Review Article

A review on animal-based homoeopathic drugs and their applications in biomedicine

Bibaswan Biswas[1]*, E. N. Sundaram[1], Shyaga Jhansi[1], Satish Patel[1], Anil Khurana[2], Raj K. Manchanda[2]

[1]Drug Standardisation Unit (H), Central Council for Research in Homoeopathy, Hyderabad, Telangana, [2]Central Council for Research in Homoeopathy, New Delhi, India

Abstract

Homoeopathy is one of the most well-practiced medical systems in the world. In Homoeopathy, like all other natural sources, animal and their secretions have been widely used. However, unlike other natural sources of homoeopathic drugs, for example, plants and chemicals, the collection and preparation of animal-based drugs are extremely challenging, especially for drugs from exotic animals. Considering the challenges, we envision that a review regarding the animal-based therapeutics, used in Homoeopathy, may be useful. Our review, consistently has found that the discoveries of the modern biomedicine agree with the reports from the homoeopathic literature. In many cases, the recent biomedical and medicinal chemistry research aptly justifies the findings of the old homoeopathic literature. Even though there are many animal-based homoeopathic drugs, this review will focus only on those drugs which are included in Essential Drugs List of Homoeopathy. We believe this article will not only be beneficial towards homoeopathic community but also may provide needed information regarding homoeopathic findings for future biomedical research.

Keywords: Animal-based drugs, Biomedicine, Homoeopathy, Sarcodes

Introduction

Homoeopathic system of medicine is the second largest medical system in the world. Homoeopathic medicines are prepared from wide range of natural sources such as plants, chemicals, minerals, microbes and animals. Homoeopathic medicines prepared from animals' venoms, secretions and fluids etc., [Table 1] have special place in the homoeopathic pharmacy. The quality, safety and therapeutic efficacy of animal-based drugs chiefly depend on their genuineness. The crude drugs from animal sources remain questionable for their quality, especially when they are procured commercially from trade due to adulteration, substitution and inappropriate storage conditions. Therefore, it is an essential aspect to check the current nomenclatures, diagnostic specifications, identification and authentication of source materials of raw drugs, testing and preparation methods of medicines, etc., according to modern scientific validation on regular basis.

However, there are many challenges associated with identification, authentication and collection of source materials for production of animal-based drugs; for example, medicines procured from endangered species, those bred in captivity and sometimes dangerous to handle. To overcome these challenges, it is necessary to undertake in-depth study of the chemical constituents of the drugs, originated from animals. This is particularly important as this not only will unravel the origin of their bioactivities of those drugs but also will pave the path of the synthesis of the therapeutically relevant chemical constituents to successfully substitute the existing formulation in case of the unavailability of the natural sources.

In Homoeopathy, there are numerous drugs. Considering their necessity for public health, Ministry of AYUSH, Government of India has listed a number of drugs under the essential drug list (EDL).[1(i)] Few of the aforementioned list are of animal origin. We here review those drugs. Thus, even though Table 1 has covered almost all animal-based homoeopathic drugs, we envisioned that discussion of the drugs in EDL will largely

Access this article online

Quick Response Code:

Website: www.ijrh.org

DOI: 10.4103/ijrh.ijrh_20_19

***Address for correspondence:** Dr. Bibaswan Biswas, Drug Standardisation Unit (H), OUB-32, Vikrampuri, Road No. 4, Habsiguda, Hyderabad - 500 007, Telangana, India.
E-mail: bibaswanbiswas@yahoo.co.in

Received: 08.03.2019; **Accepted:** 11.09.2019

How to cite this article: Biswas B, Sundaram EN, Jhansi S, Patel S, Khurana A, Manchanda RK. A review on animal-based homoeopathic drugs and their applications in biomedicine. Indian J Res Homoeopathy 2019;13:159-76.

Table 1: Animal-based homoeopathic drugs

Name of drugs	Name of animal source material
	Invertebrates
Badiaga	Calcispongiae: Fresh water sponge (skeleton)
Spongia tosta	Common sponge (skeleton)
Medusa	Jelly fish (whole living animal)
Physalia	Portuguese man-of-war (whole living animal)
Corallium rubrum	Red coral (skeleton)
Sanguisuga	Hirudo, the leech (whole living animal)
Helix tosta	Toasted snail (whole living animal)
Murex purpurea	Purple-fish (juices)
Calcarea calcinata	Calcinated oyster shell (shell)
Sepia	Cuttlefish (juice)
Asterias rubens	Star-fish (whole living animal)
Armadillo officinalis	Sow bug, sow louse (whole dried animal)
Astacus fluviatilis	Crawfish or river crab (whole living animal)
Homarus	Lobster (digestive fluid)
Limuluscyclops	King crab (blood)
Scolopendra	Centipede (whole living animal)
Aranea diadema	The cross spider (whole living animal)
Aranea scinencia	Grey spider (whole living animal)
Aranearum tela	Black spider (cobweb)
Araneinum	Juice of greasy spider Aranea scinencia
Buthus australis	Algerian scorpion (venum)
Enturoides elegans	Scorpion (poison)
Latrodectus katipo	Poison spider (whole living animal)
Latrodectus mactans	Black widow spider (whole living animal)
Mygale lasiodora	Black Cuban spider (whole living animal)
Scorpio europus	Scorpion (whole living animal)
Tarentula cubensis	Cuban spider (whole living animal)
Tarentula hispania	Spanish spider (whole living animal)
Theridion curassavicum	Orange spider (whole living animal)
Trombidium	A parasite found upon common house fly
Apis mellifica	Honeybee (whole living animal)
Apium virus	Honeybee (poison)
Blatta americana	American cockroach (whole living animal)
Blatta orientalis	Indian cockroach (whole living animal)
Bombyx	Caterpillars (whole living animal)
Cantharis	Spanish fly (whole dried animal)
Cimexacanthia	Bedbug (whole living animal)
Coccinella septempunctata	Ladybird beetle (whole living animal)
Coccus cacti	Cochineal insect (whole dried animal)
Culex musca	Culex mosquito (whole living animal)
Doryphora	Colorado beetle (whole living animal)
Pediculus capitis	Head louse (whole living animal)
Formica rufa	The ant (whole living animal)
Pulex irritants	Common flea (whole living animal)
Vespa crabro	Wasp, European hornet (whole living animal)
	Vertebrates
Serum anguillar ichthyotoxin	Eel serum (serum)
Gadus morrhua	Cod (first cervical vertebra)
Oleum jecoris aselli	Cod-liver oil (oil)
Pyrarara	River fish (nosode) (whole living animal)
Bufo rana	Common toad (poison)
Bufo sahytiensis	Brazilian toad

Contd...

Table 1: Contd...

Name of drugs	Name of animal source material
	Vertebrates
Amphisbaena vermicularis	Snake-like lizard (poison)
Heloderma	Gila monster (poison)
Lacerta agilis	Green lizard (whole dried animal)
Bothrops lanceolatus	Yellow viper (poison)
Cenchris contortrix	Copperhead snake (venom)
Crotalus horridus	North American rattlesnake (venom)
Bungarus fasciatus	Banded Krait (poison)
Chelone	Snake-head or Turtle-head
Crotalus cascavella	Brazilian rattle snake (poison)
Elaps corallinus	Brazilian coral snake (poison)
Lachesis trigonocephalus	Surukuku snake (venom)
Naja tripudians	Indian hooded snake (venom)
Toxicophis	Moccasin snake (venom)
Vipera	Common viper (venom)
	Aves
Calcarea ovi testae	Egg-shell (shell)
Ovi gallinae pellicula	Hen's egg (fresh membrane of shell)
Carbo animalis	Ox (charred hide)
Castor equi	Horse (thumbnail)
Castoreum	Beaver (secretion found in pre-putial sacs)
Feltauri	Ox (gall)
Ingluvin	Fowl (gizzard)
Mephatis	Skunk (liquid contained in the anal gland)
Moschus	Musk deer (inspissated secretion contained in pre-putial follicles)
Cervus brazilliens	Brazilian deer (fresh hide)
Pulmo vulpis	Wolf or fox (fresh lung)
Sphingurus	Tree porcupine (prickles)
Vulpis heper	Fox (liver)
	Lacs (milk and milk products)
Koumyss	Fermentation from ass's milk
Lac caninum	Bitch's milk
Lac defloratum	Skimmed cow's milk
Lac felinum	Cat's milk
Lac vaccinifloc	Milk cream
Lac vaccinum	Cow's milk
Lac vaccinum coagulatum	Curds
	D. Sarcodes
Whole endocrine glands	
Thyroidinum	Thyroid glands of sheep or calf
Pituitarinum posterium	Post-position of pituitary gland of sheep
Hormones	
Adrenalin (Epinephrine)	Hormone produced by adrenal gland/synthetic salt of adrenalin hydrocloricum
Cortisone	Hormone secreted by cortex of adrenal gland of man
Cortisone acetate	Cortisone monoacetate
Adrenocorticotrophin	Hormone produced by pituitary gland
Insulin	Hormone produced by pancreas
Extracts	
Orchitinum	Testicular extract
Oophorium	Ovarian of cow, sheep, pig
Pancreatium	Pancreas of beef containing digestive enzyme
Corpus luteum	Ovaries of pregnant animals

Contd...

Table 1: Contd...

Name of drugs	Name of animal source material
	Other sarcodes
Miscellaneous	
Fel tauri	Fresh ox-gall
Vulpistel	Fresh fox-gall
Parotidinum	Parotid gland
Cholesterinum	Main constituents of gall bladder and bile
Mammary gland	Glands of cow and sheep
Placenta	Extracts of placenta
Spleen	Extracts of spleen
Ingluvin	Gizzard of fowl
Lecithin	Yolk of egg and animal brain

serve the purpose of the review. The animal-based EDL drugs which will be discussed in detail are listed in Table 2.

This review essentially includes the exploration and characterisation of bioactive chemicals present in those medicines of animal origin. In this article, we discussed the research related to the therapeutic uses of the certain widely administrated animal-based homoeopathic drugs (under EDL) as well as their medicinally relevant ingredients. Furthermore, we seek to address the issue of unavailability of the raw drugs by replacing them with synthetic sources. We hope this review article will be beneficial towards the research not only related to Homoeopathy but also to overall biomedical research.

Table 2: Animal-based homoeopathic drugs under essential drug list

Homoeopathy drug	Description
Apis mellifica	Honey (whole live bee)
Badiaga	Dried fresh water sponge
Blatta orientalis	Whole insect (crushed)
Bufo rana	Poisonous venom from dorsal gland of common toad
Cantharis	Dried whole Spanish fly
Carbo animalis	Ox-hide (charred hide)
Crotalus horridus	Venom of North American rattle snake
Eel serum	Eel serum
Formica rufa	Red wood ant (crushed whole live ant)
Lac caninum	Bitch milk
Lac defloratum	Skimmed cow milk
Lachesis	Venom of Surukuku snake
Mephitis	Skunk (liquid contained in the anal gland)
Murex purpurea	Sea snail (juice found in sac situated between heart and liver)
Mygale	Black Cuban spider (live whole spider)
Naja tripudians	Indian cobra (venom)
Sepia	Cuttlefish (dried liquid contained in the ink bag)
Spongia tosta	Marine sponge (common roasted sponge)
Tarentula cubensis	Cuban spider (live whole spider)
Tarentula hispana	Spanish spider (live whole spider)
Trombidium	Mite (live whole animal)
Thyroidinum	Domestic sheep (dried whole thyroid glands)
Vipera	Russell's viper (venom)

Apis Mellifica

Homoeopathic use

The homoeopathic formulation consists of whole live European honey bees *Apis mellifica* Linn. (Synonym: *Apis mellifica*; Family: Apidae). In Homoeopathy, Dr. C. W. Wolf and Dr. William Boericke, M.D. reported several uses of *Apis mellifica*.[1(ii),2] Dr. William Boericke reported the use of *Apis mellifica* in physiological and psychological ailments. The ailments include burning while urination, involuntary passage of stool on every motion, swollen fiery red tonsils, vertigo with sneezing, headache, indifference, apathy and stupor alternating with erotic mania.[2] Overall, physiological effects of the drug chiefly deal with external as well as internal inflammation.[2] Rev. Brauns, a clergyman of Thuringia, was first to report honeybee venom in their pure form as a therapeutic agent. He eventually published his results regarding the animal trials. E. E. Marcy, in Theory and Practice, published his results regarding the medical usage of dried and powdered bees. Recognising the immense therapeutic activity of bee venom, the clinical findings were reported in the form of a monograph in the *Amerikanische Arzneiprüfungen* (American Proving), Vol. I, p. 171-422.

Research in modern biomedicine

Recent scientific study related to the bioactivity of venoms has explored the potential medicinal usage of bee venom in modern medicines. Owen detected the presence of Serotonin, 5-hydroxytryptamine, an essential human neurotransmitter in bee venom.[3] Their further study proved that serotonin is a fundamental component of the venom.[4] Lin's work indicated that bee venom possesses anticoagulant properties.[5] The main toxin present in bee venom is Melittin, a small peptide [Figure 1]. It exhibits numerous bioactivities.[6,7] Its anticancer activity was reported by Song and Hong. They found that melittin as well as the bee venom inhibited the growth of SKOV3 and PA-1 ovarian cancer cells.[8] Beside melittin, the constituents of bee venom include number of bioactive peptides, enzymes and small molecules.[9,10] New findings have also confirmed the use of bee venom as antinociceptive

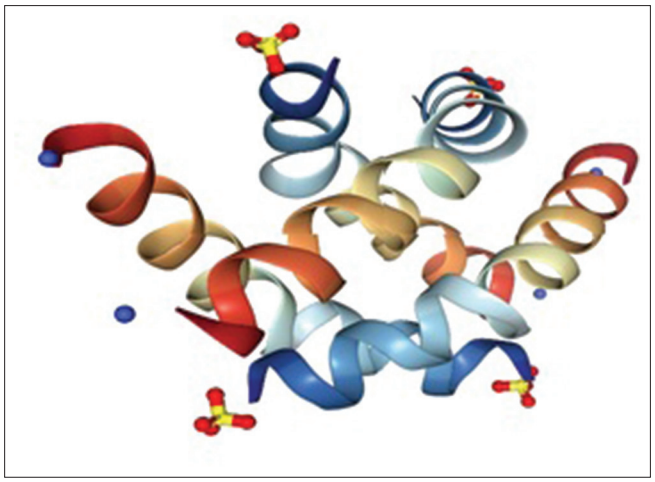

Figure 1: Structure of Melittin bee venom molecules

agent.[11] The report suggested that the origin of the activity of the venom is due to its anti-inflammatory activity.[12] Bee venom also shows antibacterial activity towards Gram-positive and Gram-negative bacteria.[13] It shows activity against penicillin-resistant strain of *Staphylococcus aureus*.[13] Bee venom is also known to show anti-HIV, at large antiviral activities.[14] It also shows anticancer activities chiefly via apoptosis.[15,16]

Cockroaches

Homoeopathic use

Cockroaches are considered as one of the most abundant pests in the world and survived many mass extinctions. Until recently, the therapeutic effects of the cockroaches have not been recognised by the scientific community. However, this is not the case with the homoeopathic community.

There are many medicinal properties reported with cockroaches, *Blatta orientalis* and *Blatta americana* in Homoeopathy. These two species are native to two different geographical area as indicated in their species name. *B. orientalis* is chiefly used to treat asthma while *Blatta Americana is used for* oedema.[17-20]

Research in modern biomedicine

The beneficial effects of homoeopathic drug – *B. orientalis* which is under EDL has been explored by recent biomedical communities.[21,22] The study has shown antibacterial activity of *B. orientalis* hemolymph against five bacterial strains. The bacterial strains are *Proteus mirabilis, Escherichia coli, Salmonella typhi, Staphylococcus aureus* and *Pseudomonas aeruginosa*. Highest activity was observed with *E. coli*. Moderate activity was seen against *P. mirabilis*, *S. aureus* and *P. aeruginosa*. The lowest activity was observed against *S. typhi*. The SDS-PAGE analysis showed bands at 18 kDa, 30 kDa and 66 kDa. Fourier transform infrared (FTIR) showed peaks from 3299 cm^{-1} to 546 cm^{-1}. The FTIR studies suggest the presence of cyclopeptane, aromatic compounds, triazoles, secondary sulphonamide, bromo compounds, secondary amide, vinyl halides, thiophenes, aldehyde group, methylene compound and sulphonic acid groups. The authors suggested that the presence of these functional groups may lead to its antibacterial effects. Considering the potential of these drugs, chemical analysis of the drugs has been carried out.[23] The study provided the physicochemical standards for the homoeopathic formulation of the drug. In the work, the HPTLC data showed many spots indicating chemical complexity of the aqueous ethanolic extract of the drug.

Sponge

Homoeopathic use

Sponges have been extensively used in Homoeopathy. In Homoeopathy, both fresh water and marine sponges have been used to treat numerous ailments. The homoeopathic drug derived from fresh water sponge *Spongilla lacustris* Linn (Family: Spongillidae; Synonyms: *Spongilla fluviatilis*) is called *Badiaga*, while the *Spongia tosta* is made from marine sponge *Spongia officinalis* Linn. (Family: Spongiidae; Synonyms: *Euspongia officinalis*).[24,25] *Badiaga* has been widely used by homoeopathic practitioners. Dr. T.F Allen described the use of *Badiaga* in physiological ailments.[26] For example, he reported the use of the drug, especially for headache. Beside headache, it has also been used as overall pain reliever. Interestingly, he mentioned the use of the drug for Bubo. Dr. C. Hering reported its usage in inflammatory conditions of eye, throat and head.[27] J.H. Clarke reported that the drug can be employed for breast cancer.[28] Similar to *Badiaga*, *Spongia tosta* has also been extensively used by homoeopathic practitioner around the world. According to Dr. James Tyler Kent, this particular drug is especially beneficial for thyroid and cardiac diseases.[29] His report has been supported by the writings of Dr. H.C. Allen, Dr. E.A. Neatby and Dr. William Boericke.[30-32] Interestingly, Chinese traditional medicine reports the use of sponge in goitre.[33]

Research in modern biomedicine

Homoeopathic clinical observations have been supported by recent discovery of anti-inflammatory agents from sponges. There are many such agents which have been isolated, characterised and their activities have been evaluated from sponges. Chemically, those agents can broadly be classified into four classes: terpenes, steroids, nitrogenous, octahydroindenes and glycolipids. Among them, terpenes is the most important, as many sponge-originated terpenes (>20) have shown anti-inflammatory activities (1, 2, 3, 4, 5, 6) [Figure 2].[34] Interestingly, the extracted anti-inflammatory agents additionally show antiallergic and anticancer activities (e.g., avarol and avarone).[35] These findings are in agreement with the Homoeopathy literatures.[28] Manoalide shows antibiotic, analgesic and anticancer effects.[36,39] Ilimaquinone shows anticancer activities [Figure 2].[38] Plakotenin is reported to exhibit cytotoxicity, a potential anticancer agent [Figure 2].[39] Topsentin shows antitumour and antiviral activities [Figure 2].[40]

Similarly, Spongilipid tetracosan-1-ol-1-*O*-*β*-*D*-gluco-pyranoside, isolated from fresh water sponge shows cytotoxic activities.[41] *S. lacustris* powder extract in 3% hydrogen

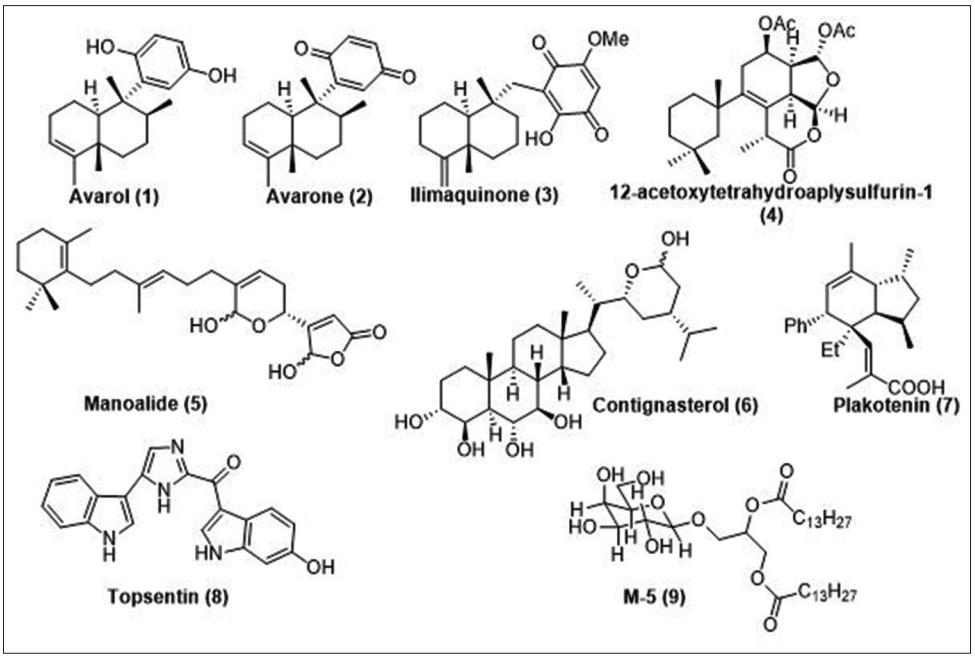

Figure 2: Sponge-based bioactive molecules: A

peroxide solution has also been used to treat acne vulgaris.[42] A number of polyenoic fatty acids, having anti-microbial properties, have also been isolated from fresh water sponge. The studies show that the secondary metabolites from sponge exhibit antibacterial, antimicrobial, cytotoxic, antifungal and antibacterial effects. Compared to antibacterial agents, antiviral agents are rare. However, there are a number of antiviral compounds which have been isolated from marine sponge. The findings are quite important as Dragmacidin F which shows anti-HIV properties [Figure 3].[43] Overall, modern biomedical science recognises sponges as one of the most important sources for bioactive natural products.

Considering the immense potential of marine sponges and reported homoeopathic literature, researchers explored *Spongia tosta* formulation similar to Homoeopathy in *in vitro study*.[44] Methanolic extract of *Spongia tosta* exhibits free radical scavenging activity and cytotoxicity against breast cancer cell line MCF 7. Encouraged by their result, the same group further explored the cytotoxic effects of ethanolic extract of *Spongia tosta* further.[44] They found that the drug shows anticancer activity against liver carcinoma, African green monkey kidney cell line, colon cancer cell line and lung cancer cell line. In accordance, the homoeopathic literatures' sponges also are found to exhibit antitumor, cardiovascular and muscle-relaxing activities.[45]

Eryloside F, a penasterol disaccharide isolated from sponge, is a thrombin receptor antagonist [Figure 4].[46] Another compound, Cyclotheonamide A inhibits serine protease [Figure 4].[47] Halichlorine, a cyclic aza polyketide, is a VCAM 1* inhibitor [Figure 4].[48] All these findings strongly suggest that marine sponge likely to possess very high level of efficacy towards cardiovascular diseases. Interestingly, sponges are known to

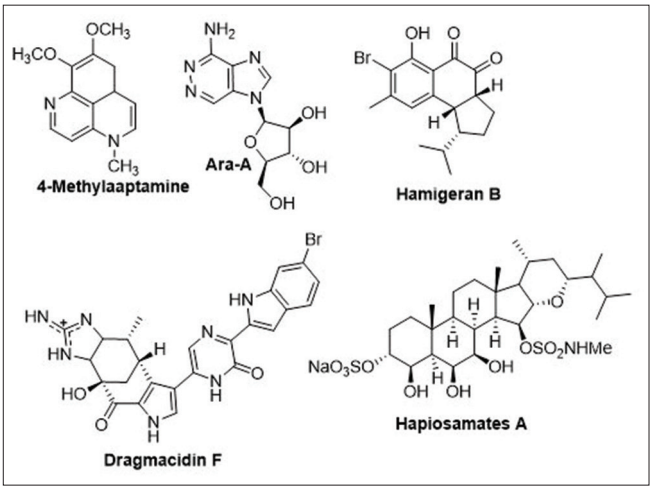

Figure 3: Sponge-based bioactive molecules: B

contain muscle relaxants. For example, Xestospongin C and S1319 [Figure 5].[49] Beside muscle-relaxing effect, S1319 exhibits bronchodilation property.[50]

Bufo Rana

Homoeopathic use

Bufo Rana is a homoeopathic remedy, made from the poison secreted from the dorsal glands of a toad, called *Bufo bufo* Linn. (Family: Bufonidae; Synonyms: *Rana bufo* Linn., *Bufo vulgaris* Lau.) As this poison is part of their defence mechanism, it can be extracted by threatening or irritating the toad. In 1879, Dr A. Cowperthwaite, of Iowa, in his *Materia Medica* reported the usefulness of the drug for ailments of cerebrospinal system. Dr. Henry Clarke reported the use of the drug to treat dropsy. However, this drug has mostly used

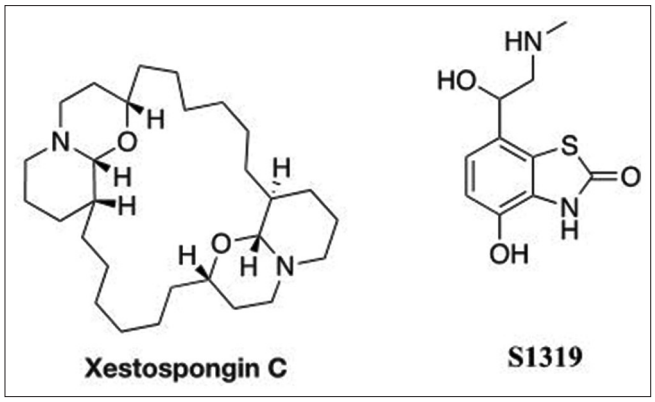

Figure 4: Sponge-based bioactive molecules: C

to treat epilepsy. Dr. Holocombe recorded a case history in detail where *Bufo rana* was successfully administered to treat epilepsy.[51] Beside neurological disorders, this drug is known to cure a number of diseases, for example, cancer, stammering, meningitis, heart disorders, gout and skin disorders.[52]

Research in modern biomedicine

The therapeutic values of the toad poison have recently been explored through research in the field of biomedicine with the help of chemical biology. Recent research has isolated and characterises a number of biologically active chemicals from the venom. Interestingly, most of them show considerable neurological effect. The existence of neuroactive compounds in toad venom clearly provides evidence for homoeopathic literature. Toad venom contains serotonin, 5-MeO-DMT, bufalin, bufotenin, norepinephrine, bufagins, epinephrine, bufothionine and bufotalin [Figure 6].[53]

Serotonin chiefly has numerous effects in human body. It reduces depression, regulates anxiety, heals wounds, stimulates nausea, maintains bone health, balances libido and mental stability. 5-MeO-DMT, used as a recreational drug, possesses neurological effect. The effect of bufotenin is similar to that of 5-MeO-DMT. In fact, the mode of action of serotonin, 5-MeO-DMT and bufotenin are similar.[53] Bufalin exhibits *in vitro* antitumor activity against different malignant tumours, including lung carcinoma and hepatocellular.[54,55] Norepinephrine, a toad venom-based compound, has diverse biological activity and arguably one of the most important components of bufotoxins.[56] It acts as a stress hormone, neurotransmitter and vasoconstrictor. Arenobufagin acts as an isoform-specific probe. This can be employed for sensing human sulfotransferase 2A1.[57] Cinobufagin has extensive clinical importance. It could be used to treat cancer, heart failure and pain (analgesic).[58] Marinobufagenin is a vasoconstrictor.[59] Epinephrine is used for cardiac arrest, anaphylaxis and superficial haemorrhage. Inhalation of epinephrine can be administrated to lessen the symptoms of croup.[60]

Sea Snail

Homoeopathic use

Murex purpurea is prepared from juice found in sac situated

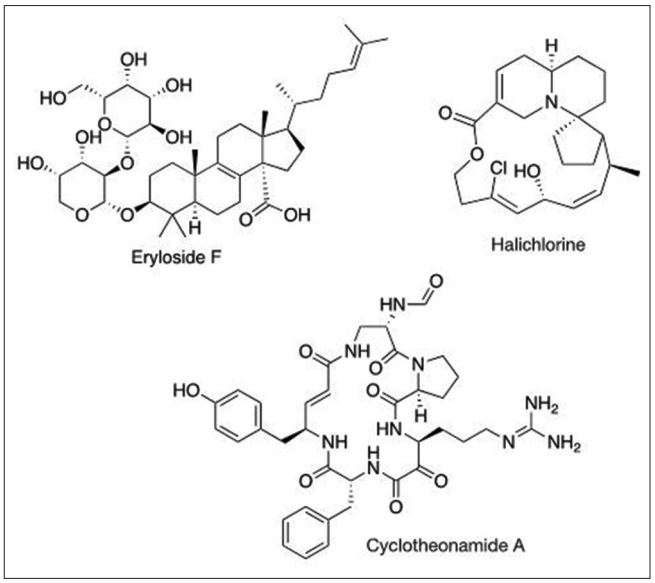

Figure 5: Sponge-based bioactive molecules: D

between heart and liver of sea snail, *Bolinus brandaris* Linn. (Family: Muricidae; Synonyms: *Murex brandaris* Linn., *Haustellum brandaris* Linn.). The shell is usually golden brown with a very long siphonal canal and a rounded body and a rounded and broad body whorl. There are many therapeutic effects documented in Homoeopathy literature.[61] The effects are associated with ailments related to head, stomach, larynx and urinary tract. However, the most important and widely appreciated effect of the drug is its effect on women's health. Both Dr. A. Lippe and J. Hempel reported the effectiveness of Murex purpurea in treating pains of women's genital organs including cancer.[61,62]

Research in modern biomedicine

Recent biomedical research also provides evidences regarding therapeutic properties of Murex purpurea. Benkendorff reported anticancer activity of the drug.[62]

Snails are known to contain large number of biological compounds. As a result, this well-known traditional medicine has been immensely investigated by the modern biomedical communities. In general, the bioactive chemicals coming from snail could be classified into two categories: (a) small molecules and (b) proteins. Both classes show significant bioactivities.

Biliverdin IX, derived a green tetrapyrrolic bile pigment, shows considerable antioxidant and antimutagenic activities [Figure 7]. Its antioxidant effect could be attributed to its ability to act as a peroxyl radical scavenger.[63] It also shows activities towards preventing cardiovascular diseases. Interestingly, this compound also acts as an HIV-1 protease inhibitor.[64] Furthermore, it has also been successfully used in fluorescence imaging.[65] 7-Dehydrocholesterol acts as provitamin-D_3protects skin from ultraviolet rays [Figure 7]. Tetrodotoxin, a neurotoxin, has been studied to combat cancer-related pain [Figure 7].[66] Its effectiveness has been supported by clinical trials. This

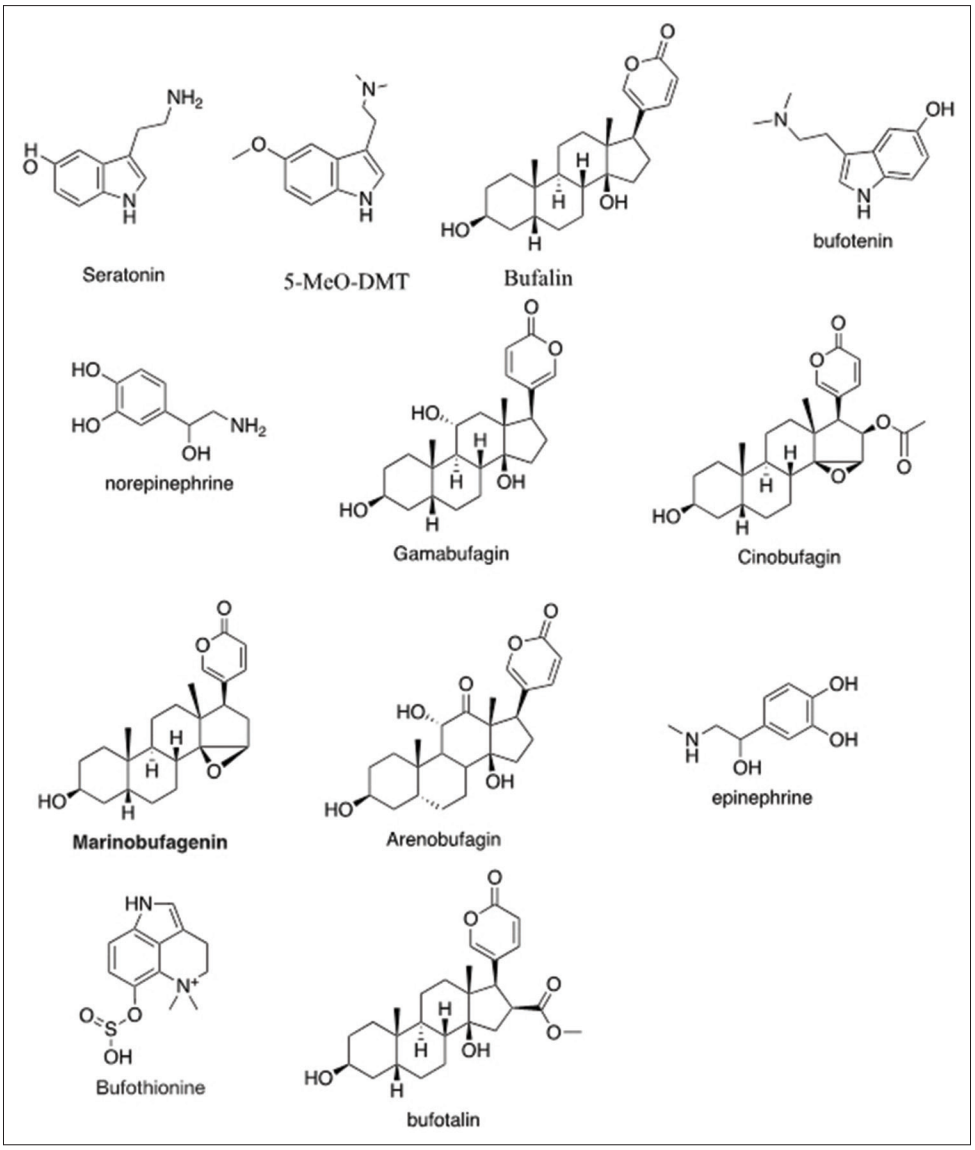

Figure 6: Toad-based bioactive molecules

has also been used to treat migraine. This mode of action is suggested to be associated with TTX-sensitive Na+ channel. Furthermore, it is clinically used to treat headache during heroin withdrawal.[67] Murexine and senecioylcholine exhibit neuromuscular-blocking activities through affecting nicotinic acetylcholine receptors [Figure 7].[68] 6-bromoisatin and structurally related compound impart apoptosis in female reproductive cancer cell selectively [Figure 7].[69] It also shows antipathogenic activity.[68] Acrylylcholine, extracted from snails, show neuromuscular blocking activity, in the hypobranchial gland [Figure 7].[68]

The second class of bioactive compounds from the snails are proteins. Conkunitzin S1, protein isolated from snail, can be used to increase glucose-stimulated insulin secretion via blocking Kv1.7 potassium currents [Figure 8].[70] Ziconotide is a synthetic and non-opioid, analgesic [Figure 8].[71] This has been approved by Food and Drug Administration, USA (FDA) in 2004 under the trade name of Prialt™. This is a structural as well as functional analogue of an ω-conotoxin, isolated from marine snail. This is one of the few examples of nonnarcotic medication to treat chronic and severe pain.[72]

Cantharis

Homoeopathic use

Cantharis, prepared from the insect *Lytta vesicatoria* Linn. (Family: Cantharidae; Synonym: *Cantharis vesicatoria* Linn., *Meloevesicatorius* Linn.) has been extensively used in pain treatment, especially for treating burning pain in ureter, genitals and other organs. The higher potencies have exclusively been administered owing to its extremely high toxicity in concentrated form. The proving has been documented in Lectures on Homoeopathic Materia Medica-James Tyler Kent.[73]

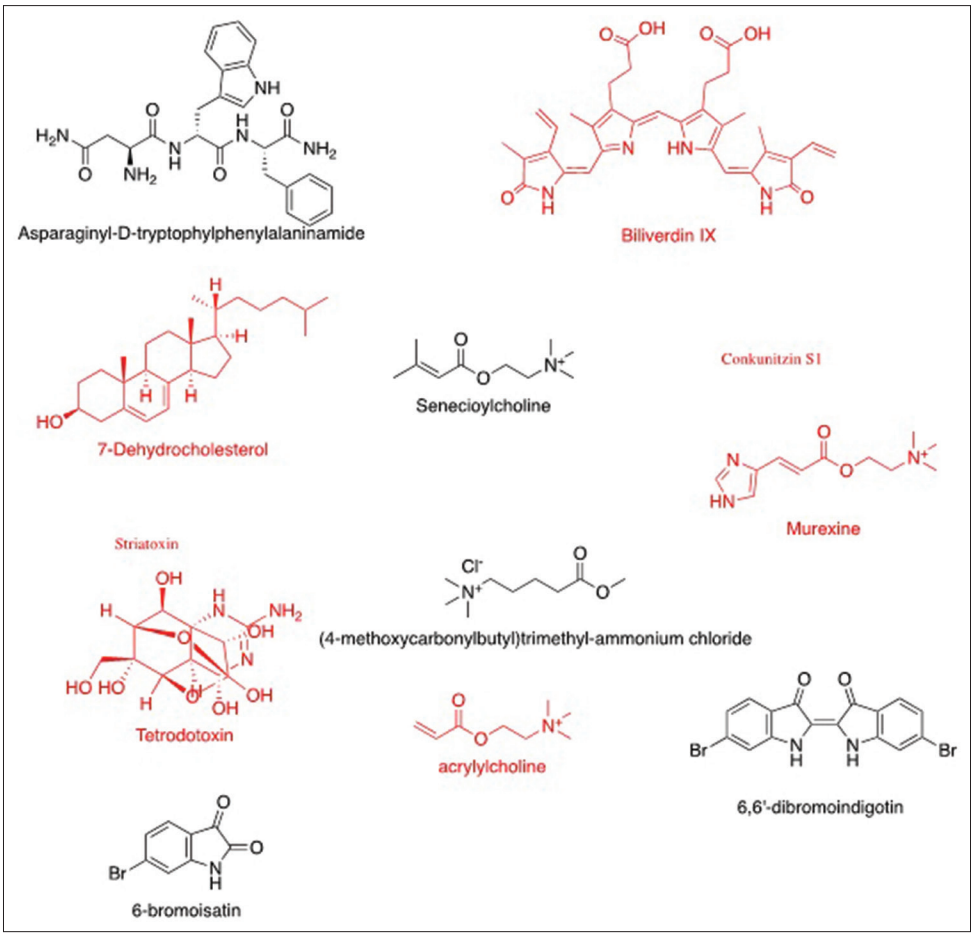

Figure 7: Snail-based bioactive small molecules

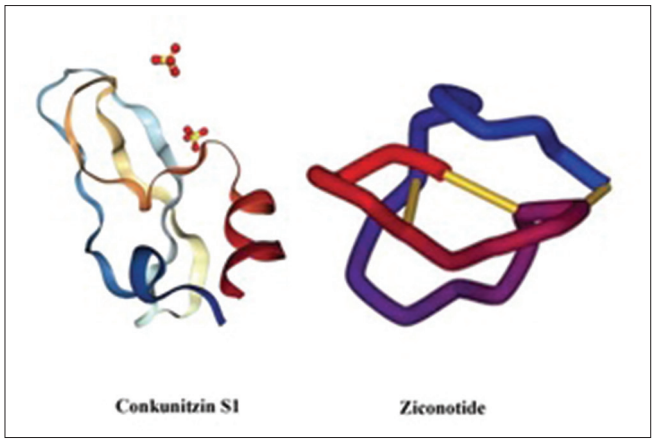

Figure 8: Snail-based bioactive proteins

Research in modern biomedicine

It has widely been used to treat blisters. The active pharmaceutical ingredient present in the drug is cantharidin [Figure 9]. This compound is in Phase 3 of Clinical trial for treatment of molluscum.[74] Beside pain-related usage, the modern biomedicinal research found further bioactivities of cantharidin. Animal trials show the effect of cantharidin as a topical treatment of cutaneous leishmaniasis.[75] Furthermore, it exhibits anticancer activities against malignant tumour cells.

Sepia

Homoeopathic use

Homoeopathic drug *Sepia* is prepared from the ink of *Sepia officinalis* Linn. (Family: Sepiidae; Synonym: *Sepia zebrine* Risso, *Sepia rugosa* Bowdich). There are many usages of the drug in Homoeopathy.[76] However, this drug is particularly used to treat several gynaecological complaints. For example, it is particularly useful to relieve symptoms related to premenstrual syndrome (PMS) and menopause. It also can be used to treat aliments related to ovaries, uterus and vagina. It is particularly helpful to fight against yeast infection during and after pregnancy. Overall, the effect of the drug is pain reliever. This drug is also used to treat digestive problems, especially difficulties associated with fatty foods and dairy products. This is also used for headaches and itchy patches in the skin. It has also been used for exhaustion and poor circulation.

Research in modern biomedicine

The medicinal importance of this drug has also been recognised by modern medical system. Cuttlefish (Sepia) ink has shown numerous promising bioactivities.[77] *S. officinalis* ink shows *in vitro* antioxidant, cytotoxic and analgesic activities.[78] *S. officinalis* ink can photoprotect against blue light-induced apoptosis of human retinal pigment

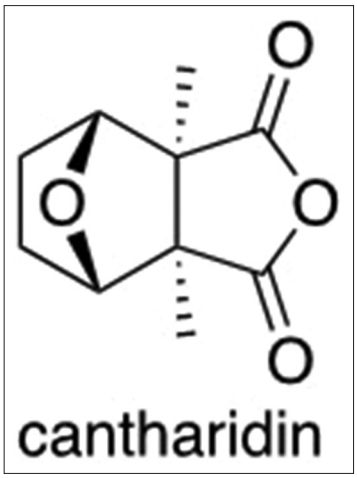

Figure 9: Structure of cantharidin

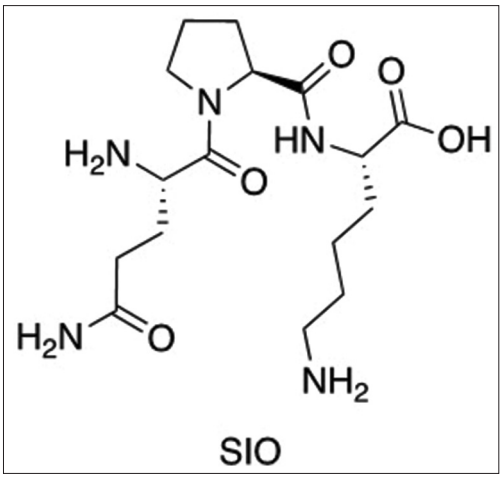

Figure 10: Bioactive sepia ink oligopeptide

epithelium cells.[79] Cuttlefish ink also shows antiretroviral activity.[80] One of the remarkable effects of cuttlefish ink is its radio protective effects on hemopoietic injury.[81] Cephalopod inks in general have been extensively used as anticancer agents. These results are in good agreement with the homoeopathic literatures.[82] Peptidoglycans, one of the components of cuttlefish ink, shows antitumor activities. It is believed to be resulted from the inhibition of embryonic development.[83] Sepia ink oligopeptide (SIO) shows anticancer activity against prostate cancer cell by inducing apoptosis through activation of induction of apoptosis via activation of caspase-3 and elevation of the ratio of Bax/Bcl-2 [Figure 10].[84-87]

Eel Serum

Homoeopathic use

Eel serum prepared from *Anguilla bengalensis* Grey (Family: Anguillidae; Subspecies: *Anguilla benglaensis bengalensis*, *Anguilla bengalensis labiata*) has extensively used in Homoeopathy for kidney diseases. In homoeopathic Materia Medica, William Boericke mentioned the serum as a toxin that can destroy blood globules.[88] It is also mentioned as a medicine used in kidney-related ailments. Dr. Nels Bergman reported the use of this medicine in hypertension as well as kidney diseases.

Research in modern biomedicine and other medical system

This remedy has also been used in other traditional medical system, for example, Fresh blood is consumed to treat general weakness and asthma among Ao tribe of Nagaland, India.[89] The modern medical system has found anticancer activities in eel serum.[90] Eel serum contains atrial natriuretic peptide (ANP) which can act a vasodepressor and is natriuretically-active in rats. This ANP was found to be 100 more potent than that of human ANP.[91] It is quite clear that the recent biomedical findings regarding cardiovascular applications of eel serum are in agreement with the reports in the old homoeopathic remedies.

Snake Venom

Homoeopathic use

There are different kinds of snake venoms such as Vipera, Lachesis, Crotalus horridus and Naja tripudians, which have been used in Homoeopathy. Here, we only discuss about the snake venom-based drugs under EDL. Importantly, each venom possesses different mode of therapeutic usages. *Vipera*, derived from the venom of *Daboia russelii* (Family: Viperidae; Synonyms: Daboia elegans Grey, Vipera daboia Daudin) has been used to treat haemorrhages, senility, premature mental condition, neurasthenia, tongue swelling, varicosis, jaundice, enlargement of liver, epistaxis, phlebitis and goitre.[92] *Lachesis,* produced from the venom of Lachesis *muta* Linn (Family: Viperidae; Synonyms: *Crotalus mutus* Linn., *Lachesis muta muta* Taylor), has been proved to cure small pox. It is one of the most important remedies for hot flushes in menopause syndrome. This is also being used to relieve symptoms associated with PMS. This is also been used in sore throat and ailments associated.[93] This is also used to soothe mental or emotional symptoms. *Lachesis* has profound importance to treat diverse circulatory problems and angina.[94] Interestingly, recent studies also show similar bioactivities.[95] *Crotalus horridus* obtained from the venom of *Crotalus horridus* Linn. (Family: Viperidae; Synonyms: *Crotalus catesbaei* Hemprich) has also been used in Homoeopathy for number of physiological and psychological issues. It is particularly useful treating severe internal intoxication affecting blood and heart.[96] It is also useful for sepsis.[97,98] It is used to cure psychiatric uses, for example, apathy, lethargy and detachment.[99] *Naja tripudians* consists of the venom derived from *Naja naja* Linn.(Family: Elapidae: Synonyms: *Naja tripudians* Merrem, Coluber naja Linn.).

Research in modern biomedicine

This venom usually has pain-relieving and soothing effects on mind.[100] Recent studies also show anti-HIV effects of the snake venom.[101] These medicinal properties of snake venoms have also been explored by biomedical communities.

Cobratoxin present in *Naja naja Linn*. It shows numerous beneficial effects as a painkiller and in conditions like lung cancer, multiple sclerosis [Figure 11].[102-104]

Dilute Russell's viper venom time is an *in vitro* test to detect Lupus anticoagulant [Figure 12].[105] The mode of action is the activation of factor X that converts prothrombin into thrombin in the presence of phospholipid and factor V. Contortrostatin is a snake venom disintegrin. Recently, it has been found that the disintegrin has antitumor and antiangiogenic activities.[106]

Captopril is the earliest FDA-approved drug which was derived from snake venom. This drug is being used for hypertension and cardiac disorders [Figure 13]. This also shows mood elevation in certain patients.[107]

Snake venoms are known to possess anticoagulant activities. For example, Eptifibatide – an approved antiplatelet drug under the glycoprotein IIb/IIIa inhibitor class [Figure 14].[108] This drug is a closed-ring heptapeptide produced from a protein, present in the venom of the rattle snakes. It belongs to the class of peptides that mimics the arginin–glycin–aspartat and reversibly binds to the platelets.

Considering the cytotoxic effect of the snake venoms, their potential as antitumor agents is quite promising. Even though snake venoms' composition are extremely complex, the antitumour activities of the venoms are majorly due to the presence of metalloproteases, serine proteases, phospholipases A2, L-amino acid oxidases, disintegrins and lectins.[106,109-111] Hannalgesin, obtained as the neurotoxin, shows strong analgesic effect without permanent adverse muscular and neurological effect.[112] Snake venom also shows antibacterial effects.[113]

Spider

Homoeopathic use

There are many spiders-based drugs which have been used in Homoeopathy. *Tarentula hispana* prepared from *Lycosa tarantula* Linn. (Family: *Lycosidae*) is used in mostly mental disorders. It is also used in physiological disorders, for example, hyperactivity, ADHD, problem children, headaches, restless leg syndrome, restlessness, ADD, migraines, autism, Parkinson's disease, abscesses and has also shown beneficial effects in a case of anorexia.[114] The medical usages of *Tarentula cubensis* (Family: *Lycosidae*) include treatment of carbuncle, gangrene, intermittent fever of evening exacerbation, diarrhoea, severe stinging and burning pain.[115] Homoeopathic drug, Mygale prepared from *Mygale lasiodora* Linn.(Family: *Antrodiaetidae),* is used in nervousness, prostration and palpitation. It is used to prevent twitching of the facial muscles. It is also used in agitation and involuntary motion of the body. Recent study shows activities against acute aching pain, difficult breathing, bad dream, etc.[116] Recent studies show that spider venoms possess analgesic effects.[117] The venom could potentially be used in stroke treatment.[118]

Research in modern biomedicine

Furthermore, spider venom contains HF-7.[119] This active

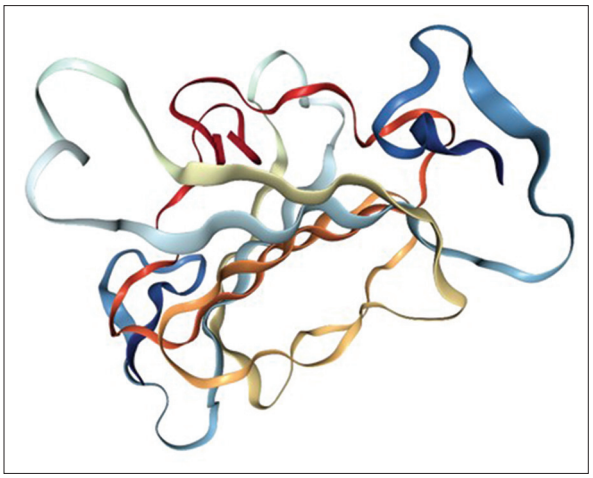

Figure 11: Structure of cobratoxin

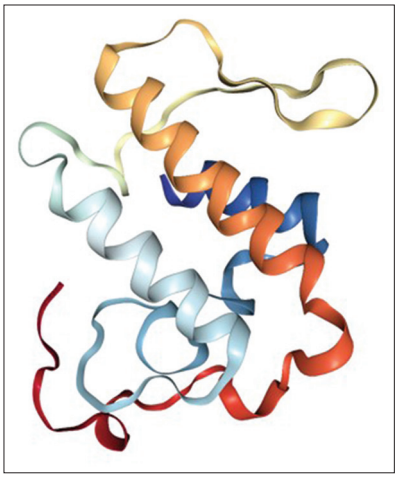

Figure 12: Structure of phospholipase a2 from *Daboia russelii pulchella*

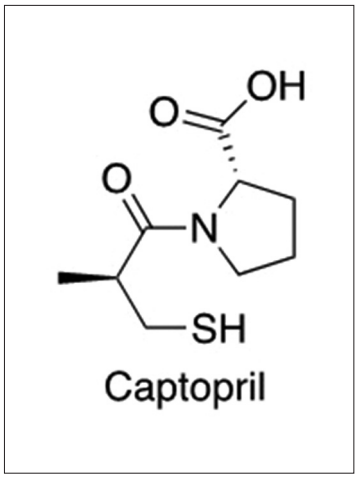

Figure 13: Structure of captopril

ingredient blocks receptors on the nerve cell membranes preventing glutamate production. The arrest of glutamate product ceases the cell death due to oxygen unavailability. It also prevents atrial fibrillation. This is performed by the active protein GsMtx-4.

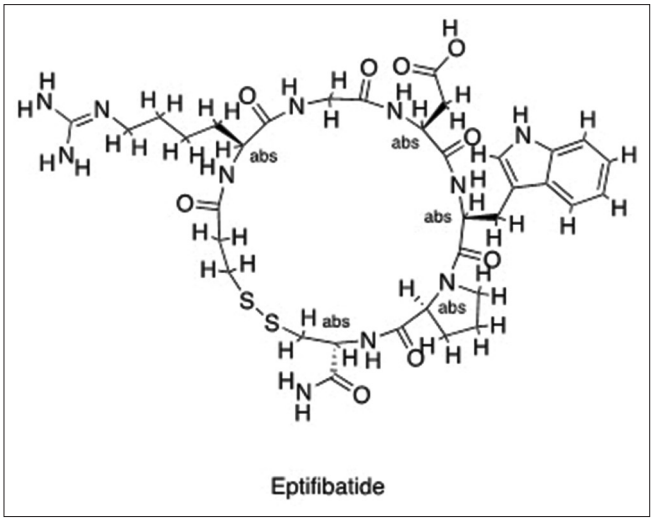

Figure 14: Eptifibatide, an approved antiplatelet drug

Carbo Animalis

Homoeopathic use

The medicine was introduced by Hahnemann. It has been primarily prescribed by him for chronic diseases. He also provided the detailed method of preparation of the drug. The drug was prepared by him by placing a thick piece of ox-hide in-between two hot charcoals burning without flames. The hide was burned till the flame coming out from the hide extinguished. Then, the red hot charred mass was extinguished by pressing with stones from both of the sides. Charred hide contains many chemicals. However, the two principal constituents are carbon and calcium phosphate. Fueter and Schweizer Zeitschrift successfully used it for burnt mole, glandular indurations, goitre and scirrhus. Dürr used human-bone coal for mesenteric atrophy. According to C. Hering, it has effects on mind.[120] Especially, it can be used to treat depressive mood and nervousness in general. It has also been used for ear, nose, eye and throat infections and/or ailments. James Tyler Kent in Homoeopathic Lectures on Materia Medica provided detail regarding the efficacy of the drug.[121] He prescribed the medicine for weakness and anaemia. Interestingly, he mentioned the use if this medicine for cancerous ulcers. His observations regarding treatment of cancerous ulcer is in agreement with the observations by Fueter and Schweizer Zeitschrift. Willam Boericke reported the use of the medicine in a wide variety of ailments, for example, headache, respiratory, skin diseases and uterine cancer. Overall, his observations are in agreement with the observation of Hering and Kent.[122]

Research in Modern Biomedicine

Activated charcoal is used in modern medical practice. The key use of the material is to absorb toxins present in the body. It is particularly helpful for preventing toxic effects due to overdose.[123] Orally administrated activated charcoal has been found to be clinically active for not only controlling the cholesterol but also beneficial balancing of LDL and HDL. In the study, seven patients with hypercholesterolaemia were treated and monitored for 4 weeks while administering activated charcoal at a dose of 8 g three times a day. The pathological results found that in plasma, total cholesterol was decreased by 25%. Furthermore, LDL was decreased by 25% while HDL was increased by 8%.[124] Beside these, activated charcoal has been found to reduce phosphate ions in serum during dialysis, in cholestasis treatment, etc.[125]

Formica Rufa

Homoeopathic use

It is prepared from European red wood ants. Homoeopathy medicine Formica Rufa has been described in homoeopathic materia medica of WilliamBoericke.[126] He reports the medicine for wide variety of physiological and psychological effects. It is indicated in conditions like vertigo, headache, nasal polypi, rheumatic iritis, heartburn, nausea, irregular bowel, bloody or albuminous urination, skin itching, sexual weakness and respiratory ailments. It is described as an arthritic medicine. Dr. Sylwestrowicz of the Hering Research Laboratory of Hahnemann College, Philadelphia indicated that the primary use of the medicine is in gout, especially in case of acute condition. He also indicated its use in psoriasis, loss of hair, chronic eczema, kidney ailments, nephritis, Dupuytren's contraction and bone swelling. He also prescribed the drug in rheumatic fever.[127] Hering also reported the medicines. According to him, it can be used to treat forgetfulness. Also, he prescribed the medicine for throat infection, dizziness and ear pain. Similar to other authors, he also prescribed the medicine for gout and limb stiffness.[128]

Research in modern biomedicine

Ant-based compounds show promising bioactivities. Terpenoid bioactive compound isolated from Papua ant nest contains terpenoids. Those terpenoids were found to be cytotoxic and induced apoptosis in human ovarian cell lines (SKOV-3) and increased Caspase–9 activity.[129] Indian tree ant, Oecophylla smaragdina, Fabricius's larvae and pupae contain bioactive proteins. These peptides show anti-angiotensin I-converting enzyme (ACE) and antioxidative bioactivities.[130] In general, many insect-derived pheromone show promising bioactivity.[131]

Milk

Homoeopathic use

Even though many milk-based homoeopathic medicines are reported, here we are going to discuss only Lac defloratum and Lac caninum as these are only two in the EDL. Lac defloratum is prepared from skimmed cow milk. Donkin successfully treated diabetes and Bright's disease with skimmed milk. Later, the work was further extended by Dr Swan who potentised and proved the medicine. It had shown results in nerve-related issues. It also shows efficacy against despondence, American sick headache, nausea, intense throbbing, constipation, copious and pale urine.[132] It is indicated for conditions like

psychological problems, vertigo, fever, insomnia, photophobia and kidney ailments.[133] It can also be used for diarrhoea in infants.[134] Lac caninum is prepared from dog (bitch) milk. It is a psychotic drug.[135] It is used in persons with low confidence, inferiority complex etc. It has also been used to treat Diphtheria.[136]

Research in modern biomedicine

The beneficial effects of milk are numerous. Thus it may not be possible to include all of them here. Here we will discuss shortly about the new findings. Bioactive peptides have been identified within the amino acid sequences of native milk proteins. As the peptide sequencing of short peptides are challenging further study in the area is required to unravel the bioactivities components chemically.[137] In general the native proteins in milk do not show bioactivities. However, proteolytic digestion leads to the release of encrypted bioactive peptides present in the milk. Due to their physiological and physicochemical versatility, milk peptides are regarded as greatly important components for health promoting foods or pharmaceutical applications. Milk is known to contain antihypertensive peptides. *In vitro* enzymatic digestion of milk proteins, several ACE-inhibitory peptides were identified.[138] Peptides derived from αs-casein has been found to scavenge free radicals and lipid peroxidation.[139,140] Iwami reported the existence of hypocholesterolemic peptides in milk.[141] Among antimicrobial peptides, the lactoferricins are studied the most, which are derived from bovine and human lactoferrin. Lactoferricins, originated from milk have shown to have antimicrobial activities against yeasts, filamentous fungi and many Gram-positive and Gram-negative bacteria.[142]

Mephitis

Homoeopathic use

The homoeopathic formulation has been prepared from Skunk's anal secretion. Hering proved the medicine in 30C. It is reported to be indicated in clinical conditions like vertigo, asthma, tooth and gum pain and discharge from the ears, whooping cough etc.[143-145]

Research in modern biomedicine

Chemical constituents: Majorly, there are two kinds of compounds which are present in the secretion: (a) thiols and (b) acetate derivatives of the thiols, e.g. *(E)*-2-butene-1-thiol and 3-methyl-1-butanethiol and 2-quinoline-methanethiol. Among them, first two are the primary cause for the unpleasant smell of the secretion. The acetate derivatives of the thiols are less odoriferous. It also contains 2-methylquinoline.[146,147] Quinolines have been studied extensively for bioactivities. Among them, anticancer activities are the most prominent ones.[148] In fact, one of the components – 2-methylquinoline shows antiprion activities.[149]

Trombidium

Homoeopathic use

This medicine is prepared from the whole mite. In general, this medicine is anti-inflammatory. According to Allen, it can act on head, eye, ear, stomach, throat and mouth.[150] William Boericke reported the use of this medicine in abdominal pain.[151] Hering also reported its use in various inflammation.[152] Douglass indicated its use in abdominal pain and diarrhoea.[153]

Thyroidinum

Homoeopathic use

It is being prepared from dried whole thyroid glands of domestic sheep. Clark indicated its use in acromegaly, abscess, albuminuria, amblyopia, amenorrhoea, anaemia, backache, constipation, fibroma, convulsions, optic neuritis, paralysis and tetanus.[154] Lippe reported its usage in muscle weakness, rickets, cretinism and arrested development of children etc.[155] Allen reported its use to cure palpitation, hysteria and different kinds of pain.[156]

Research in modern biomedicine

Thyroid gland is extremely important gland-secreting hormones. The thyroid gland is an endocrine gland near the neck. It consists of two lobes which connected to each other by isthmus. The thyroid gland secretes three hormones of two types. (a) the two thyroid hormones (thyroxine/T4 and triiodothyronine/T3) and (b) calcitonin. The thyroid hormones chiefly regulate the metabolic rate and protein synthesis. However, besides these, it also influences developments. Calcitonin is associated with calcium homeostasis.[157]

Conclusion

There are many animal-based drugs which are available in Homoeopathy showing diverse pharmacological effects. Interestingly, the recent biomedical studies also support the proving reported in Homoeopathic literature. However, recent development of analytical and biochemical field enables us to unravel the origin of the bioactivities. With the new discoveries, it is now possible to detect the active pharmaceutical ingredients. Thus, it is possible to undertake SAR (Structure Activity Relationship) study using structurally simple analogues. Overall, it could be inferred from the available literature that today's biochemical research related to animal-based drugs is considerably based on the findings of early homoeopathic practitioners. In future investigations, medical science can rely on the homoeopathic literature for drug discovery in the field of the animal-based therapeutics.

Acknowledgement

The authors are thankful to Prof. Nirmala Baburao and all the supporting staffs of DSU (H), CCRH, Hyderabad, India.

Financial support and sponsorship

Nil.

Conflicts of interest

None declared.

References

1(i). Department of AYUSH, Ministry of Health & Family Welfare, Government of India. Essential Drug List (EDL) Homoeopathy. 2013. Available from: http://ayush.gov.in/sites/default/files/1111869149-Essential_Homoeopathic_Medicines%20for%20uploading%20on%20web%20site%20%20%201.2.pdf. [Last accessed on 2019 Sep 23].

1(ii). Hering C. *Apis mellifica.* In: Guiding Symptoms of our Materia Medica. Available from: http://www.homeoint.org/hering/index.htm. [Last accessed on 2019 Sep 19].

2. Boericke W. *Apis mellifica*. In: Homeopathic Materia. Available from: http://www.homeoint.org/books/boericmm/index.htm. [Las accessed on 2019 Sep 19].

3. Owen MD, Sloley BD. 5-hydroxytryptamine in the venom of the honey bee (*Apis mellifera* L.): Variation with season and with insect age. Toxicon 1988;26:577-81.

4. Owen MD, Pfaff LA, Reisman RE, Wypych J. Phospholipase A2 in venom extracts from honey bees (*Apis mellifera* L.) of different ages. Toxicon 1990;28:813-20.

5. Ouyang C, Lin SC, Teng CM. Anticoagulant properties of *Apis mellifera* (honey bee) venom. Toxicon 1979;17:197-201.

6. Fletcher JE, Jiang MS. Possible mechanisms of action of cobra snake venom cardiotoxins and bee venom melittin. Toxicon 1993;31:669-95.

7. De Lima PR, Brochetto-Braga MR. Hymenoptera venom review focusing on *Apis mellifera*. J Venom Anim Toxins Incl Trop Dis 2003;9:149-62.

8. Jo M, Park MH, Kollipara PS, An BJ, Song HS, Han SB, *et al.* Anti-cancer effect of bee venom toxin and melittin in ovarian cancer cells through induction of death receptors and inhibition of JAK2/STAT3 pathway. Toxicol Appl Pharmacol 2012;258:72-81.

9. Son DJ, Lee JW, Lee YH, Song HS, Lee CK, Hong JT, *et al.* Therapeutic application of anti-arthritis, pain-releasing, and anti-cancer effects of bee venom and its constituent compounds. Pharmacol Ther 2007;115:246-70.

10. Gmachl M, Kreil G. The precursors of the bee venom constituents apamin and MCD peptide are encoded by two genes in tandem which share the same 3'-exon. J Biol Chem 1995;270:12704-8.

11. Kwon YB, Lee JD, Lee HJ, Han HJ, Mar WC, Kang SK, *et al.* Bee venom injection into an acupuncture point reduces arthritis associated edema and nociceptive responses. Pain 2001;90:271-80.

12. Chung KS, An HJ, Cheon SY, Kwon KR, Lee KH. Bee venom suppresses testosterone-induced benign prostatic hyperplasia by regulating the inflammatory response and apoptosis. Exp Biol Med (Maywood) 2015;240:1656-63.

13. Fennell JF, Shipman WH, Cole LJ. Antibacterial action of melittin, a polypeptide from bee venom. Proc Soc Exp Biol Med 1968;127:707-10.

14. Fenard D, Lambeau G, Maurin T, Lefebvre JC, Doglio A. A peptide derived from bee venom-secreted phospholipase A2 inhibits replication of T-cell tropic HIV-1 strains via interaction with the CXCR4 chemokine receptor. Mol Pharmacol 2001;60:341-7.

15. Oršolić N. Bee venom in cancer therapy. Cancer Metastasis Rev 2012;31:173-94.

16. Park MH, Choi MS, Kwak DH, Oh KW, Yoon DY, Han SB, *et al.* Anti-cancer effect of bee venom in prostate cancer cells through activation of caspase pathway via inactivation of NF-κB. Prostate 2011;71:801-12.

17. An Unusual Asthma Cure – *Blatta orientalis* | National Center for Homeopathy. Available from: https://www.homeopathycenter.org/homeopathy-today/unusual-asthma-cure-blatta-orientalis. [Last accessed on 2019 Mar 06].

18. Lippe A. *Blatta orientalis* [Blatta]. Hpathy. Available from: https://hpathy.com/e-books/keynotes-and-red-line-symptoms-by-adolph-von-lippe/blatta-orientalis-blatta-2/. [Last accessed on 2019 Mar 06].

19. *Blatta americana* (Lam.) Blatta. Kakerlat Americana Oar.) Portugal: Baratta. from Materia Medica by Benoît Mure. Homeopathy. Available from: https://www.materiamedica.info/en/materia-medica/benoit-mure/blatta-americana-lam-blatta-kakerlat-americana-oar-portug-baratta. [Last accessed on2019 Mar 06].

20. *Blatta americana* | National Center for Homeopathy. Available from: https://www.homeopathycenter.org/remedy/blatta-americana-0. [Last accessed on 2019 Mar 06].

21. Balasubramanian S, Priya K, Revathi I, Revathi A, Venkatesh P, Gunasekaran G. Screening of antibacterial activity and biochemical assay from haemolymph of cockroach *Blatta orientalis* (Linnaeus, 1758). J Entomol Zool Stud 2017;5:753-8.

22. Chandrakant Nimgulkar C, Dattatray Patil S, Dinesh Kumar B. Anti-asthmatic and anti-anaphylactic activities of *Blatta orientalis* mother tincture. Homeopathy 2011;100:138-43.

23. Biswas B, Jhansi S, Potu R, Patel S, Nagaraju M, Arya R, *et al.* Physicochemical study of the homoeopathic drug, *Blatta orientalis*. Indian J Res Homoeopath 2018;12:125.

24. Badiaga | National Center for Homeopathy. Available from: https://www.homeopathycenter.org/remedy/badiaga-0. [Last accessed on 2019 Jan 17].

25. Spongia Tosta | National Center for Homeopathy. Available from: https://www.homeopathycenter.org/remedy/spongia-tosta. [Last accessed on 2019 Jan 17].

26. Allen TF. Badiaga. Encyclopedia of Pure Materia Medica. Available from: http://www.homeoint.org/allen/index.htm. [Last accessed on 2019 Sep 19].

27. Hering C. Badiaga. In: Guiding Symptoms of our Materia Medica. Available from: http://www.homeoint.org/hering/index.htm. [Last accessed on 2019 Sep 19].

28. Clarke JH. Badiaga. In: Dictionary of Practical Materia Medica. Available from: http://www.homeoint.org/clarke/index.htm. [Last accessed on 2019 Sep 19].

29. Kent JT. Spongia Tosta. In: Lectures on Homeopathic Materia Medica. Available from: http://www.homeoint.org/books3/kentmm/index.htm [Last accessed on 2019 Sep 19].

30. Allen HC. Spongia Tosta. Keynotes and Characteristics. Available from: http://www.homeoint.org/books/allkeyn/index.htm. [Last accessed on 2019 Sep 19].

31. Edwin A. Spongia tosta. In: A Manual of Homeopathic Therapeutics. Available from: https://hpathy.com/e-books/a-manual-of-homeopathic-therapeutics-by-edwin-a-neatby/spongia-tosta-spong-3/. [Last accessed on 2019 Jan 17].

32. Boericke W. Spongia tosta. In: Homeopathic Materia. Available from: http://www.homeoint.org/books/boericmm/index.htm. [Last accessed on 2019 Sep 19].

33. Yang ML, Lu B. Treatment of Goiter with traditional Chinese medicine regimen Xing Qi Hua Ying Tang: A clinical study on 72 patients with multinodular and diffuse goiter. J Altern Complement Med 2018;24:374-7.

34. Keyzers RA, Davies-Coleman MT. Anti-inflammatory metabolites from marine sponges. Chem Soc Rev 2005;34:355-65.

35. Pejin B, Tommonaro G, Glumac M, Jakimov D, Kojic V. The redox couple avarol/avarone in the fight with malignant gliomas: The case study of U-251 MG cells. Nat Prod Res 2018;32:616-20.

36. Lai K-H, Backlund A. Separation and identification on stereoisomers of manoalide derivatives and their configuration-depending antileukemic effects *in vitro* and *in vivo*. Digital Comprehensive Summaries of Uppsala Dissertations from the Faculty of Pharmacy, Uppsala University, Uppsala, Sweden, 2017. p. 1-60.

37. Pettinger J, Jones K, Cheeseman MD. Lysine-targeting covalent inhibitors. Angew Chem Int Ed Engl 2017;56:15200-9.

38. Xue B, Wang W, Qin JJ, Nijampatnam B, Murugesan S, Kozlovskaya V, *et al.* Highly efficient delivery of potent anticancer iminoquinone derivative by multilayer hydrogel cubes. Acta Biomater 2017;58:386-98.

39. Kobayashi J, Takeuchi S, Ishibashi M, Shigemori H, Sasaki T. Plakotenin, a new cytotoxic carboxylic acid from the Okinawan marine sponge *Plakortis* Sp. Tetrahedron Lett 1992;33:2579-80.

40. Tsujii S, Rinehart KL, Gunasekera SP, Kashman Y, Cross SS, Lui MS, *et al.* Topsentin, bromotopsentin, and dihydrodeoxybromotopsentin: Antiviral and antitumor bis (indolyl) imidazoles from Caribbean deep-sea sponges of the family *Halichondriidae*. Structural and synthetic studies. J Organ Chem 1988;53:5446-53.

41. Hu JM, Zhao YX, Chen JJ, Miao ZH, Zhou J. A new spongilipid from the freshwater sponge *Spongilla lacustris*. Chem Inform 2009;40:1.

42. Udompataikul M, Wongniraspai M, Showpittapornchai U, Jariyapongsakul A. The study on effects and safety of *Spongilla*

lacustris in 3% hydrogen peroxide solution on rat skin. J Med Assoc Thai 2012;95 Suppl 12:S15-20.
43. Ercolano G, De Cicco P, Ianaro A. New drugs from the sea: Pro-apoptotic activity of sponges and algae derived compounds. Mar Drugs 2019;17. pii: E31.
44. Baharum Z, Akim AM, Taufiq-Yap YH, Hamid RA, Kasran R. *In vitro* antioxidant and antiproliferative activities of methanolic plant part extracts of theobroma cacao. Molecules 2014;19:18317-31.
45. Archana R, Begum S. In vitro cytotoxicity of marine sponge spongia tosta in A-549, HepG2, HT-29 and vero cancer cell lines. Euro J Pharm Med Res 2016;3;337-41.
46. Stead P, Hiscox S, Robinson PS, Pike NB, Sidebottom PJ, Roberts AD, *et al.* Eryloside F, a novel penasterol disaccharide possessing potent thrombin receptor antagonist activity. Bioorg Med Chem Lett 2000;10:661-4.
47. Lee AY, Hagihara M, Karmacharya R, Albers MW, Schreiber SL, Clardy J. Atomic structure of the trypsin-cyclotheonamide a complex: Lessons for the design of serine protease inhibitors. J Am Chem Soc 1993;115:12619-20.
48. Sipkema D, Franssen MC, Osinga R, Tramper J, Wijffels RH. Marine sponges as pharmacy. Mar Biotechnol (NY) 2005;7:142-62.
49. De Smet P, Parys JB, Callewaert G, Weidema AF, Hill E, De Smedt H, *et al.* Xestospongin C is an equally potent inhibitor of the inositol 1,4,5-trisphosphate receptor and the endoplasmic-reticulum Ca(2+) pumps. Cell Calcium 1999;26:9-13.
50. Suzuki H, Ueno A, Takei M, Sindo K, Miura T, Sakakibara M, *et al.* Tracheal relaxing effects and beta2 adrenoceptor selectivity of S1319, a novel sponge-derived bronchodilator agent, in isolated guinea-pig tissues. Br J Pharmacol 1999;128:716-20.
51. Search for&Quot; Buforana&Quot. Available from: https://hpathy.com/?s=Bufo+rana. [Last accessed on 2019 Feb 07].
52. Bufo | National Center for Homeopathy. Available from: https://www.homeopathycenter.org/homeopathy-today/bufo. [Last accessed on 2019 Feb 07].
53. Chen KK, Kovaríková A. Pharmacology and toxicology of toad venom. J Pharm Sci 1967;56:1535-41.
54. Wang H, Zhang C, Xu L, Zang K, Ning Z, Jiang F, *et al.* Bufalin suppresses hepatocellular carcinoma invasion and metastasis by targeting HIF-1α via the PI3K/AKT/mTOR pathway. Oncotarget 2016;7:20193-208.
55. Takai N, Kira N, Ishii T, Yoshida T, Nishida M, Nishida Y, *et al.* Bufalin, a traditional oriental medicine, induces apoptosis in human cancer cells. Asian Pac J Cancer Prev 2012;13:399-402.
56. Morilak DA, Barrera G, Echevarria DJ, Garcia AS, Hernandez A, Ma S, *et al.* Role of brain norepinephrine in the behavioral response to stress. Prog Neuropsychopharmacol Biol Psychiatry 2005;29:1214-24.
57. Tian X, Wang C, Dong P, An Y, Zhao X, Jiang W, *et al.* Arenobufagin is a novel isoform-specific probe for sensing human sulfotransferase 2A1. Acta Pharm Sin B 2018;8:784-94.
58. Song H, Guo T, Bi K, Wang H, Zhang R. Determination of resibufogenin and cinobufagin in heart-protecting musk pill by HPLC. Biomed Chromatogr 2000;14:130-2.
59. Lenaerts C, Wells M, Hambÿe S, Blankert B. Marinobufagenin extraction from rhinella marina toad glands: Alternative approaches for a systematized strategy. J Sep Sci 2019;42:1384-92.
60. Benkreira A, Lamarche Y. Epinephrine and Vasopressin Use Following Cardiac Arrest After Cardiac Surgery. In: Difficult Decisions in Cardiothoracic Critical Care Surgery. Switzerland: Springer; 2019. p. 111-23.
61. Lippe A. Murex Purpurea. Available from: http://www.homeoint.org/books2/lippkeyn/index.htm. [Last accessed 2019 Sep 19].
62. Benkendorff K, McIver CM, Abbott CA. Bioactivity of the murex homeopathic remedy and of extracts from an Australian muricid mollusc against human cancer cells. Evid Based Complement Alternat Med 2011;2011:879585.
63. Stocker R, McDonagh AF, Glazer AN, Ames BNBT-M in E. [31] Antioxidant activities of bile pigments: Biliverdin and bilirubin. In: Oxygen Radicals in Biological Systems Part B: Oxygen Radicals and Antioxidants. Academic Press; Cambridge, USA, 1990. p. 301-9.
64. McPhee F, Caldera PS, Bemis GW, McDonagh AF, Kuntz ID, Craik CS, *et al.* Bile pigments as HIV-1 protease inhibitors and their effects on HIV-1 viral maturation and infectivity *in vitro*. Biochem J 1996;320 (Pt 2):681-6.
65. Filonov GS, Piatkevich KD, Ting LM, Zhang J, Kim K, Verkhusha VV, *et al.* Bright and stable near-infrared fluorescent protein for *in vivo* imaging. Nat Biotechnol 2011;29:757-61.
66. Hagen NA, Lapointe B, Ong-Lam M, Dubuc B, Walde D, Gagnon B, *et al.* A multicentre open-label safety and efficacy study of tetrodotoxin for cancer pain. Curr Oncol 2011;18:e109-16.
67. Nieto FR, Cobos EJ, Tejada MÁ, Sánchez-Fernández C, González-Cano R, Cendán CM, *et al.* Tetrodotoxin (TTX) as a therapeutic agent for pain. Mar Drugs 2012;10:281-305.
68. Turner AH, Craik DJ, Kaas Q, Schroeder CI. Bioactive compounds isolated from neglected predatory marine gastropods. Mar Drugs 2018;16. pii: E118.
69. Edwards V, Benkendorff K, Young F. Marine compounds selectively induce apoptosis in female reproductive cancer cells but not in primary-derived human reproductive granulosa cells. Mar Drugs 2012;10:64-83.
70. Bayrhuber M, Vijayan V, Ferber M, Graf R, Korukottu J, Imperial J, *et al.* Conkunitzin-S1 is the first member of a new kunitz-type neurotoxin family. Structural and functional characterization. J Biol Chem 2005;280:23766-70.
71. Safavi-Hemami H, Brogan SE, Olivera BM. Pain therapeutics from cone snail venoms: From ziconotide to novel non-opioid pathways. J Proteomics 2019;190:12-20.
72. Schmidtko A, Lötsch J, Freynhagen R, Geisslinger G. Ziconotide for treatment of severe chronic pain. Lancet 2010;375:1569-77.
73. Tyler ML. *Cantharis*. Available from: http://www.homeoint.org/english/index.htm. [Last accessed on 2019 Sep 19].
74. Molluscum Contagiosum: Positive Results for Phase 3 Trials of Investigational Drug. Available from: https://www.contagionlive.com/news/molluscum-contagiosum-positive-results-for-phase-3-trials-of-investigational-drug. [Last accessed on 2019 Mar 05].
75. Ghaffarifar F. Leishmania major: *In vitro* and *in vivo* anti-leishmanial effect of cantharidin. Exp Parasitol 2010;126:126-9.
76. Sepia – Homeopathic Remedies. Available from: https://www.homeopathicremediesblog.com/remedies/sepia/. [Last accessed on 2019 Mar 05].
77. Derby CD. Cephalopod ink: Production, chemistry, functions and applications. Mar Drugs 2014;12:2700-30.
78. Fahmy SR, Soliman AM. *In vitro* antioxidant, analgesic and cytotoxic activities of Sepia officinalis ink and Coelaturaaegyptiaca extracts. Afr J Pharm Pharmacol 2013;7:1512-22.
79. Seagle BL, Gasyna EM, Mieler WF, Norris JR Jr. Photoprotection of human retinal pigment epithelium cells against blue light-induced apoptosis by melanin free radicals from sepia officinalis. Proc Natl Acad Sci U S A 2006;103:16644-8.
80. Rajaganapathi J, Thyagarajan SP, Edward JK. Study on cephalopod's ink for anti-retroviral activity. Indian J Exp Biol 2000;38:519-20.
81. Lei M, Wang J, Wang Y, Pang L, Wang Y, Xu W, *et al.* Study of the radio-protective effect of cuttlefish ink on hemopoietic injury. Asia Pac J Clin Nutr 2007;16 Suppl 1:239-43.
82. Ernst E. Homeopathy for cancer? Curr Oncol 2007;14:128-30.
83. Senan VP, Sherief PM, Nair JR. Cytotoxic effect of ink extracts of cuttlefish and squid on chick embryo fibroblasts. Int J Phar Sci Res 2013;4:1893-6.
84. Zhang Z, Sun L, Zhou G, Xie P, Ye J. Sepia ink oligopeptide induces apoptosis and growth inhibition in human lung cancer cells. Oncotarget 2017;8:23202-12.
85. Guo-Fang D, Huang FF, Zui-Su Y, Di YU, Yong-Fang Y. Anticancer activity of an oligopeptide isolated from hydrolysates of Sepia ink. Chin J Nat Med 2011;9:151-5.
86. Li F, Luo P, Liu H. A potential adjuvant agent of chemotherapy: Sepia ink polysaccharides. Mar Drugs 2018;16. pii: E106.
87. Huang F, Yang Z, Yu D, Wang J, Li R, Ding G, *et al.* Sepia ink oligopeptide induces apoptosis in prostate cancer cell lines via caspase-3 activation and elevation of bax/Bcl-2 ratio. Mar Drugs 2012;10:2153-65.
88. Boericke W. Serum anguillae. In: Homoeopathic Materia Medica.

Available from: http://www.homeoint.org/books/boericmm/s/ser-ang.htm. [Last accessed on 2019 Mar 05].
89. Chakravorty J, Meyer-Rochow VB, Ghosh S. Vertebrates used for medicinal purposes by members of the Nyishi and Galo tribes in Arunachal Pradesh (North-East India). J Ethnobiol Ethnomed 2011;7:13.
90. Halim NR, Azlan A, Yusof HM, Sarbon NM. Antioxidant and anticancer activities of enzymatic eel (monopterussp) protein hydrolysate as influenced by different molecular weight. Biocatal Agric Biotechnol 2018;16:10-6.
91. Takei Y, Takahashi A, Watanabe TX, Nakajima K, Sakakibara S. Amino acid sequence and relative biological activity of eel atrial natriuretic peptide. Biochem Biophys Res Commun 1989;164:537-43.
92. Vipera | National Center for Homeopathy. Available from: https://www.homeopathycenter.org/remedy/vipera. [Last accessed on 2019 Mar 05].
93. Lachesis. Available from: https://www.encyclopedia.com/philosophy-and-religion/ancient-religions/ancient-religion/lachesis. [Last accessed on 2019 Mar 05].
94. Angina Pectoris Homeopathic Treatment by Dr. Tsan in Philadelphia. Available from: https://www.philahomeopathy.com/angina-pectoris/. [Last accessed on 2019 Mar 05].
95. Granados-Zúñiga J, Aragón-Ortíz F. Cardiovascular alterations induced by the venom of *Lachesis muta* (Serpentes: Viperidae) and its fibrinogenolitic enzyme. Rev Biol Trop 1998;46:1149-57.
96. Hering C. *Crotalus horridus*. Available from: http://www.homeoint.org/hering/index.htm. [Last accessed on 2019 Sep 19].
97. Bernard GR, Vincent J-L, Laterre P-F, LaRosa SP, Dhainaut J-F, Lopez-Rodriguez A, *et al.* Efficacy and Safety of Recombinant Human Activated Protein C for Severe Sepsis. NEJM 2001; 344.
98. Frass M, Linkesch M, Banyai S, Resch G, Dielacher C, Löbl T, *et al.* Adjunctive homeopathic treatment in patients with severe sepsis: A randomized, double-blind, placebo-controlled trial in an intensive care unit. Homeopathy 2005;94:75-80.
99. *Crotalus horridus* – Uses, Symptoms, Side Effects, Indications – Best Homeo. Available from: https://www.homeopathycenter.org/remedy/crotalus-horridus. [Last accessed on 2019 Sep 19].
100. *Naja tripudians* | National Center for Homeopathy. Available from: https://www.homeopathycenter.org/remedy/naja. [Last accessed on 2019 Sep 19].
101. Soares AM, Giglio JR. Chemical modifications of phospholipases A2 from snake venoms: Effects on catalytic and pharmacological properties. Toxicon 2003;42:855-68.
102. Shi GN, Liu YL, Lin HM, Yang SL, Feng YL, Reid PF, *et al.* Involvement of cholinergic system in suppression of formalin-induced inflammatory pain by cobratoxin. Acta Pharmacol Sin 2011;32:1233-8.
103. Dhanak AC, Rishipathak DD, Gide DP. Multiple sclerosis & it's treatment with alpha-cobratoxin: A review. Int J PharmTech Res 2010;2:740-9.
104. Alama A, Bruzzo C, Cavalieri Z, Forlani A, Utkin Y, Casciano I, *et al.* Inhibition of the nicotinic acetylcholine receptors by cobra venom α-neurotoxins: Is there a perspective in lung cancer treatment? PLoS One 2011;6:e20695.
105. Triplett DA. Use of the dilute Russell viper venom time (dRVVT): Its importance and pitfalls. J Autoimmun 2000;15:173-8.
106. Swenson S, Costa F, Ernst W, Fujii G, Markland FS. Contortrostatin, a snake venom disintegrin with anti-angiogenic and anti-tumor activity. Pathophysiol Haemost Thromb 2005;34:169-76.
107. Cushman DW, Ondetti MA. History of the design of captopril and related inhibitors of angiotensin converting enzyme. Hypertension 1991;17:589-92.
108. Platelet Glycoprotein IIb/IIIa in Unstable Angina: Receptor Suppression Using Integrilin Therapy (PURSUIT) Trial Investigators. Inhibition of platelet glycoprotein IIb/IIIa with eptifibatide in patients with acute coronary syndromes. N Engl J Med 1998;339:436-43.
109. Shanbhag VK. Applications of snake venoms in treatment of cancer. Asian Pac J Trop Biomed 2015;5:275-6.
110. Araya C, Lomonte B. Antitumor effects of cationic synthetic peptides derived from lys49 phospholipase A2 homologues of snake venoms. Cell Biol Int 2007;31:263-8.
111. Costa TR, Burin SM, Menaldo DL, de Castro FA, Sampaio SV. Snake venom L-amino acid oxidases: An overview on their antitumor effects. J Venom Anim Toxins Incl Trop Dis 2014;20:23.
112. Pu XC, Wong PT, Gopalakrishnakone P. A novel analgesic toxin (hannalgesin) from the venom of king cobra (*Ophiophagus* hannah). Toxicon 1995;33:1425-31.
113. Lee ML, Tan NH, Fung SY, Sekaran SD. Antibacterial action of a heat-stable form of L-amino acid oxidase isolated from king cobra (*Ophiophagus* hannah) venom. Comp Biochem Physiol C Toxicol Pharmacol 2011;153:237-42.
114. A Case of Anorexia Cured by Tarentula Hispanica – Christiane Lhuillier – Hpathy. https://hpathy.com/clinical-cases/a-case-of-anorexia-cured-by-tarentula-hispanica/. [Last accessed on 2019 Sep 19].
115. Tyler ML. Tarentula Cubensis. Available from: http://www.homeoint.org/cazalet/tyler/tarentula.htm. [Last accessed on 2019 Sep 19].
116. Manchanda RK, Chakraborty PS, Singh P, Nayan SS, Singh O, Pradhan PK, *et al*. Mygalelasiodora: A multicentric observational homoeopathic clinical verification study. Indian J Res Homoeopath 2015;9:249.
117. Souza AH, Ferreira J, Cordeiro Mdo N, Vieira LB, De Castro CJ, Trevisan G, *et al.* Analgesic effect in rodents of native and recombinant Ph alpha 1beta toxin, a high-voltage-activated calcium channel blocker isolated from armed spider venom. Pain 2008;140:115-26.
118. Chassagnon IR, McCarthy CA, Chin YK, Pineda SS, Keramidas A, Mobli M, *et al.* Potent neuroprotection after stroke afforded by a double-knot spider-venom peptide that inhibits acid-sensing ion channel 1a. Proc Natl Acad Sci U S A 2017;114:3750-5.
119. McCormick J, Li Y, McCormick K, Duynstee HI, van Engen AK, van der Marel GA, *et al*. Structure and total synthesis of HF-7, a neuroactive glyconucleoside disulfate from the funnel-web spider *Hololena curta*. J Am Chem Soc. 1999; 121:5661-5.
120. Hering C. Carbo animalis. In: Guiding Symptoms of our Materia Medica. Available from: https://homeopathybooks.in/guiding-symptoms-of-our-materia-medica/carbo-animalis-5/. [Last accessed on 2019 Jul 02.]
121. Kent JT. Carbo Animalis. In: Homeopathy Books. Available from: https://homeopathybooks.in/lectures-on-homeopathic-materia-medica/carbo-animalis-2/. [Last accessed on 2019 Jul 02].
122. Boericke W. Carbo animalis. In: Homoeopathic Materia Medica. Available from: http://www.homeoint.org/books/boericmm/c/carb-an.htm. [Last accessed on 2019 Jul 02].
123. Neuvonen PJ, Olkkola KT. Oral activated charcoal in the treatment of intoxications. Role of single and repeated doses. Med Toxicol Adverse Drug Exp 1988;3:33-58.
124. Kuusisto P, Vapaatalo H, Manninen V, Huttunen JK, Neuvonen PJ. Effect of activated charcoal on hypercholesterolaemia. Lancet 1986;2:366-7.
125. Activated Charcoal: Uses, Side Effects, Interactions, Dosage, and Warning. Available from: https://www.webmd.com/vitamins/ai/ingredientmono-269/activated-charcoal. [Last accessed on 2019 Jul 02].
126. Boericke W. *Formica rufa*. In: Homeopathic Materia Medica. Available from: http://www.homeoint.org/books/boericmm/f/form.htm. [Last accessed on 2019 Sep 19].
127. *Formica Rufa* – Homeopathic Remedies | *Formica rufa*. Available from: https://www.webhomeopath.com/homeopathy/homeopathic-remedies/homeopathy-remedy-Formica_Rufa.html. [Last accessed on 2019 Jul 02].
128. Hering C. *Formica rufa*. In: Guiding Symptoms of Our Materia Medica. Available from: http://www.homeoint.org/hering/index.htm [Last accessed on 2019 Sep 19].
129. Hasanuddin K, Supriadi G, Kurnia D, Adhita D. Potential of terpenoid bioactive compound isolated from Papua ant nest as an alternative ovarian cancer treatment. Open J Obstet Gynecol 2015;5:406-11.
130. Pattarayingsakul W, Nilavongse A, Reamtong O, Chittavanich P, Mungsantisuk I, Mathong Y, *et al.* Angiotensin-converting enzyme inhibitory and antioxidant peptides from digestion of larvae and pupae of asian weaver ant, oecophylla smaragdina, fabricius. J Sci Food Agric 2017;97:3133-40.
131. Mori K. Pheromones: synthesis and bioactivity. Chem Commun 1997;13:1153-8.

132. Allen HC. Lac defloratum. In: Keynotes and Characteristics. Available from: http://www.homeoint.org/books/allkeyn/index.htm [Last accessed on 2019 Sep 19].
133. Phatak SR. Lac defloratum. In: Concise Materia Medica. Available from: https://homeopathybooks.in/concise-materia-medica-by-s-r-phatak/lac-defloratum-3/ [Last accessed on 2019 Sep 19].
134. Lac Defloratum | National Center for Homeopathy. Available from: https://www.homeopathycenter.org/remedy/lac-defloratum [Last accessed on 2019 Sep 19].
135. Sankaran R. The Soul of Remedies: Lac Caninum. Hpathy. Available from: https://hpathy.com/homeopathy-papers/the-soul-of-remedies-lac-caninum-rajan-sankaran/. [Last accessed on 2019 Jul 02].
136. Rice P. Lac Caninum in Diphtheria. Hpathy. Available from: https://hpathy.com/clinical-cases/lac-caninum-in-diphtheria/. [Last accessed on 2019 Jul 02].
137. Montone CM, Capriotti AL, Cerrato A, Antonelli M, La Barbera G, Piovesana S, *et al.* Identification of bioactive short peptides in cow milk by high-performance liquid chromatography on C18 and porous graphitic carbon coupled to high-resolution mass spectrometry. Anal Bioanal Chem 2019;411:3395-404.
138. Gobbetti M, Minervini F, Rizzello CG. Angiotensin I-converting-enzyme-inhibitory and antimicrobial bioactive peptides. Int J Dairy Technol 2004;57:173-88.
139. Rival SG, Boeriu CG, Wichers HJ. Caseins and casein hydrolysates 2. Antioxidative properties and relevance to lipoxygenase inhibition. J Agric Food Chem 2001;49:295-302.
140. Suetsuna K, Ukeda H, Ochi H. Isolation and characterization of free radical scavenging activities peptides derived from casein. J Nutr Biochem 2000;11:128-31.
141. Iwami K, Sakakibara K, Ibuki F. Involvement of post-digestion'hydrophobia'peptides in plasma cholesterol-lowering effect of dietary plant proteins. Agric Biol Chem 1986;50:1217-22.
142. Korhonen H, Pihlanto A. Bioactive peptides from food proteins. Handbook of food products manufacturing–Health, meat, milk, poultry, seafood, and vegetables. John Wiley & Sons, Inc., Hoboken, USA, 2007. p. 5-37.
143. Hering C. Mephitis putorius. In: Guiding Symptoms of Our Materia Medica. Available from: https://homeopathybooks.in/guiding-symptoms-of-our-materia-medica/mephitis-putorius-2/. [Last accessed on 2019 Jul 02].
144. Boericke W. Mephitis putorius. In: Homeopathic Materia Medica. Available from: http://www.homeoint.org/books/boericmm/index.htm [Last accessed on 2019 Sep 19].
145. Clarke JH. Homeopathy. In: Mephitis from Materia Medica. Available from: http://www.homeoint.org/clarke/index.htm [Last accessed on 2019 Sep 19].
146. Wood WF. New components in defensive secretion of the striped skunk, *Mephitis mephitis*. J Chem Ecol 1990;16:2057-65.
147. Andersen KK, Bernstein DT. Some chemical constituents of the scent of the striped skunk (*Mephitis mephitis*). J Chem Ecol 1975;1:493-9.
148. Afzal O, Kumar S, Haider MR, Ali MR, Kumar R, Jaggi M, *et al.* A review on anticancer potential of bioactive heterocycle quinoline. Eur J Med Chem 2015;97:871-910.
149. Cope H, Mutter R, Heal W, Pascoe C, Brown P, Pratt S, *et al.* Synthesis and SAR study of acridine, 2-methylquinoline and 2-phenylquinazoline analogues as anti-prion agents. Eur J Med Chem 2006;41:1124-43.
150. Allen TF. Trombidium muscae domesticae. In: Encyclopedia of Pure Materia Medica. Available from: https://homeopathybooks.in/encyclopedia-of-pure-materia-medica-by-tf-allen/trombidium-muscae-domesticae-3/. [Last accessed on 2019 Jul 02].
151. Boericke W. Trombidium muscae domesticate. In: Homeopathic Materia Medica. Available from: http://www.homeoint.org/books/boericmm/index.htm [Last accessed on 2019 Sep 19].
152. Hering C. Trombidium muscae domesticae. In: Guiding Symptoms of Our Materia Medica. Available from: http://www.homeoint.org/hering/index.htm [Last accessed on 2019 Sep 19].
153. Douglass ME. Trombidium. Available from: https://homeopathybooks.in/pearls-of-homeopathy-by-m-e-douglass/trombidium-2/. [Last accessed on 2019 Jul 02].
154. Clarke JH. Thyroidinum. In: Dictionary of Practical Materia Medica. Available from: http://www.homeoint.org/clarke/index.htm [Last accessed on 2019 Sep 19].
155. von Lippe A. Thyroidinum. In: Keynotes and Red Line Symptoms. Available from: http://www.homeoint.org/books2/lippkeyn/index.htm [Last accessed on 2019 Sep 19].
156. Allen HC. Thyroidinum. In: Medicine. Available from: https://homeopathybooks.in/materia-medica-of-nosodes-by-h-c-allen/thyroidinum-medicine/. [Last accessed on 2019 Jul 02].
157. Guyton AC. Parathyroid Hormone, Calcitonin, Calcium and phosphate metabolism, Vitamin D, Bone and Teeth, Text Book of Medical Physiology; Philadelphia: Elsevier Health Sciences; 2001. p. 899-915.

पशु–आधारित होम्योपैथिक दवा और जैव–चिकित्सा में उनके अनुप्रयोगों की समीक्षा

होम्योपैथी विश्व में चिकित्सा प्रदान करने वाली प्रणालियों में से एक है। होम्योपैथी में, अन्य सभी प्राकृतिक स्त्रोतों की तरह पशु और उनके स्त्राव का व्यापक रुप से उपयोग किया गया है। हांलाकि, होम्योपैथिक दवाओं के अन्य प्राकृतिक स्त्रोतों के विपरीत, उदाहरण के लिए पौधों और रसायनों का संग्रह और जानवरों पर आधारित दवाओं की तैयारी, विशेष रुप से विदेशी जानवरों से दवाओं के लिए बेहद चुनौतीपूर्ण है। इस विचार से, जानवरों पर आधारित दवाओं से संबंधित अनुसंधान से जुड़ी चुनौतियों को यहां हम उन दवाओं की जैव–उत्पत्ति की रासायनिक उत्पत्ति के बारे में अनुसंधान की समीक्षा करते हैं। हमारी समीक्षा में लगातार पाया गया है कि आधुनिक जैव–चिकित्सा अनुसंधान की खोज होम्योपैथिक साहित्य की रिपोर्टों के अनुरुप है। कई मामलों में, हाल ही में जैव–चिकित्सा और औषधीय रसायन विज्ञान अनुसंधान ने पुराने होम्योपैथी साहित्य के निष्कर्षों को उचित ठहराया है। हमारा मानना है कि यह लेख न केवल होम्योपैथिक समुदाय के लिए फायदेमंद होगा, बल्कि भविष्य के जैव–चिकित्सा अनुसंधान के लिए होम्योपैथिक निष्कर्षों के बारे में आवश्यक जानकारी भी प्रदान करेगा।

Une étude des médicaments homéopathiques à base d'animaux et leurs applications en biomédecine

L'homéopathie est l'un des systèmes médicaux les plus pratiqués au monde. En homéopathie les animaux et leurs sécrétions, comme toutes les autres sources naturelles, ont beaucoup été utilisés. Cependant, contrairement aux autres sources naturelles des médicaments homéopathiques, tels que les plantes et les produits chimiques, la collecte et la préparation de médicaments à base d'animaux sont extrêmement difficiles, en particulier pour les médicaments provenant d'animaux exotiques. Vu les défis associés à la recherche portant sur les médicaments à base d'animaux, nous passons ici en revue les recherches sur l'origine chimique de la bio-activité de ces médicaments. Notre revue a constamment montré que les découvertes de la recherche biomédicale moderne correspondent à ce qui est trouvé dans la littérature homéopathique. Dans de nombreux cas, les recherches récentes en chimie biomédicale et médicinale justifient à juste titre les découvertes de la littérature homéopathique ancienne. Nous pensons que cet article sera non seulement bénéfique pour la communauté homéopathique mais pourra également fournir les informations nécessaires concernant les découvertes homéopathiques pour la recherche biomédicale future.

Revisión de los medicamentos homeopáticos animales y sus aplicaciones en biomedicina

La homeopatía es uno de los sistemas de medicina mejor practicado en el mundo. En homeopatía, se han utilizado ampliamente animales y sus secreciones, al igual que otras las otras fuentes naturales. Sin embargo, a diferencia de las otras fuentes naturales en homeopatía, como las plantas y los productos químicos, la recogida y preparación de los medicamentos de animales resultan sumamente complicadas, en especial cuando se trata de animales exóticos. Teniendo los problemas asociados a la investigación de medicamentos basados en animales, se ha revisado la investigación sobre el origen químico de las bioactividades de estos medicamentos. En esta revisión, se ha observado uniformemente que los descubrimientos de la investigación biomédica moderna coinciden con los informes de la bibliografía homeopática. En muchos casos, las investigación químicas biomédicas y médica modernas justifican coherentemente los hallazgos de la bibliografía homeopática antigua. En muchos casos, la investigación reciente en química biomédica y medicinal justifica acertadamente los hallazgos de la antigua literatura homeopática. En nuestra opinión, este artículo no solo será beneficioso para la comunidad homeopática sino que también proporcionará la información necesaria sobre los hallazgos homeopáticos para futuras investigaciones biomédicas.

Eine Übersicht über homöopathische Arzneimittel auf tierischer Basis und ihre Anwendungen in der Biomedizin

Die Homöopathie ist eines der am besten praktizierten medizinischen Systeme der Welt. In der Homöopathie sind wie bei allen anderen natürlichen Quellen Tiere und deren Sekrete weit verbreitet. Im Gegensatz zu anderen natürlichen Quellen homöopathischer Arzneimittel, z. pflanzen und chemikalien das sammeln und aufbereiten von arzneimitteln auf tierischer basis ist eine große herausforderung, insbesondere für arzneimittel von exotischen tieren. In Anbetracht der Herausforderungen, die mit der Erforschung von Arzneimitteln auf tierischer Basis verbunden sind, überprüfen wir hier die Erforschung der chemischen Herkunft der Bioaktivität dieser Arzneimittel. Unsere Überprüfung hat durchweg ergeben, dass die Entdeckungen der modernen biomedizinischen Forschung mit den Berichten aus der homöopathischen Literatur übereinstimmen. In vielen Fällen rechtfertigen die jüngsten Forschungsergebnisse der biomedizinischen und medizinischen Chemie die Ergebnisse der alten homöopathischen Literatur. Wir glauben, dass dieser Artikel nicht nur der homöopathischen Gemeinschaft zugute kommt, sondern auch die erforderlichen Informationen zu homöopathischen Befunden für die künftige biomedizinische Forschung liefert.

動物性來源的順勢療法藥物及其在生物醫學中的應用綜述

順勢療法是世界上其中一種最好的醫療系統。在順勢療法中，像所有其他天然來源一樣，動物及其分泌物已被廣泛使用。然而，與其他天然來源的順勢療法藥物不同，例如，植物和化學物以及動物性來源藥物的收集和製備都極具挑戰性，特別是對於非本地動物的藥物。考慮到與動物性來源藥物研究相關的挑戰，我們在此回顧了有關這些藥物生物活性化學來源的研究。在我們的綜述一致發現，現代生物醫學研究的發現與順勢療法文獻的報告一致。在許多情況下，最近的生物醫學和藥物化學研究恰當地證明了過往順勢療法文獻的發現。我們相信這篇文章不僅有益於順勢療法社區，而且可能為未來的生物醫學研究提供有關順勢療法發現的必要資訊。