Some Invertebrate as Medical Treatment for Human

Research project

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SUPERVISOR CERTIFICATE

This research project has been written under my supervision and has been submitted for the award of the degree of BSc. in General Science with my approval as a supervisor.

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DEDICATION

This work is dedicated to:

My Dear Father and Mother who always prayed for me All whom I appreciate and finally, my friend who encourage and support me.

ABSTRACT

Since ancient times, invertebrates have played an important role in the traditional medicine in many parts of the world. Invertebrates are widely used in folk medicine. However, studies on their therapeutic use have been neglected and their magical–religious purposes are poorly understood. The present study aims to document traditional knowledge related to the use of invertebrates for medicinal purposes.

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Introduction

Biomedical research involving the use of animals has been the cornerstone of medical progress for the past several centuries (Wilson-Sanders,2011). Seafood diet from invertebrates such as mollusks and crustaceans has been linked with various medicinal benefits to improve human health (Giribet and Edgecombe,2020). Marine Natural Products (MNP) isolated from invertebrates have shown wide range of therapeutic properties including antimicrobial, antioxidant, antihypertensive, anticoagulant, anticancer, anti-inflammatory, wound healing and immune modulator, and other medicinal effects. Therefore, invertebrates are rich sources of chemical diversity and health benefits for developing drug candidates, cosmetics, nutritional supplements, and molecular probes that can be supported to increase the healthy life span of human (De Zoysa,2012). Invertebrates may also play a pivotal role in toxicity and efficacy testing of new pharmaceuticals for both human and animal diseases.

It is known that invertebrates play mystical and magical roles in the treatment of numerous illnesses in a range of cultures, the potential medicinal benefits of invertebrates in traditional medicines despite some studies have not received the attention they deserve (Loko et al.,2019). For instance, skin diseases have been treated with more invertebrates compared with other disease categories. Similarly, invertebrates were more used to treat skin diseases in contemporary Spanish ethnoveterinary medicine (González et al.,2016). In addition, tradition healers were asked to determine which of the invertebrate drugs in their own practices were most commonly prescribed, the most medically valuable and the most expensive (Alves et al.,2011), in total, 38 invertebrate species were reported by interviewees as used for 50 medicinal purposes (Loko et al.,2019). Indeed, in Yorubic traditional medicine, invertebrates such as arthropods are widely used and play a significant

role in healing practices, owing to the large number of chemical compounds they synthesize (Lawal and Banjo,2007).

By those Knowledge mentioned Above, we provide an overview of use of some invertebrates as medical important for human such as some species belonged to Mollusca, and Arthropoda, to give an outlook of how invertebrates are being used in treatment for common diseases.

Phylum Arthropod

Class crustacea

Crabs

Are terrestrial and aquatic creatures that are most commonly found in coastal regions. Similar to lobsters and crayfish. They have a hard-outer shell that is made up of a protein called chiton and have four pairs of legs with two large claws. Male crabs are larger and meatier than female crabs. It is estimated that there are about 4500 species of crabs that can be found in both freshwater and saltwater (Varsha,2023).

Crab is packed with protein, which is important for building and maintaining muscle. Crab also contains high levels of omega-3 fatty acids, vitamin B12, and selenium. These nutrients play vital roles in improving general health while helping prevent a variety of chronic conditions (Dany,2022).

Figure 1: Crab

Medically, Crabs have several importance

May promote bone health

all crab meat is known to be possibly high in phosphorus concentration, making it an important food for people wanting to "bone up". If you are at high risk for osteoporosis or are getting older and want an active lifestyle in the future, high-phosphorus foods like crab can be very important (John,2021).

May protect the heart

Crab meat is noticeably high in omega-3 fatty acids, and while many people assume that all fats are bad for them, omega-3s are the "good" ones that actually balance your cholesterol levels and may promote anti-inflammatory activity throughout the body. This can reduce blood pressure, lower strain on the heart, and prevent the development of atherosclerosis. This can lessen your risk of heart attack and stroke (John,2021). Research shows that consuming food that is rich in omega-3 fatty acids helps reduce LDL cholesterol and lowers the risk of heart issues (Williams et al., 2016).

May increase circulation

Copper is a mineral that is often overlooked in the body, and yet it has a number of important functions for regular organ function. For example, copper can play a crucial part in the absorption of iron in the gut, which is one of the most important minerals in our system. Iron plays a key part in the production of red blood cells, thus possibly boosting circulation and ensuring that oxygenated blood reaches all parts of the body. This can increase the speed of healing and regrowth of cells following an injury or illness (John,2021).

May detoxify the body

Our body's immune system can't do it all, and the other centers of detoxification for the blood and body are the kidney and liver. The phosphorus levels found in crab can help to improve kidney function, thus perhaps speeding the release of toxins from the body and can help to improve overall metabolic efficiency (Rubin,2010).

May help improve eyesight, reduce inflammation, and prevent arthritis

Studies suggest that muscles and ovaries of certain crab species may help in improving eyesight and reduce inflammation. The presence of long-chain polyunsaturated fatty acids in crab meat may help with inflammation and improve eyesight. It may also help prevent arthritis and other autoimmune diseases. Studies also suggest that a diet that is low in long-chain polyunsaturated fatty acids may lead to neurological issues (Mandume et al.,2019).

May help in weight management

Crab meat also contains omega-3 fatty acids. Studies suggest that eating food rich in omega-3 fatty acids may help in curbing appetite (Parra et al.,2008). Crab meat contains zero carbs, you can add it to your low-carb diet to help weight loss.

May help prevent Alzheimer's disease and Dementia

Seafood like crab meat contains long-chain omega-3 fatty acids and plasma fatty acids. Small studies suggest that eating seafood like crab may have a positive effect in reducing the risk of dementia and Alzheimer's disease (Newton and McManus,2011). Further research is required to establish its effectiveness.

Phylum Mollusca

Class Bivalvia

Mussels

Mussel is the common name used for members of several families of bivalve mollusks, from saltwater and freshwater habitats. These groups have in common a shell whose outline is elongated and asymmetrical compared with other edible clams, which are often more or less rounded or oval. Mussels are a clean and nutritious source of protein, as well as being a great source of omega 3 fatty acids, zinc and folate, and they exceed the recommended daily intake of selenium, iodine and iron. **Their various health benefits can be attributed to their nutritional value given below.**

Figure 2: Mussel

Medically, Mussels have several importance

Treatment for arthritis

According to research, the residents of the Maori coast of New Zealand whose diet consisted of green lipped mussels had lower incidences of arthritis. It has been found to be beneficial in the treatment of osteoarthritis and rheumatoid arthritis (Coulson et al.,2012).

Treatment for joint pains

Green mussels are a rich source of nutrients like iron, betaine and glycosaminoglycans like chondroitin sulfate. Some of these substances have been shown to contribute to relieving joint pains and joint stiffness (Zhao et al.,2018).

Helps the circulatory system

Regular intake of green lipped mussels may reduce the likelihood of heart attack and other circulatory problems. They facilitate healthy circulation to the vital organs and muscles by strengthening the arterial walls and improving blood flow (Balta et al.,2021).

Bone and teeth health

Consumption of mussels may facilitate the structural strengthening of teeth and bones and provide necessary support to surrounding tissues owing to its mineral rich profile. However, there is a lack of studies to substantiate this health benefit (Awuchi et al.,2020).

Healthy nervous system

By stimulating the muscles, tissues and organs, green lipped mussels may help improve nerve cell functioning throughout the body and have a positive effect on cognitive functions (Kean et al.,2013).

Skin care benefits

Seafood is beneficial for your skin as it has been shown to revive skin cells. Inflammation is one of the causes of skin aging. Green lipped mussels are rich in zinc and omega-3 fatty acids, both of which possess anti-inflammatory properties. Besides, deficiency of omega-3 fatty acids and zinc is considered to be one of the causes of psoriasis and eczema (Gray et al.,2019).

May help prevent anemia

Mussels are an excellent source of iron with 100 grams serving of cooked mussels contributing to over 100% of the recommended daily value for people above the age of 50. As we all know, iron plays a vital role in the production of red blood cells. Deficiency of iron can lead to health issues like anemia, shortness of breath and low energy levels (Miller,2013).

Immune system health

Regular consumption of green lipped mussels may help to improve your resistance to viral and bacterial infection. They also improve wound healing by intensifying and accelerating the formation of antibodies (Coulson et al.,2015).

Anti-aging benefits

Mussels contain mucopolysaccharides that help slow down the effects of skin aging. Mucopolysaccharides are found in our hair, skin, and nails, and they are present in greater quantities when we are young to help us grow. They help to maintain the elasticity of skin and give a smooth complexion (Wanitphakdeedecha et al.,2011).

Reduce symptoms of asthma

A study showed that patients who were given Green lipped mussels extract experienced a significant decrease in daytime wheezing (Emelyanov et al.,2002).

Octopus

An octopus is a soft-bodied, eight-limbed mollusc of the order Octopoda, class Cephalopoda with squids, cuttlefish, and nautiloids. It is bilaterally symmetric with two eyes and a beaked mouth at the center point of the eight limbs. The siphon is used both for respiration and for locomotion, by expelling a jet of water. Octopuses have a complex nervous system and excellent sight, and are among the most intelligent and behaviourally diverse of all invertebrates. All octopuses are venomous, but only the blue-ringed octopuses are known to be deadly to humans.

Figure 3: Octopus

it is a good source of iron, omega-3, selenium, copper, vitamin B12, potassium, magnesium, and calcium. It is a great source of protein for people trying to lose weight as it is low in fat, it is useful in reducing triglycerides which helps in preventing risk of stroke and cardiac attack, it has an excellent anti-inflammatory property which helps in reducing chronic illness like heart disease (Singh et al.,2020). It contains taurine which is an amino acid that shows reduction in blood pressure and cholesterol level, taurine also has anti-viral as a well as antioxidant effects.

Medically, Octopus have several importance

Rich in Omega-3 fatty acids

The octopus contains high amounts of omega-3 fatty acids, including eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). EPA and DHA are crucial for fetus development, maintaining cardiovascular health, and improving cognitive function in people with mild Alzheimer's disease (Luo et al.,2021).

Good source of antioxidants

Octopus contains essential amino acids and antioxidants and can be used to strengthen the immune system to improve the body's disease-fighting abilities. Moreover, antioxidants neutralize free radicals and help reduce inflammation (Ben Slama-Ben Salem et al.,2017).

May lower plasma fat levels

An animal study found that Adimchae (a type of kimchi containing octopus) could lower plasma lipid levels and prevent plaque formation (fatty deposits) in the arteries (Jung et al.,2015). This may reduce the risk of cardiovascular conditions.

May promote cardiovascular health

Octopus (*Amphioctopus neglectus*) contains macrocyclic lactone, a bioactive compound that can inhibit the angiotensin-converting enzyme (ACE), responsible for causing hypertension. Additionally, it contains taurine, may help prevent blood clots by lowering cholesterol levels in blood vessels (Chakraborty et al.,2019).

May help manage diabetes

A study on diabetic rats found that using octopus proteins as a dietary supplement could reduce blood glucose levels. The researchers concluded that octopus proteins could prevent complications caused by diabetes, especially toxic liver disease (hepatotoxicity) (Salem et al.,2018).

Formation of hemoglobin

It is rich in Iron is vital for the hemoglobin formation. As human beings lose blood in injuries, the extra hemoglobin is essential. During menstruation, women lose blood so they have high chances to suffer from anemia (Olsson et al.,2012).

Lowers migraine

The supplements of magnesium help to lower the attacks and severity of migraine along with the reduction of recurrence (Dolati et al.,2020).

Hair benefits

Protein is essential to maintain the healthy hair and also to prevent from damages. The study shows that protein has vital role in the growth of hair. Due to these benefits, it is used for the production of conditioners (McElwee et al.,2004).

Balance blood pressure

It is essential to maintain balance in blood pressure. It lowers the chances of hypertension and heart ailments. It has vasodilator properties which provide relief from the tension of blood vessels (Robaczewska et al.,2016).

Phylum Arthropoda

Class Crustacea

Order Decapoda

Shrimp are crustaceans (a form of shellfish) with elongated bodies and a primarily swimming mode of locomotion

Figure 4:  **Shrimp**

Medically, Shrimp have several importance

May promote heart health

Astaxanthin, a carotenoid with antioxidant properties, may be useful in treating atherosclerotic cardiovascular disease (thickening of arteries). It inhibits the oxidation of low-density lipoprotein (LDL) and may help prevent plaque buildup in the arteries (Fassett and Coombes,2011). Shrimps are rich in omega-3 fatty acids that can help lower heart disease risk significantly. Intake of EPA and DHA (omega-3 fatty acids) was associated with 15% and 18% lower CVD mortality in men and women, respectively (Lavie et al.,2021).

Have Anti-aging and skin and hair protective properties

Exposure to the sun's UV rays produces free radicals that can accelerate skin aging. Studies demonstrate that astaxanthin (a strong antioxidant present in shrimp) suppresses cell damage caused by these free radicals. Furthermore, astaxanthin also stimulates the body's antioxidant defense mechanism (Davinelli et al.,2018). Shrimps also contain trehalose, a type of sugar that protects the skin and hair from UV damage (Xiao et al.,2020). Taurine, a protein present in shrimp, also has anti-aging properties.

May help fight inflammation

Chronic inflammation by oxidative stress can increase the risk of neurodegeneration, cancer, and skin damage. Astaxanthin, as stated, reduces oxidative stress and may help treat inflammatory skin disorders like psoriasis and atopic dermatitis (Davinelli et al.,2018). Glycosaminoglycan, a bioactive compound found in shrimp, has anti-inflammatory properties and helps significantly reduce the influx of inflammatory cells to the injury site. They also contain an anti-inflammatory peptide (a short chain of amino acids) called shrimp anti-lipopolysaccharide factor (SALF), which is used as a drug to potentially treat urethral, vaginal, cervical, and pelvic inflammatory diseases (Lin et al.,2013).

May improve gastrointestinal health

The astaxanthin found in shrimp shows antimicrobial activity against H. pylori, a type of bacteria that causes stomach infections. The pathogen can damage the stomach and intestinal tissue. This was shown in rats, where oral administration of astaxanthin was found to protect against ethanol-induced gastric lesions (injuries) (Kim et al.,2005).

May promote weight loss

Shrimps are low in calories and have no carbs. Moreover, their zinc content may boost leptin levels in the body, which concurrently can help prevent overeating. Leptin is a hormone that regulates the storage and use of fat and energy throughout the body (Baltaci and Mogulkoc,2012). Shrimps are also rich in iodine, which can help regulate body weight through its interaction with the thyroid, a gland that plays an essential role in the body's metabolism and regulating body weight (Velasco and Garcia,2017).

Maintains a healthy pregnancy

Low levels of mercury, fat and high protein content make shrimp a healthy choice for pregnancy. Shrimps also contain remarkable levels of essential minerals (Di Lena et al.,2018). An article in American Pregnancy Organization stated that shrimp is safe for pregnancy. Consumption of 8-12 ounces of properly cooked shrimp per week is good for pregnant women. It helps maintain a healthy pregnancy.

Medicine for anemia.

Shrimps have various vitamins. Vitamin B is one of them. Vitamin B in shrimps is not only one kind as there are other kinds of vitamin B, for example vitamin B6, B12, Kolin, Niacin and pantotenis acid. These vitamins B are essential for stabilizing blood pressure and preventing anemia. Anemia patients can consume shrimps as part of their medication with adjusted shrimp portion (Dawood et al.,2018).

Reducing the risk of hypothyroid.

Eating shrimps can give additional copper intake. The lack of copper intake can cause hypothyroid (Lall and Kaushik,2021).

Summarized

Table.1 Medical benefit of type invertebrate

Invertebrate type	Medical benefit
Crab	Promote bone, protect heart, increase circulation, detoxify body, improve eyesight, reduce inflammation, prevent arthritis, weight loss, prevent Alzheimer disease and dementia, reduce heart disease.
Mussels	Arthritis, joint pains, help circulatory system, bone and teeth health, health nervous system, skin benefit, reduce symptoms of asthma, prevent anemia, health immune system, anti-aging benefits.
Octopus	Rich in omega-3 fatty acids, antioxidant, lower plasma fat level, cardiovascular health, manage diabetes, formation hemoglobin, lower migraine, hair benefits, balance blood pressure.
Shrimp	Anti-aging, skin and hair protect, fight inflammation, gastrointestinal health, heart health, weight loss, health pregnancy, prevent anemia, reduce risk of hypothyroid.

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