



## MEDICINAL EFFECT OF BEE VENOM: APITHERAPY BY BEE VENOM

Dr. Kirti Sharma<sup>#\*</sup>, Himanchal Mishra<sup>\*\*</sup> and Dr. S. R. Inchulkar<sup>\*\*\*</sup>

\*P.G. Scholar First Year, Department of Agad Tantra Evam Vidhi Vaidyak, Govt. Ayurvedic College, Raipur (C.G.).

\*\*Local Bee Keeper, AHA Bee Keeping, Bhilai (C.G.).

\*\*\*Professor and HOD, Department of Agad Tantra Evam Vidhi Vaidyak, Govt. Ayurvedic College Raipur (C.G.).

Article Received on  
16 Oct. 2018,

Revised on 07 Nov. 2018,  
Accepted on 28 Nov. 2018

DOI: 10.20959/wjpps201812-12848

### \*Corresponding Author

**Dr. Kirti Sharma**

P.G. Scholar First Year,  
Department of Agad Tantra  
Evam Vidhi Vaidyak, Govt  
Ayurvedic College, Raipur  
(C.G.).

### ABSTRACT

Apitherapy is the use of honeybee produced substances for health and healing. Honeybee products like honey, pollen, propolis, royal jelly, bees wax and bee venom are used by people for nutrition, immune system support, treatment of a variety of ailments, skin care, and healing of open wounds. Honey bee venom has been used in many different cultures and countries as a therapy for treating complicated diseases like rheumatoid arthritis, amyotrophic lateral sclerosis, Parkinson's disease, Alzheimer's disease, liver fibrosis, atherosclerosis, pain and others. It is particularly popular today in China and Eastern Europe, chiefly for chronic inflammatory disease. This article will be beneficial to understand medicinal effect of bee venom or toxins in

different aspects and will be helpful to formulate medications and therapies.

**KEYWORDS:** Bee venom, Apitherapy, Honey Bee, Bee Sting Etc.

### INTRODUCTION

A honey bee is a flying insect within the genus *Apis*, which are basically known for storing honey and producing along with a various bee products like nectar, pollen, wax, propolis, royal jelly and bee venom. In the early 21st century, only seven species of honey bee are recognized, with a total of 44 subspecies, They are- *Apis mellifera*, *Apis cerena*, *Apis dorsata*, *Apis florea*, *Apis andreniformis*, *Apis koschevnikovi* and *Apis nigrocincta* in which first four species are indian bees and only first two bees are domesticate.<sup>[1]</sup> Honey bees have a size

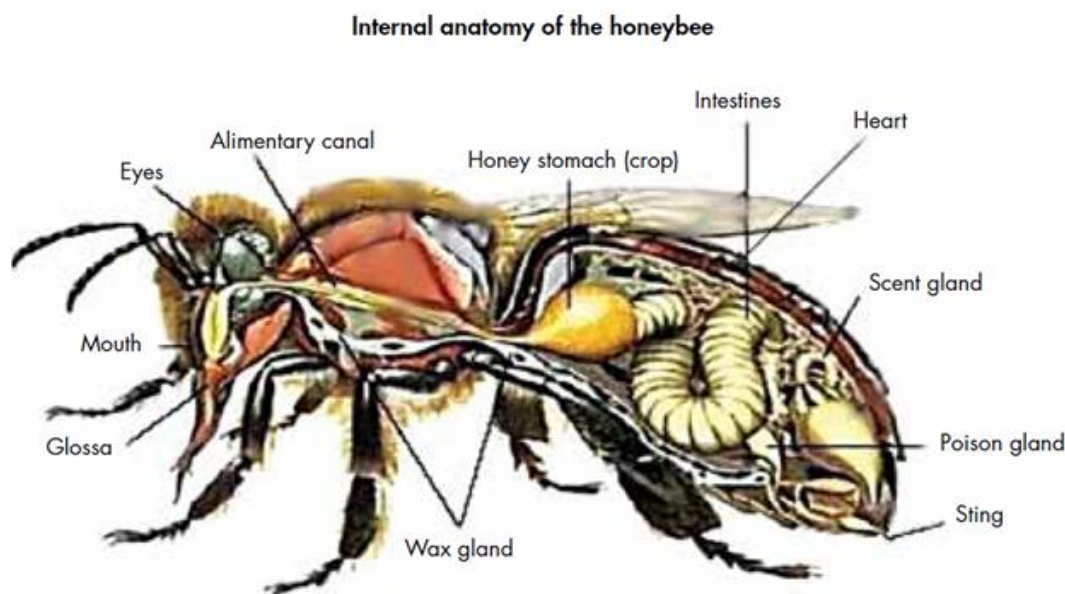
around 12 to 20 mm long, oval shaped, golden yellow coloured with brown bands on body. Although body colour of bees may be different and it varies species to species.<sup>[2]</sup>

### **Anatomy of Honey Bee**

Segmented type honeybee body consist head, thorax and abdomen. The head of honey bee have a set of eyes i.e. compound eyes and simple eyes along with antennae, mandible and feeding structures. Compound eyes are used by bees for identifying color, light and directional information from the sun's UV rays, while the function of the simple eye, also called ocelli, helps in determining the amount of light present. The antenna's function is to smell and detect odors and to measure flight speed. The mandible is the bee's jaw, which is used for eating pollen and making breads, cutting and shaping wax, feeding larvae and the queen, cleaning the hive, grooming and fighting.

The thorax of the bee consists of the wings, legs and the muscles that control their movement. The forewing, which is typically larger than the hind wing, is used for flight and as a cooling mechanism, while the latter is used to fan away heat and cool the hive.

Lastly, the abdomen's six segments include female reproductive organs in the queen, male reproductive organs in the drone and the stinger in both workers and queen.<sup>[3]</sup>



**BEE'S Organ and Their Function**<sup>[4,5]</sup>

| Structure of organ            | Location                      | Function  |
|-------------------------------|-------------------------------|---|
| head glands                   | front of the head             | produce brood food and royal jelly  |
| wax glands                    | under the abdomen             | produce wax   |
| odor glands                   | near upper tip of the abdomen | produce scent to orientate bees when the colony is disturbed  |
| sting and poison sac          | tip of the abdomen            | defend the colony by injecting venom  |
| long tongue                   | Head                          | gathers nectar  |
| honey stomach                 | enlarged aera of esophagus    | carries nectar and water  |
| pollen comb, press and basket | hind legs                     | comb pollen from the body, press it into pellets, and carry it to hive. Also used to carry propolis |

**Apitherapy Through Bee Products:** Apitherapy is originated from ancient Egypt, Greece and China. In every religious book either it may Veda or Bible or Quran, honey has mentioned as a medicine for wound treatment and healing. At the same time, In the Old Testament, the land of Israel was often referred to as the “land flowing of milk and honey.” The Romans also used honey to heal their wounds after battles.

In ethno medicine which is a study of traditional medicine practiced by ethnic group describes use of different bee products in its branch called animal Ethno medicine. It applies the methods of ethno botany and medical anthropology. Despite technological developments, bee products along with herbal drugs still occupied a unique place in a majority of the population in the Third World and terminal patients in the west. Many valuable drugs of today came into use through the study of indigenous remedies. Bee products in their raw form along with crude extracts and purified compounds from them have been shown to exhibit antimicrobial, anti-inflammatory, antioxidative, radio-protective, and tissue-regenerating activities.<sup>[6]</sup> Few basic bee products and its medicinal uses are.

**i) Nectar:** Bee loving high sucrose liquid available in flora is called nectar, It's basically initial stage of honey before evaporation. It's a high source of carbohydrate and now a day it's using by people for their healthy diet.<sup>[7]</sup>

**ii) Honey:** Honey is a complex mixture made by nectar and sweet deposits from plants and trees are gathered, evaporated and stored in honeycomb by honeybees.<sup>[7]</sup> Honey has high levels of monosaccharide, fructose, glucose and it contains about 70 to 80% sugar, which is cause of its sweetness. Honey also has antiseptic and antibacterial properties. Modern medical science has managed to find uses for honey in chronic wound management and combating infection.<sup>[8]</sup>

**iii) Beeswax:** Worker bees at young age secrete beeswax from its wax gland situated at bottom portion of abdomen. Secretion of bee wax is produced for repairing and building honeycomb. Application and use of bee wax are far better than petroleum wax. Apart from using beeswax for making candles or skin moisturizer, it is being used for reducing cholesterol and relieving pain. It is also treating ulcers, diarrhea, hiccups and inflammation.<sup>[9]</sup>

**iv) Pollen:** For feeding to bee colony, bee collects pollen from flowers and carry it back to honeycomb using pollen basket equipped with their leg. This bee pollen contains vitamins, minerals, carbohydrates, lipid and proteins. Bee pollen is available at many health food stores. You may find bee pollen in other natural dietary supplements, as well as in skin softening products used for baby's diaper rash or eczema.<sup>[9]</sup>

**v) Royal jelly:** The worker nurse bee secretes royal jelly from its hypopharynx glands. This is fed to the larvae of queen, worker and drone bees. It typically contains proteins, sugar, fats, vitamins, salts, amino acids and moisture. Royal jelly is being used for asthma, hay fever, liver disease, type 2 diabetes, diabetic foot ulcers, insomnia, fatigue, premenstrual syndrome, infertility, pancreatitis, menopausal symptoms, stomach ulcers, kidney disease, bone fractures, menopausal symptoms, skin disorders, and high cholesterol. It is also used as a general health tonic, for fighting the effects of aging, and for boosting the immune system. Some people apply royal jelly directly to the skin as a tonic or to the scalp to encourage hair growth.<sup>[9]</sup>

**vi) Bee hive Air:** One of the most amazing therapy using now a days is inhaling smell of honey bee air which creates through blowing wings of honey bees during honey flow period. Natural therapist using such a circulated bee hives air to treat asthma and it is being possible by making an arrangement for a patient to inhale hive air by covering his nose in a mask with honeycomb.<sup>[7]</sup>

### **Apitherapy Through Bee Venom**

Apitherapy through bee venom or bee sting is a matter of study and it seems that it will be beneficial in treatment of many complicated diseases. Honey bee venom is being used from long time by different cultures and countries. In ancient China and Europe, bee stings were using by their emperors regularly for getting relief from pain. Modern medicinal science is also tending to use bee venom as an alternative medicine and forming different drugs and therapy to treat illness. Eastern Europe is popularly using bee venom today for treatment of chronic inflammatory disease. On this method, beekeepers isolate bees and provoked it to sting on patient's affected area.<sup>[10]</sup>

In a natural phenomenon, Bee venom injects by bees on human skin through sting during its defending mechanism for protecting their colony. Bee venom which is also known as apitoxin is a transparent and colourless liquid containing proteins that can lead to localized inflammation or swelling and in extreme case, severe allergic reaction. Collection of bee venom from bees on stinger or poison sac inside abdomen is possible through specially made venom extraction machine. It extracts or milk bee venom without harming the bees just by putting very little electrical current on its sting.<sup>[7]</sup>

Peptides in the venom, principally mellitin and the less idealistically named peptide-401, inhibit the inflammatory response by a combination of actions. They stimulate the production of cortisol, as well as stabilizing mast cells. Different Studies have also recommended that mellitin may inhibit the expression of inflammatory genes that cause the painful tissue swelling in rheumatoid arthritis. Recent research has shown that modifying mellitin can greatly improve the effectiveness of liposome-encapsulated target drugs commonly used in cancer treatment. A variety of modified mellitin proteins were tested to achieve a compound stable enough to be inserted into liposomal nano particles and then into living cells without altering or causing damage to them. Various therapeutic agents were then attached to the protein, which acts as a transporter agent, allowing enhanced therapeutic effects by targeting specific cells, such as groups of tumor cells.<sup>[10]</sup>

**Medicinal Effect of Bee Venom:** Some of the important medicinal effects which have been observed on different studies are briefing here.

**1) Anticoagulation Effect:** Bee venom is a complex mixture of proteins such as phospholipase and melittin, which have an effect on blood clotting and blood clots. Study has been carried out with *Apis mellifera* type honeybees to see action of honey bee venom on human plasma proteins and its anti-thrombotic effect. On investigation, crude venom has obtained from *Apis mellifera* type bees and its anti-coagulation factor was purified by using gel filtration chromatography (sephadex G-50), and the molecular weights of the anti-coagulants in this venom estimated by using sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE). Blood samples were obtained from 10 rabbits, and the prothrombin time (PT) and the partial thromboplastin time (PTT) tests were conducted. The approximate lethal dose (LD) values of BV were determined. Crude BV increased the blood clotting time. Clotting was not observed even at more than 300 seconds.<sup>[11]</sup>

## 2) Anti Bacterial Effect

Mellitin, a major component of bee venom, is more active against gram positive than gram negative bacteria. Moreover, Bee venom has been reported to have multiple effects, including antibacterial, antiviral, and anti-inflammation effects, in various types of cells. In addition, wasp venom has been reported to have antibacterial properties. With different concentration tested, bee venom was found to have a significant antibacterial effect against *E. coli*, *S. aureus*, and *Salmonella typhimurium*. BV inhibits the growth and survival of bacterial strains and that venom can be used as a complementary antimicrobial agent against pathogenic bacteria. Bee venom lacked the effective proteins necessary for it to exhibit antibacterial activity for some specific strains while being very effective against other specific strains. Bee venom have a specific mechanism that allows it to have an antibacterial effect on certain susceptible bacteria.<sup>[12]</sup>

**(3) Therapeutic Applications:** Bee venom is a very complex mixture of natural products extracted from honey bee which contains various pharmaceutical properties such as peptides, enzymes, biologically active amines and nonpeptide components. The use of bee venom into the specific points is so called bee venom therapy, which is widely used as a complementary and alternative therapy for 3000 years. A growing number of evidence has demonstrated the anti-inflammation, the anti-apoptosis, the anti-fibrosis and the anti-arthrosclerosis effects of bee venom therapy. With these pharmaceutical characteristics, bee venom therapy has also been used as the therapeutic method in treating rheumatoid arthritis, amyotrophic lateral sclerosis, Parkinson's disease, Alzheimer's disease, liver fibrosis, atherosclerosis, pain and others. Although widely used, several cases still reported that bee venom therapy might cause some adverse effects, such as local itching or swelling.<sup>[13]</sup>

**(4) Potential Efficacy of Bee Venom Acupuncture:** Bee venom acupuncture is a form of acupuncture in which bee venom is applied to the tips of acupuncture needles, stingers are extracted from bees, or bees are held with an instrument exposing the stinger, and applied to acupoints on the skin. Bee venom is a complex substance consisting of multiple anti-inflammatory compounds such as melittin, adolapin, apamin. Other substances such as phospholipase A2 can be anti-inflammatory in low concentrations and pro-inflammatory in others. However, bee venom also contains proinflammatory substances, melittin, mast cell degranulation peptide 401, and histamine. Nevertheless, in small studies, bee venom acupuncture has been used in man to successfully treat a number of musculoskeletal diseases



such as lumbar disc disease, osteoarthritis of the knee, rheumatoid arthritis, adhesive capsulitis, and lateral epicondylitis. Bee venom acupuncture can also alleviate neurological conditions, including peripheral neuropathies, stroke and Parkinson's disease.<sup>[14]</sup>

#### **(5) Bee Venom Effect Against HIV**

The toxin melittin, a peptide in bee sting venom, could serve as a prophylactic against HIV when applied prior to sexual activity, according to a new study. This approach could potentially destroy HIV by creating holes in the envelope that surrounds the virus. Although melittin can kill viruses, it is a cytolytic, which means it can destroy cells by increasing their permeability. Unfortunately, this negatively affects both the virus and important human cells, according to *Itech Post*. The results of a study conducted by investigators from Washington University, found that by attaching melittin to complex nanoparticles, it allows the compound to selectively target HIV without affecting non-viral cells. The investigators infused the nanoparticles with the bee venom toxin. A protective bumper was then added to the nanoparticle's surface, which allowed it to bounce off normal cells and leave them intact, according to *Itech Post*. When the melittin on the nanoparticles fuses with the viral envelope, it forms pore-link attack complexes that rupture the envelope and strips it off the virus, according to Joshua L. Hood, MD, PhD, as reported by *Itech Post*. Hood noted that the approach could lead to the development of a vaginal gel that stops HIV transmission, and even an intravenous treatment to help individuals already infected with HIV.<sup>[15]</sup>

#### **CONCLUSION**

In conclusion, with the present knowledge of bee venom components and toxicity and evidences gathered from sufficient number of studies, it is revealing that Bee venom has a significant medicinal effect. However the effectiveness of bee venom in treatment of cancer, HIVs and few kind of arthritis is likely to be a subject of further researches. At the same time we should move towards combine application of bee venom therapy and medication for relieving rheumatoid arthritis. Even the pharmacological basis behind bee venom therapy is not fully understood, there are suggestions that bee venom has a number of pharmacological actions including analgesic, anti inflammatory and anti cancer actions through multiple mechanism.

#### **REFERENCES**

- 1 <https://www.worldatlas.com/articles/the-seven-species-of-honey-bees-living-today.html>.
- 2 <https://www.orkin.com/stinging-pests/bees/honey-bees/>.

- 3 <http://www.loudounbee.org/gallery/image/3-anatomy-of-the-honey-bee/>.
- 4 Textbook “Beekeeping guide by AHA Beekeeping Bhilai.
- 5 Textbook Beekeeping guide by National Bee Board.
- 6 <https://www.hindawi.com/journals/ecam/si/191798/cfp/>.
- 7 <https://saveourbees.com.au/bee-products/>.
- 8 <https://www.medicalnewstoday.com/articles/264667.php>.
- 9 <https://www.webmd.com/vitamins/ai/ingredientmono-305/beeswax-beepollen> - royal jelly.
- 10 <https://www.pharmaceutical-journal.com/opinion/blogs/bee-venom-and-its-various-uses/11046414.blog?firstPass=false>.
- 11 <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4797586/>.
- 12 Zolfagharian H<sup>1</sup>, Mohajeri M<sup>2</sup>, Babaie M<sup>3</sup> Research article :Bee Venom (*Apis Mellifera*) an Effective Potential Alternative to Gentamicin for Specific Bacteria Strains: Bee Venom an Effective Potential for Bacteria, <https://www.ncbi.nlm.nih.gov/pubmed/27695631>.
- 13 Zhang S<sup>1</sup>, Liu Y<sup>1</sup>, Ye Y<sup>2</sup> Bee venom therapy: Potential mechanisms and therapeutic applications, ncbi Epub 2018 Apr 11, <https://www.ncbi.nlm.nih.gov/pubmed/29654868>
- 14 Cherniack EP<sup>1</sup>, Govorushko S<sup>2</sup>, To bee or not to bee: The potential efficacy and safety of bee venom acupuncture in humans, Epub 2018 Sep 28. [www.ncbi.nlm.nih.gov/pubmed/30268393](http://www.ncbi.nlm.nih.gov/pubmed/30268393).
- 15 <https://www.specialtypharmacytimes.com/news/bee-venom-potential-key-to-hiv-cure>.