

Neem the Miracle Tree- A Medicinal and Dental Update

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ABSTRACT

Aim: The aim of this article is to introduce the contemporary applications of Neem in field of medicine and dentistry.

Summary: Neem has been used as a medicinal agent for more than 2,000 years. In traditional medicine, all parts of the neem tree are used— flower, seeds, fruits, roots, bark, and in particular, leaves to treat more than 100 diseases. The neem tree (*Azadirachta indica*) and its chemical products have been used for centuries in many facets for human utility. The place of neem in traditional medicine has been established for centuries. Despite this impressive history, it has many hurdles yet to overcome to gain widespread acceptance in Western society for its medicinal applications. Neem is the miracle tree it is purported to be, and markers point in a positive direction for its future in terms of proven applications and increased acceptance by the scientific community.

Keywords: *Azadirachta indica*, limonoids, neem



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Date of Submission: 04-04-2012

Reviews Completed: 12-10-2012

Date of Acceptance: 20-10-2012

INTRODUCTION

Neem, scientifically referred to as *Azadirachta indica*, is a medicinal tree. It offers plenty of usages in several shapes and sizes. It has anti-fungal, anti-bacterial, anti-viral, anti-diabetic, and anti-infertility properties. Typically, it is known as the village pharmacy because of its holistic power to protect against several health complications. Since ancient ages, this tree is well-respected in the history of natural medicine. It can treat various diseases and disorders ranging from malaria to bad teeth. Almost all parts of this tree contain medicinal benefits. Its seeds, leaves and barks have compounds known as limonoids with proven medicinal properties.¹

Even in Western medicine, the list of reported medicinal benefits in published studies is extensive.²⁻⁵ Despite these evidences, to date, no neem-based health products have been approved for internal use in the United States. Unlike the modes of action for pesticide applications, the modes of action for neem chemicals in human medicinal applications are not well understood or described in published studies. The information that follows reflects these deficiencies, and is presented primarily to illustrate the voluminous amount of research conducted about neem chemicals and their potential use in Western medicine.

Ecology: Neem is drought resistant and can tolerate almost any length of high temperature. Typically this tree is grown in sub-arid to sub-humid areas, where the annual rainfall varies between 400 mm to 1200 mm. This tree thrives in any types of soil, however, best grown in well drained deep sandy soil. This tree cannot stay alive below 4°C temperatures. At this temperature, leaf shedding is confirmed in addition to premature death. Neem has impressive and far-reaching pesticide properties. Recently, neem has been suggested as an effective infertility agent in controlling populations of rodents, such as rats. It has also been shown to be effective in controlling food borne pathogens; making it a potential agent against food spoilage bacteria.⁶ Neem tree has various usages in a variety of sectors of which its medicinal usages are the foremost.

MEDICINAL USAGES

Various parts of the neem tree have been used as traditional Ayurvedic medicine in India (Table-1). Neem oil and the bark

and leaf extracts have been therapeutically used as folk medicine to control leprosy, intestinal helminthiasis, respiratory disorders, constipation and as a general health promoter. Its use for the treatment of rheumatism, chronic syphilitic sores and indolent ulcer has also been evident. Neem oil finds use to control various skin infections. Bark, leaf, root, flower and fruit together cure blood morbidity, biliary afflictions, itching, skin ulcers, burning sensations and phthisis. The aqueous extract of neem bark and leaf also possesses anticomplement and immune stimulant activity. Neem oil has been shown to possess activity by selectively activating the cell-mediated immune mechanisms to elicit an enhanced response to subsequent mitogenic or antigenic challenge.⁷ Aqueous extract of neem leaves significantly decreases blood sugar level and prevents adrenaline as well as glucose-induced hyperglycaemia. Recently, hypoglycaemic effect was observed with leaf extract and seed oil, in normal as well as alloxan-induced diabetic rabbits.⁸ Neem leaf and bark aqueous extracts produce highly potent antiacid secretory and antiulcer activity.⁹ Intra-vaginal application of neem oil, prior to coitus, can prevent pregnancy. It could be a novel method of contraception.¹⁰ Neem seed and leaf extracts are effective against both chloroquin-resistant and sensitive strain malarial parasites.¹¹ Extracts of neem leaf, neem oil seed kernels are effective against certain fungi including *Trichophyton*, *Epidermophyton*, *Microspor trichosporon*, *Geotricum* and *Candida*.¹² Oil from the leaves, seed and bark possesses a wide spectrum of antibacterial action against Gram-negative and Gram-positive microorganisms, including *M. tuberculosis* and streptomycin resistant strains. In vitro, it inhibits *Vibrio cholera*, *Klebsiella pneumoniae*, *M. tuberculosis* and *M. pyogenes*. Antimicrobial effects of neem extract have been demonstrated against *Streptococcus mutans* and *S. faecalis*.¹³ Aqueous leaf extract offers antiviral activity against *Vaccinia virus*, *Chikungunya* and measles virus.¹⁴ Neem leaf aqueous extract effectively suppresses oral

squamous cell carcinoma induced by 7,12-dimethylbenz anthracene (DMBA), as revealed by reduced incidence of neoplasm. Neem may exert its chemopreventive effect in the oral mucosa by modulation of glutathione and its metabolizing enzymes.¹⁵

The antioxidant activity of neem seed extract has been demonstrated in vivo during horse- grain germination.¹⁶ Varying degrees of central nervous system (CNS) depressant activity in mice was observed with the leaf extract. Fractions of acetone extract of leaf showed significant CNS depressant activity.¹⁴ In HIV/AIDS patients, a 12-week oral administration of acetone water neem leaf extract (IRAB) had a "significant" influence in vivo on CD4 cells (which HIV reduces) without any adverse effects in the patients. Of the 60 patients who completed treatment, 50 were completely laboratory-test compliant. The mean levels of CD4 cells increased by 159% in 50 patients, which is a major increase; the number of HIV/AIDS pathologies decreased from the 120 baseline to 5; and significant increases were experienced in body weight (12%), hemoglobin concentration (24%), and lymphocyte differential count (24%).¹⁷

DENTAL AND ORAL CARE

The bark features a strong concentration of all of the vitamins and ingredients available in the seeds and leaves, giving it a powerful anti-inflammatory, antibacterial and antiseptic property. The bark as well as the twigs helps in dental care-battling gingivitis and preventing cavities. Neem extract is added in many organic toothpastes and mouthwashes.

In the preliminary findings by Vanka *et al.*,¹⁸ neem inhibited *Streptococcus mutans* and reversed incipient carious lesions. In a study by Wolinsky *et al.*,¹⁹ when saliva-conditioned hydroxyapatite was pre-treated with neem extract (from bark sticks) there was major inhibition in *Streptococcus* colonization on tooth surfaces. Prashant *et al.*²⁰ conducted a study to observe the effect of mango and neem extract on four organisms causing dental caries and concluded that using the extract of both- mango and neem would provide even further benefit. In a 6-week clinical study performed by Pai *et al.*,²¹ to evaluate the efficacy of neem leaf extract incorporated in mucoadhesive dental gel with commercially available chlorhexidine gluconate (0.2% w/v) mouthwash as positive control, suggested that the dental gel containing neem extract has significantly ($P < 0.05$) reduced the plaque index and bacterial count than that of the control group.

Side Effects: Traditional ayurvedic practitioners recommend against the use of neem if the person suffers from obvious wasting or fatigue. Infants have suffered complex sequelae and even death as a cause of internal use of neem and thus should be avoided in children. It is not recommended for pregnant or nursing women to use neem. Those who have

Table 1: Ayurvedic uses of Neem

Part	Uses
Leaf	Leprosy, eye problem, epistaxis, intestinal worms, anorexia, biliousness, skin ulcers
Bark	Analgesic, alternative and curative of fever
Flower	Bile suppression, elimination of intestinal worm and phlegm
Fruit	Piles, intestinal worms, urinary disorder, epistaxis, phlegm, eye problem, diabetes, wound, ulcers, skin diseases
Twig	Cough, asthma, piles, phantom tumour, intestinal worms, spermatorrhoea, obstinate urinary disorder, diabetes
Gum	Scabies, wound, ulcers, skin diseases
Seed	Leprosy and intestinal worms
Oil	Leprosy and intestinal worms

impaired liver or kidney function should also take great caution. Excess doses of seed or seed supplements may be toxic.⁹

CONCLUSION

It is heartening to see that a traditional Indian plant medicine has now led to several therapeutically and industrially useful preparations and compounds, which generates enough encouragement among the scientists in exploring more information about this medicinal plant. As the global scenario is now changing towards the use of nontoxic plant products having traditional medicinal use, development of modern drugs from neem should be emphasized for the control of various diseases. In fact, time has come to make good use of centuries-old knowledge on neem through modern approaches of drug development. For the last few years, there has been an increasing trend and awareness in neem research. Quite a significant amount of research has already been carried out during the past few decades in exploring the chemistry of different parts of neem. An extensive research and development work should be undertaken on neem and its products for their better economic and therapeutic utilization.

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