain the epoxy-bridged morphine structure, whether or not hydrogenated.

(B) ALKALOIDS OF CINCHONA AND THEIR DERIVATIVES; SALTS THEREOF

(1) **Quinine***, present in the bark of various plants of the *Cinchona* genus, particularly *Cinchona officinalis*, *Cinchona calisaya* and *Cinchona succirubra*. Crystalline white powder. Quinine and its salts have a paralysing effect on the protoplasm of protozoa present in the blood, so they are used as febrifuges (antipyretics) and antimalarials.

(2) **Quinidine**. Contained in the bark of plants of the *Cinchona* genus. Crystals; may be extracted from the mother-liquors of quinine sulphate.

(3) **Cinchonine**, ranks second in importance to quinine among the alkaloids contained in *Cinchona* bark; crystals.

(4) **Cinchonidine**, found in *Cinchona* bark; crystals.

(5) **Quinine tannate**.

(C) CAFFEINE AND ITS SALTS*

Caffeine, extracted from coffee beans, tea and cola nuts; or obtained by synthesis. Silky crystals; used in medicine.

(D) EPHEDRINES AND THEIR SALTS

(1) **Ephedrine***, contained in *Ephedra vulgaris* and also obtained synthetically; colourless crystals; used in medicine.

(2) **Methylephedrine**.

(3) **Etafedrine** (INN).

(4) **Norephedrine**.

(5) **Pseudoephedrine** (INN).

(E) THEOPHYLLINE AND AMINOPHYLLINE (THEOPHYLLINE-ETHYLENEDIAMINE) AND THEIR DERIVATIVES; SALTS THEREOF

Theophylline*, present in tea, but is also obtained synthetically. Crystals, often used as a diuretic, as is also aminophylline (theophylline-ethylenediamine).

(F) ALKALOIDS OF RYE ERGOT AND THEIR DERIVATIVES; SALTS THEREOF

(1) **Ergometrine** (INN) (9,10-didehydro-N-[(S)-2-hydroxy-1-methylethyl]-6-methylergoline-8β-carboxamide) (ergonovine). Tetrahedral or fine needle crystals. Used as an oxytocic and as a precursor in the production of lysergide (INN) (see the list of precursors at the end of Chapter 29). An important derivative is ergometrine maleate; this is also known as ergonovine maleate.

(2) **Ergotamine** (INN) (12'-hydroxy-2'-methyl-5'α-(phenylmethyl) ergotaman-3',6',18-trione). Used as a vasoconstrictor and as a precursor in the production of lysergide (INN) (see the list of precursors at the end of Chapter 29). Its principal derivatives include ergotamine succinate and ergotamine tartrate.

(3) **Lysergic acid** (9,10-didehydro-6-methylergoline-8-carboxylic acid). Prepared from the alkaline hydrolysis of ergot alkaloids. Also produced from *Claviceps paspali*. Crystals are in the form of hexagonal plates or scales. Used as a psychomimetic and as a precursor in the production of lysergide (INN) (see list of precursors at the end of Chapter 29).

(4) Other **ergot alkaloids**, e.g., ergosine, ergocristine, ergocryptine, ergocornine and methylergometrine.

(G) NICOTINE AND ITS SALTS

Nicotine*, alkaloid present in tobacco leaves; can also be obtained by synthesis. Colourless liquid which turns brown when exposed to air; has a characteristic, penetrating odour. A strong base, toxic, forms crystalline salts; used as a fungicide and insecticide for plants.

(H) OTHER VEGETABLE ALKALOIDS AND THEIR DERIVATIVES AND SALTS

(1) **Arecoline**, alkaloid present in betel-nut (areca-nut).

(2) **Aconitine**, one of the most violent poisons known; extracted from the dried roots of *Aconitus napellus*. Used in medicine as a powerful sedative.

(3) **Physostigmine** (eserine). Occurs in Calabar-beans; colourless crystals which turn reddish-yellow when exposed to air; used in medicine.

(4) **Pilocarpine**, principal alkaloid in *Pilocarpus jaborandi*; colourless mass which turns brown when exposed to air. Pilocarpine and its salts are used in medicine (to provoke perspiration) and by oculists; also used in the preparation of hair-growing lotions.

(5) **Sparteine**, alkaloid present in broom; colourless liquid. Sparteine sulphate is used as a heart stimulant.

(6) **Atropine**, obtained chiefly from *Datura stramonium*; also obtained synthetically; crystals; a violent poison which dilates the pupil of the eye.

(7) **Homatropine**, colourless crystals; it has the same chemical and physiological action as atropine.

(8) **Hyoscyamine**, the principal alkaloid present in *Atropa belladonna* and in numerous plants of the *Hyoscyamus* genus. Colourless crystals; highly toxic. Its salts (e.g., the sulphate and hydrobromide) are used in medicine.

(9) **Scopolamine** (hyoscine), present in many plants of the *Datura* genus; colourless syrupy liquid or colourless crystals. Its salts (e.g., the hydrobromide and the sulphate) are crystalline; used in medicine.

(10) **Colchicine**, found in the plant *Colchicum autumnale*. Gummy mass, yellow powder, crystals or flakes; used in medicine; very toxic.

(11) **Veratrine**, a natural mixture of alkaloids extracted from sabadilla seeds; amorphous white powder; hygroscopic, irritant and highly sternutatory; toxic; used in medicine.

(12) **Cevadine**, corresponds to crystallised veratrine.

(13) **Cocaine**, crystals; extracted from the leaves of several varieties of coca, especially *Erythroxylum coca*; also obtained synthetically. The crude cocaine on the market is never pure, but contains from 80 % to 94 % of cocaine; in that form, it remains classified here. The aqueous solution of cocaine gives an alkaline reaction; it forms numerous salts; a powerful anaesthetic.

(14) **Emetine**, present in the roots of *Uragoga ipecacuanha*. Amorphous white powder which turns yellow when exposed to light; used as an expectorant and as an emetic; its salts are used against amoebean dysentery.

(15) **Strychnine**, extracted from various plants of the *Strychnos* genus (nux vomica, St. Ignatius' beans). Silky crystals; a violent poison. Forms crystalline salts, used in medicine.

(16) **Theobromine**, extracted from cocoa and also obtained synthetically. Crystalline white powder, used in medicine as a diuretic and heart stimulant.

(17) **Piperine**, extracted from the *Piper nigrum*; crystals.

(18) **Coniine**, present in the conium (hemlock), and also obtained synthetically. Colourless oily liquid with a penetrating odour; violent poison; used in medicine.

(19) **Curarine**, extracted from curare; used in medicine.

(20) **Porphyrine** (alkaloid).

(21) **Tomatine**.

(22) **Alkaloid tannates** (chelidonine tannate, colchicine tannate, pelletierine tannate, etc.).

(23) **Hydrastine**.

(24) **Hydrastinine**.

(25) **Hydrohydrastinine**.

(26) **Oxohydrastinine**.

(27) **Tropine** (tropan-3-ol).

(28) **Tropinone**.

(29) **Cephaeline**.

(30) **Metamfetamine** (INN) (methamphetamine, N-methylamphetamine, deoxyephedrine, 2-methylamino-1-phenylpropane).

(IJ) OTHER ALKALOIDS OF NON VEGETAL ORIGIN

Non vegetal alkaloids are found in certain types of fungi, such as psilocybin in the fungus of the genus Psilocybe, and in animals, such as bufotenin in the skin of some toads. Many marine organisms also contain alkaloids.

(1) **Fungal Alkaloids** : Viridicatin* (*Penicillium viridactum*); Rugulovasine A (*penicillium alkaloid*), sporidesmin A (a toxin which causes pithomycotoxicosis in animals); cytochalasin b; teolocidin B4 (indole alkaloid tumor promotor); penitrem D (tremorgenic mycotoxin); roquefortine (blue cheese).

(2) **Animal Alkaloids** : Histrinocotoxin* (South American poison dart frog spiro piperidine); samandarine; epabitidine; Castoramine and muscopyridine (isolated from the musk deer and the Canadian beaver).

(3) **Insect Alkaloids** : Coccinelline* (beetle); pyrazine; danaidone (African Monarch butterfly pheromone); glomerine (European millipede); epilachnene (Mexican bean beetle azamacrolide); subcoccinella 24-punctata (spotted ladybird).

(4) **Marine Alkaloids** : Varacin* (sea squirt); manzamine (Okinawan sponge); convolutamine D (moss animal); tetrodotoxin (Japanese puffer fish); Eudistomin (isolated mainly from marine tunicates of the genus *Eudistoma).*

(5) **Bacterial Alkaloids :** Very rare in nature. Procyanine*.

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Certain substances of this heading, which are regarded as narcotic drugs or as psychotropic substances under international instruments, are indicated in the list appearing at the end of Chapter 29.