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**ENTOMOLOGY**

# Insect-Based Medicines: A Review of Present Status and Prospects of Entomo-Therapeutic Resources for Human Ailment

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**Abstract**

Insects and products derived from them have been consistently used as medicinal resources by human civilizations all over the world. The immunological, analgesic, antibacterial, diuretic, anesthetic and anti rheumatic property in the bodies of insects is now well recognized; however the immense scope for its exploration still remains untapped. The chemicals generated by insects for self defense can be used as medicinal drugs of enormous potentiality. Insects have long been utilized as significant dietary factor and remedy for illnesses in folk tradition. Such entomotherapeutic potential of insects can also make important contribution in conserving the biodiversity of insects. At present, insect based medicines are gradually on the rise and gaining popularity and relevance. Products based on insect-derived substances with conventional technologies will help in yielding further benefits. This review collates the most important works conducted on insects used for different medicine and includes a discussion of the potentialities of such medicines.

**Highlights**

- Insects and their products seem to constitute an almost inexhaustible source of pharmacological research

**Keywords:** Entomotherapy, Ailment, Medicine, Potentiality

Human beings have been using animal resources for therapeutic purposes since ancient times (Rosner, 1992; Souza-Dias, 1995; Unnikrishnan, 1998) where folk remedies were elaborated from parts of the animal body, from products of its metabolism, such as corporal secretions and excrements, or from non-animal materials such as nests and cocoons. Since early times, insects and their products have been used, directly and indirectly, in the medical systems of different human cultures throughout the world (Costa-Neto, 2002). Insects have proven to be very important as sources of drugs for modern medicine since they have immunological, analgesic, antibacterial, diuretic, anesthetic, and antirheumatic properties (Yamakawa, 1998). The use of insects in folk medicine has been particularly common in China and in the State of Bahia in Brazil (Costa-Neto, 2002; Feng *et al.,* 2009) but is also present in many other counties including Mexico, India, Africa and South Korea (Pemberton, 1999; Costa-Neto, 2005; Dossey, 2010). An estimated 300 insect species are used to produce 1700 traditional Chinese medicines while 42 species have been used in Bahian Folk Medicine (Costa-Neto, 2002; Feng *et al.,* 2009). Recently, this fact has been recognized by a number of companies set up to exploit natural products from insects utilizing modern molecular and biochemical techniques (Ratcliffe *et al.,* 2011). The search for new pharmaceuticals from naturally occurring biological material has been guided by ethnobiological data

(Blakeney, 1999). The investigation of folk medicine has also proven a valuable tool in the developing art of bioprospecting for pharmaceutical compounds (Kunin and Lawton, 1996). The commercial value of products based on insects comprises about US$ 100 million per year (Themis, 1997). Insects, thus, represent an inexhaustible source for pharmaceutical substances of the future (Ratcliffe, 2011).

## The History of Entomotherapy

Insects and their life activity products are widely used in traditional medicine since antiquity (Ying, 2009; Dossey, 2010). Insects have been relatively neglected as sources of modern drugs although they have provided valuable natural products, including honey (bee-wax, propolis, pollen and Royal Jelly) and silk, for at least 4-7000 years (Crane, 1983), and have featured in folklore medicine for thousands of years too (Feng *et al.,* 2009). The Maya, for example, are said to have used maggots for therapeutic purposes a thousand years ago (Zimmer, 1993). These larvae feed on dead tissue where gangrene-causing bacteria thrive. Several authors have recorded the use of insects as medicines (Costa-Neto, 2002). Insect body extracts have been used widely in folk medicine, and in Chinese traditional medicine, for treating throat and ear infections, tuberculosis, influenza, cancer and many other diseases and ailments (Pemberton, 1999; Costa-Neto, 2002; Feng *et al.,* 2009).

In China, insects from 77 species, 14 families and 8 orders have been traditionally used to treat tumours and cancer (Jiang, 1990). Bee and wasps venom first experimentally licensed by the U.S. FDA in 1976 & fully licensed in 1980. In Brazil, insects have been medicinally used by indigenous society for millennia and by descendants of the European settlers and African slaves for the last five centuries (Costa-Neto, 2002). Silkworms (*Bombyx mori* L. 1758) have been used in Chinese traditional medicine for at least three thousand years (Zimian *et al.,* 1997) and the larvae of certain flies have been recognized for centuries as beneficial agents for the healing of infected wounds (Sherman *et al.,* 2000). Thus, entomotherapy has been reported since colonial times (Piso, 1957).

## Present Status of Therapeutic Use of Insect

Meyer-Rochow *et al*., (2013) noted in their review article on the loss of traditional knowledge among the most ethnic people in the world. They mentioned the abandonment of the rich traditional knowledge insects, including therapeutic uses of insects in medicinal potions and remedies, before such uses have been recorded. At the same time as there is increased popularity of ethnical foods in the western world. (Fritzsche and Gitsaga 2002; Meyer-Rochow *et al*., 2008). The Pacific Science Congress in Korea in 1987, the International Conference on Mini livestock in Beijing in 1995, FAO symposium in Chiang Mai on edible forest insects in 2008 were some of the symposia and conferences that resulted in the focus on insects and their many uses.

It emphasized how insects play a greater role as a possible food resource for humankind and also serve as a raw material for certain drugs and medicines. Getting to understand food insects and therapeutically significant insect species can lead to economic generation and would allow countries like India to develop ways to sustainably use this abundant natural resource (Meyer-Rochow *et al*., 2013).

Insects have been extensively used all over the past for medical dealing on nearly every continent, moderately little medical entomological study has been conducted since the revolutionary arrival of antibiotics. Arthropods represent a rich and largely unexplored source of new medicinal compounds (Dossey 2010). A large number of studies have been carried out by the scientist on the composition of chemical which are present in insect body, used to treat various disease like venom present in honeybee, wasps; cantharidin produced by blister beetle for treating cancer etc. In January 2004, the U.S. Food and Drug Administration (FDA) granted permission to produce and market maggots for use in humans or animals as a prescription-only medical device for the following indications: "For debriding non-healing necrotic skin and soft tissue wounds, including pressure ulcers, venous stasis ulcers, neuropathic foot ulcers, and non-healing traumatic or post-surgical wounds (*Roach et al., 2016; Heitkamp et al., 2013).*

While we evaluate about a range of insects used as medicine dating from ancient beliefs to traditional practices to modern scientifically proved benefits, we assume, must we consider entomotherapy for modern medicine?

## Honey Bee and Wasps

Honey bee and wasp venom are used for cancer and all sorts of infections tuberculosis, flu and colds. Honey products for treating wounds and infections, bee sting therapy treats illnesses from arthritis to cancer in many countries. *Apis mellifera* has become increasingly popular as a meridian therapy in many nations. In addition, there are reports of increased granulation tissue in wounds treated with honey (Moran, 1999), and after incubation of epidermal keratinocytes with honey, of the stimulation of TNF-a, IL-1b and TGF-b and matrix metalloproteinase-9 (MMP-9) cytokines which are involved in the re-epithelialization of skin wounds (Majtan *et al.*, 2010). Real progress in understanding the healing properties of honey and royal jelly was made when scientists identified, using murine macrophage cultures, that a major protein from these honey bee products, apalbumin, stimulates the release of the cytokine TNF alpha (Majtan *et al.*, 2006). TNF-alpha is an inflammatory cytokine involved in tissue repair and regeneration and is produced by monocytes.

Morphological changes of PANC-1 human pancreatic cancer cells (white arrow: nucleus fragmentation and condensation; black arrow: membrane bleb) in NDM (nutrient-deprived medium) after 24 h exposure with 6.25 mM of compound 1 from propolis. Bee venom therapy has been used in Chinese medicine, as well as in ancient Greece and Egypt, for thousands of years for the treatment of arthritis, rheumatism, other auto-immune diseases, cancer, skin diseases, pain and infections (Chen and Lariviere, 2010).

## Fruit Fly

Fruit fly is the insect which can detect one of the treacherous diseases which we called "cancer". Cancer cells exhibit a metabolism that is fundamentally altered as compared to that of normal cells (Tennant *et al.*, 2010; Ward *et al.*, 2012), leading to changes in the tumor's microenvironment, in lipid peroxidation activity (Singer *et al.*, 1972; Kneepkens *et al.*, 1994) and to a variety of potential intra- and extracellular cancer-specific markers. Thus, quantitative and qualitative variations of metabolites provide important information on cell conditio. In the fruit fly *Drosophila melanogaster* there are about 50 different types of olfactory receptor expressing olfactory receptor neurons. The expressed type of olfactory receptor defines the characteristic spectrum of ligands the olfactory receptor neuron will respond to (Hallem *et al.*, 2004). A particular odour elicits an ensemble response which consists of the differentially activated, inhibited or non-activated olfactory receptor neurons (Hallem *et al.*, 2004; Galizia *et al.*, 2010). Scientists, thus,

**Table 1:** Summary of major components of bee, wasp venom with potential for development as drugs

| Insect | Component | Activity | % venom | References |
|---|---|---|---|---|
| Honey bee, wasp | Melittin peptide | Kills bacteria and cancer cells,anti-inflammatory | 40-60 in bee | Gevod and Birdi, 1984 |
| Bumble bee | Bombolitins peptide | Antimicrobial | Major peptide | Choo *et al.*, 2010 |
| Honey bee, wasp | Apamin peptide | Treat muscular dystrophy and kill tumours | 2-3 | Lange *et al.*, 1994; Son *et al.*, 2007 |
| Honey bee, bumble bee | Mast cell degranulation peptide (MCD) | Analogues inhibit allergies | 2-3 | Argiolas *et al.*, 1985 |
| Honey bee, bumble bee, wasp | Hyaluronidase enzyme | Enhance cancer chemotherapy | 1.5-2 | Son *et al.*, 2007; Monteiro *et al.*, 2009; Hoffman, 2010 |
| Honey bee | Adolapin and other polypeptides | Analgesic and anti-inflammatory | 1 | Chen and Lariviere, 2010 |
| Honey bee bumble bee, wasp | Phospholipases A1 | Kills cancer cells and inhibits malaria | 10-12 | Monteiro *et al.*, 2009 |
| Wasp | Phospholipases A1 | Sting diagnosis and immunotherapy | 6-14 | Monteiro *et al.*, 2009 |
| Wasp, bee | Kinins e.g. bradykinin and other neurotoxins | Pain control and neurological diseases | Major peptides in some species | Mendes and Palma 2006; Mortari *et al.*, 2007 |

investigated the potential of utilizing the fruit fly's olfactory system to detect cancer cells and they recorded an array of olfactory receptor neurons on the fruit fly's antenna. Detection of cancer odours with artificial chemosensing systems has been demonstrated before, *e.g.* by GC-MS, by metalloporphyrin coated quartz microbalances or by gold nanoparticle sensor. While sensor arrays can provide real-time responses, gas chromatography is only sequential and often requires preconcentrating the samples in order to achieve sufficient sensitivity. Electronic noses are not yet universal detectors, and they are usually limited in their receptive range and their sensitivity (Rock *et al.,* 2008). Even though the Drosophila sensor array is bound to be limited in its receptive range as well, harnessing the capabilities of biological sensor systems can ultimately lead to sensitive chemosensors with a broader receptive range than available today, and it might help to complement existing electronic noses, filling the gaps that cannot be reached by artificial systems.

## Maggots

Studies of cellular and humoral immunity of the blow fly *Calliphora vicina* maggot revealed three groups of pharmacologically active substances that are use in medicine: alloferons, allostatins, and antimicrobial peptides. Alloferons are the *C. vicina* peptide family selectively stimulating cytotoxic activity of the natural killer cells, an evolutionary ancient group of immune competent cells playing the key role in antiviral and antitumoral immunity of mammals (Chernysh *et al.,* 2004). Alloferons are used in medicine for treatment of herpes, viral infections and viral hepatitis *B. allostatins* are synthetic peptides combining structural characteristics both of alloferons and of some mammalian immunoactive proteins. Allostatins, like alloferons, stimulate cytotoxic activity of the natural killer cells and interferon production, but, unlike alloferons, have pronounced adjuvant properties, i.e. the ability to enhance immune recognition of alien (non-self) antigens (Terme *et al.,* 2008). At present, allostatins are used to enhance resistance of skin and mucous membranes to viral infections; in future, they might find use in immunotherapy of cancer and other diseases. One more group of proteins and peptides of the *C. vicina* maggot immune response, which are promising for use in medicine, serve antimicrobial peptides. The study of the preparation whose composition includes defensins, cecropins, diptericins, and proline-rich peptides of *C. vicina* show that this type of drugs has great potential for treatment and prevention of antibiotic-resistant infections. Fly larvae aid in wound *via* number of mechanism through release antibacterial substance larvae eat necrotic tissue that would otherwise form a nidus for infection, ingested bacteria are destroyed within maggots, larval secretion break the adhesion molecule, fibronectin and collagen into smaller molecule (Horobin *et al.,* 2003).

## Ant

The South American tree ant, *Pseudomyrmex* sp. commonly called as the samsum ant has venom which possesses many pharmacological effects such as reducing inflammation, relieving pain, inhibition of tumor growth, hepatitis treatment, liver protection (Altman *et al.,* 1984). According to Bai *et al.,* (2003), solenopsin A, a primary alkaloid obtained from fire ant *Solenopsis invicta* exhibits anti angiogenic activity; this toxin has the ability to inhibit a series of kinases involving in angiogenesis mechanism. *Polyrachisla mellidens,* a medicinal ant used in Chinese medicine, was confirmed to exert potent analgesic and anti-inflammatory actions. Its therapeutic efficacy in the treatment of various inflammatory disorders had been reported (Kou *et al.,* 2005). Weak vision was treated with ant eggs mixed with an equal amount of white flour to make dough (Gudger, 1925). Most of the native healers used ants. Ants were put into canvas bags and put around the legs of paralyzed (Attygalle, 1989).

## Silkworm

Silkworms have been used for detoxification and treating bacterial infections causing sore eyes, swollen throat and loss of speech, as well as for impotence (Ahn *et al.,* 2008). *Bombyx mori* pupae have been used to extract a vaso relaxation substance, a dimethyladenosine compound, which inhibits phosphodiesterase and greatly enhances nitric oxide (NO) production in endothelial cells. This compound is a pharmaceutical candidate for development to treat vasculogenic impotence in men (Ahn *et al.,* 2008). In addition, *B. mori* larvae have been used as bioreactors to express high levels of the antioxidant, Mn-superoxide dismutase,

**Table 2:** Summary of anti-bacterial and anti-cancer factors produced by Dipteran larva

| Maggot factors | Dipteran species | Activity against | References |
|---|---|---|---|
| | Antimicrobial peptides | | |
| Sarcotoxin 1A | *Sarcophaga peregrina* | Gram-negative bacteria | Natori, 2010 |
| Sapecin B | *Sarcophaga peregrina* | Gram-positive bactéria, MRSA, fungi, cancer cells | Natori, 2010 |
| Defensin A | *Phormia terranovae* | Gram-positive bacteria | Dimarcq *et al.*, 1990 |
| Lucifensin | *Lucilia sericata* | Gram-positive bacteria, MRSA | Andersen *et al.*, 2010 |
| | **Smaller antimicrobial factors** | | |
| Alloferon 1<br>Alloferon 2 | *Calliphora vicina* | Viruses and anti-cancer with cytokine activity | Chernysh *et al.*, 2002 |
| p-hydroxybenzoic acid p-hydroxyphenylacetic acid Octahydro-dipyrrolo [1,2-a;10,20-d] [1,2-a;10,20-d] | *Lucilia sericata* | Bacteria | Huberman *et al.*, 2007 |
| Seraticin | *Lucilia sericata* | Bacteria, MRSA | Bexfield *et al.*, 2008 |
| 5-S-GADa | *Sarcophaga peregrina* | Bacteria and anti-cancer | Leem *et al.*, 1996 |

then vacuum dried at 56 and homogenised to produce a powder. This silkworm powder has subsequently been used to treat mice and shown to enhance various immune parameters such as activation of NK cells to effectively inhibit hepatoma 22 tumours in vivo. Treatment of mice with the silkworm powder is totally non-toxic, in contrast to chemotherapy drugs normally used, so that this antioxidant powder provides a potential new medicine for development in the future (Yue *et al.*, 2009). Silk-based nanoparticles containing curcumin have been shown to have potential for treating breast cancers in vivo (Numata and Kaplan 2010), and gel films have been made from sericin and successfully tested as wound dressings (Teramoto *et al.*, 2008).

## Blister Beetle

Cantharidin, a defensive secretion which is synthesised by some coleopteran species belonging to the Meloidae (Dixon *et al.*, 1963, Capinera *et al.*, 1985; Blodgett *et al.*, 1991, Carrel *et al.*, 1993, Dettner 1997; Hemp *et al.*, 1999 a,b; Gullan and Cranston, 2010) and Oedemeridae (Carrel *et al.*, 1986 a,b, Nicholis *et al.*, 1990, Samlaska *et al.*, 1992, Holz *et al.*, 1994, Frenzel and Dettner, 1994) in which it occurs in the haemolymph and other tissues (Carrel and Eisner, 1974; Young, 1984; Bologna 1991a,b; Dettner *et al.*, 1997). Those beetles producing cantharidin are often termed "blister beetles" as cantharidin is a toxic terpenoid (exo, exo-2, 3- dimethyl-7-oxabicyclo [2.2.1] heptane-2,3-dicarboxylic acid anhydride. In China it is used for the treatment of cancer for over 2000 years (Wang, 1989). Cantharidin or its derivatives have been shown to kill a variety of tumour cells in vitro as well as in animal models in vivo including hepatomas (Mack *et al.*, 1996; Chen *et al.*, 2003), leukaemia (Dorn *et al.*, 2009), breast cancer (Huang *et al.*, 2009), melanoma (An *et al.*, 2004), bladder and gall bladder carcinomas (Huan *et al*, 2006), colorectal carcinoma (Peng *et al.*, 2002) and pancreatic cancer (Li *et al.*, 2010). Research has shown that cantharidin is a selective inhibitor of protein phosphatase 2A (PPA2), arresting the growth of cancer cells at the G2/M phase so that they enter mitosis but then undergo apoptosis. Particularly important is the ratio between the proteins produced by the pro-apoptotic Bax gene and the anti-apoptotic Bcl-2 gene as these have been shown to be significant regulators of cell proliferation and apoptosis (Huang *et al.*, 2009).

## Grasshopper

The hind legs of grasshoppers were crushed and mixed with water, then drunk as a influential diuretic to treat kidney diseases. The mixture, which is said to have refreshing properties, reduces swelling**,** (De asis, 1982) rural people in the State of Oaxaca today use grasshoppers to treat certain intestinal disorders. (Conconi and Moreno, 1998). Grass hopper is also used to treat violent headaches: the healer crushes the dry grasshoppers and ashes, mixes the ashes of the grasshopper with a little organic salt, and makes incisions on the nape and front of the patient. He then applies the solution to the incisions (Antonio, 1994). This treatment sting sand the patient must sleep a lot. Duration of treatment is at least three days. In addition, the powder of a whole toasted or sun-dried grasshopper is turned into a tea for the treatment of asthma and hepatitis (Costa-Neto, 2002).

## Termite

From a serviceable standpoint, termites are commonly used insects in traditional popular medicine (Alves *et al.*, 2011; Solavan *et al.*, 2006; Coutinho *et al.*, 2009; Lima *et al.*, 2010). A total of 45 termite species belonging to four families were recorded as being used by human populations, with 43 species used in the human diet or for livestock feeding and nine species used as a therapeutic resource (Figueirêdo *et al.*, 2015). Different species of termites are used to treat various diseases that affect humans health. For *e.g. Microcerotermes exiguous used for* asthma, bronchitis, influenza, whooping cough, flu (Alves *et al.*, 2009; Alves *et al.*, 2011). *Nasutitermes macrocephalus* is used to treat asthma, leakage, bronchitis, 'catarrh in the chest' coughs, influenza, sore throat, sinusitis and tonsillitis ( Lima *et al.*, 2010; Alves *et al.*, 2008 )

## Cricket

Crickets legs were prepared like those of grasshoppers just crushed and mixed with water and were employed as a diuretic for dropsy (edema). (Barajas, 1952; Conconi, 1982; De Asis, 1982). In southwestern Nigeria, for *e.g.* an infected foot is treated by smearing and rubbing the gut contents of mole crickets (*Gryllotalpa Africana* Beauvois) on it (Fasoranti, 1997). In some places crickets (*Brachytrupes* sp.) are also consumed as food items in order to aid mental development and for pre and post-natal care purposes (Banjo *et al.*, 2003).

## Mealy Bugs

Mealy bugs can be considered a versatile medicinal

**Table 3:** Other common insects mentioned as folk medicines in different human cultures

| Common Name | Scientific Name | Disease Treated | Refference |
|---|---|---|---|
| Locust | — | post childbirth anemia, lung diseases, e.g., asthma and chronic cough | Conconi and Moreno, 1998 |
| Pod borer | *Helicoverpa armigera* | Panacea | Oudhia, 2002 |
| Weevil | | Stomach pains | Green,1998 |
| May beetle | *Melolontha vulgaris* | Scratches, anemia, rheumatism | Ratcliffe,1990 |
| House fly | *Musca domestica* | Eye cysts, baldness | Metzner, 2002; Costa-Neto and Oliveira, 2000 |
| Cicada | *Huechys sanguinea* | Migraine headache, ear infection | Kritsky, 1987 |
| Red velvet mite | *Trombidium grandissimum* | Malaria, urogenital disorders, parlaysis, aphrodisiac | Oudhia, 2002 |
| Cattle tick | *Boophilus microplus* | Chickenpox | Morge, 1973 |
| Ground beetle | *Scarites spp.* | Suture wounds | Gudger, 1925 |
| Peanut beetle | *Palembus dermestoides* | Asthma, arthritis, tuberculosis, sexual impotence | Costa-Neto, 1999 |
| Ghost moth | *Hepialus oblifurcus* | Fortifier | Steinkraus and Whitfield, 1994 |
| Giant skipper | *Aegiale hesperiaris* | Rheumatism, aphrodisiac | Maya, 2000 |
| Palm beetle | *Pachymerus nucleorum* | Earache | Marques and Costa-Neto, 1994 |
| Mud wasps | *Synagris spp. and Sceliphron spp* | Provide lime to the fetus | Adriaeus, 1951 |
| Stingless bee | *Trigona spinipes* | Cough, Acne | Costa-Neto, 1996; Costa-Neto and Oliveria, 2000 |

and useful insect. In addition to their utilization as an ointment, (Jenkins, 1964) varnish, or perfume, whole insect bodies were boiled to produce a sticky mass which was placed over lesions of leprosy and other skin conditions and to treat muscular pain, chronic itching, mange bum, or scars. It aids in the healing of burns through reducing excessive swelling and inflammation and thus is said to be helpful in heat strokes and diseases of fluid imbalance such as dropsy. (Herrera, 1871) reported the mass of boiled mealy bugs was sometimes ingested to alleviate the affects of poisonous mushrooms and other fungi, or diarrhea and to clean the teeth. *Dactylopius coccus*, known as "grana" mealybug, is mostly used as an agent to color or redden tissue or foods. It, too, can be boiled to produce a sticky mass and used, as discussed above, as a skin treatment, a tooth powder to dean teeth and in the treatment of caries. (Lopez, 1971; Mexa, 1979).

## Stink Bug

The oil of the bugs obtained from its body was applied externally in treating Scrofula and other tubercular diseases and was also used for kidney, liver, and stomach ailments. When alive, these bugs are a powerful analgesic and anaesthetic against toothache and rheumatic and arthritic pain or to alleviate gastrointestinal diseases. (Conconi and Moreno, 1998) It was also used to treat goiter and was recommended for those with a weak constitution and as an aphrodisiac (Ancona, 1933; De Asis, 1982; Taylor, 1975). Contemporary people of rural areas in the State of Guerrero use them against Bocio disease, perhaps because of the large amount of iodine they contain. (Conconi and Moreno, 1998)

## Cockroach

Lee *et al.,* (2011) reported that tangled up in the heads of cockroaches are chemical compounds that can kill *Escherichia coli* and Methicillin-resistant Staphylococcus aureus (MRSA) two harmful bacteria. *E. coli* can cause vomiting, diarrhea, respiratory problems and pneumonia. One type of *E. coli* can also cause meningitis. MRSA can be bad, too. MRSA stands for methicillin-resistant *Staphylococcus aureus*, which means it's a type of *Staphylococcus aureus* that can't be killed by the antibiotic methicillin, and even other antibiotic medicines like penicillin or amoxicillin. The complex treatment of MRSA could perhaps be solved by ground-up cockroaches that potentially provide alternatives to currently available drugs that may be effective but have serious and unwanted side effects. It was discovered that tissues taken from the brains and nervous system of the insects killed off over 90% of MRSA infections and *E. coli.* The study discovered nine molecules in the tissues of the insects that were shown to be toxic to the bacteria. Cockroaches are also used for ear ache (Morge, 1973), dropsy, ulcers, Bright's disease, whooping cough (Illingworth, 1915), epilepsy (Ratcliffe, 1990) and boils (Mbata, 1991).

## Head Lice

In Spain, head lice are considered a therapeutic resource for the treatment of jaundice. All folk remedies based on the ingestion of these insects meet in the present document, previously dispersed among a large number of references (Leo *et al.,* 2002). The therapeutic use of head lice against jaundice has remained in Spanish oral tradition and has survived until today, although its current use has not been documented in research within the last decade. Many references indicate that lice should be administered to the patient on an empty stomach without his/her knowledge. They are usually dissolved or mixed in food that the patient has to take. A wide range of food is mentioned and chocolate is especially recommended (Meyer-Rochow, 2013).

## Constraints of Entomotherapy

With the advent of westernization and the desire to have recognition have led to the loss of valuable traditional knowledge based insect based-cure particularly amongst the rural areas (Meyer-Rochow,1975), he however cited other reasons include over-exploitation of insect resources, decreasing populations of insect species usable as food and/ or ingredients of medicines due to diminishing ecological niches, or simply new policies regulating the use of insects imposed on the locals by some superiors. Although honey and its derivative products are under investigation for possible medical applications in cancer therapy there are, according to the American Cancer Society, "no clinical studies in humans showing that bee venom or other honeybee products are effective in preventing or treating cancer (Ades, 2009). In case of maggot therapy the disadvantage is the negative perception with which it is regarded by both patients and practitioners ( Evans, 1997; Green 2004; Sherman, 2000 ). Although the so-called 'yuk factor' of its clinical appearance has been frequently reported in case studies, there is little evidence to suggest that patients refuse larval therapy when it is offered (Evans, 2002). Cantharidine produce by blister beetle have some constraints, the clinical use of cantharidine is limited because of its short half-life and toxicity (Becerro *et al.,* 2008). Cantharidine was also shown to be a poorly water-soluble drug with low oral bioavailability (26.7%) in beagle dog (Chu *et al.,* 2003)

With efforts and increasing popularity there is increasing awareness on entomotherapy. Nevertheless, there is still not enough focus on creating and upgrading technologies or skills in the production of insect-containing food stuffs and commercially viable insect farming enterprises.

## Conclusion and Future Thrust

Insect based medicine has had a long record in folklore and is coming under increasing awareness and analysis for amalgamation into evidence based medicine (table 3). Insect based products that purify arthropod derived substance with conventional skill have recently been developed and may yield further benefits. The success of insects in drug discovery is essentially related to their complex chemical property, to their accessible in various species in nature, to the existing of high technology methods which are available, essentially for pharmaceutical companies and research centers. Moreover, insects and their products have been, and will be, important sources of new pharmaceutical compounds.

In recent times, there has been a transformed curiosity in insect product research due to the failure of substitute drug discovery methods to deliver many lead compounds in key therapeutic areas, such as immune-suppression, anti-infective and metabolic diseases. The discovery of pharmaceuticals coming from insects should follow the similar common ideology that are known in phytochemical research. Progress of a quality control standard for commercial species to guarantee the safety and efficiency of the medicine for people. It is clear that require for drugs, throwaway consumer products, biological agents and insecticides will continue to increase for the probable future. But unless we take definite action to protect and develop our environment under sustainable circumstances, the window of chance for the discovery of new medicinal and biological agents will be put down the lid forever.

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