

ANTIBACTERIAL COMPOUNDS IN NEEM

Overview

Almost every study of neem notes its antibacterial properties, but the more recent studies available online typically mention it in passing and emphasize newer discoveries or focus on a more specific use. Most of this work has been done in laboratories because treating bacteria (unlike viruses or cancer) is relatively straight-forward. In test tubes, neem has been shown to have significant effects on both gram-positive and gram-negative organisms and other bacteria that cause a wide array of human and animal diseases including E. coli, streptococcus and salmonella.

Some of the more recent work has focused on oral care, a critical issue in both developing countries where professional dental care is limited and in developed nations where populations are aging. Extracts from neem sticks or bark have been shown to inhibit the growth of streptococcus mutans. A separate study at the University of California http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9107574&query_hl=38&itool=pubmed_docsum indicates that neem stick extract showed significant reductions in bacterial adhesion in vitro, suggesting that it can reduce the ability of some streptococci to colonize tooth surfaces.

While scientists still don't understand neem's antibacterial actions, it has been show to work at concentrations as low as 20 parts per million in a test of its efficacy against pathogenic bacteria of fish.

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10783742&query_hl=53&itool=pubmed_docsum

Recent Research

[Foodborne Pathog Dis.](#) 2007 Winter;4(4):481-8.

Antibacterial activity of guava (*Psidium guajava* L.) and Neem (*Azadirachta indica* A. Juss.) extracts against foodborne pathogens and spoilage bacteria.

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http://www.ncbi.nlm.nih.gov/pubmed/18041957?ordinalpos=1&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

The antibacterial activity of guava (*Psidium guajava*) and neem (*Azadirachta indica*) extracts against 21 strains of foodborne pathogens were determined--*Listeria monocytogenes* (five strains), *Staphylococcus aureus* (four strains), *Escherichia coli* O157:H7 (six strains), *Salmonella Enteritidis* (four strains), *Vibrio parahaemolyticus*, and *Bacillus cereus*, and five food spoilage bacteria: *Pseudomonas aeruginosa*, *P. putida*, *Alcaligenes faecalis*, and *Aeromonas hydrophila* (two strains). Guava and neem extracts showed higher antimicrobial activity against Gram-positive bacteria compared to Gram-negative bacteria except for V.

parahaemolyticus, *P. aeruginosa*, and *A. hydrophila*. None of the extracts showed antimicrobial activity against *E. coli* O157:H7 and *Salmonella* Enteritidis. The minimum inhibitory concentration (MIC) of ethanol extracts of guava showed the highest inhibition for *L. monocytogenes* JCM 7676 (0.1 mg/mL), *S. aureus* JCM 2151 (0.1 mg/mL), *S. aureus* JCM 2179 (0.1 mg/mL), and *V. parahaemolyticus* IFO 12711 (0.1 mg/mL) and the lowest inhibition for *Alcaligenes faecalis* IFO 12669, *Aeromonas hydrophila* NFRI 8282 (4.0 mg/mL), and *A. hydrophila* NFRI 8283 (4.0 mg/mL). The MIC of chloroform extracts of neem showed similar inhibition for *L. monocytogenes* ATCC 43256 (4.0 mg/mL) and *L. monocytogenes* ATCC 49594 (5.0 mg/mL). However, ethanol extracts of neem showed higher inhibition for *S. aureus* JCM 2151 (4.5 mg/mL) and *S. aureus* IFO 13276 (4.5 mg/mL) and the lower inhibition for other microorganisms (6.5 mg/mL). No significant effects of temperature and pH were found on guava and neem extracts against cocktails of *L. monocytogenes* and *S. aureus*. The results of the present study suggest that guava and neem extracts possess compounds containing antibacterial properties that can potentially be useful to control foodborne pathogens and spoilage organisms.

PMID: 18041957 [PubMed - indexed for MEDLINE]

[Indian J Dent Res.](#) 2007 Oct-Dec;18(4):148-51.

The effect of mango and neem extract on four organisms causing dental caries: *Streptococcus mutans*, *Streptococcus salivarius*, *Streptococcus mitis*, and *Streptococcus sanguis*: an in vitro study.

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http://www.ncbi.nlm.nih.gov/pubmed/17938488?ordinalpos=2&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

BACKGROUND AND OBJECTIVES: Chewing twigs of the mango or neem tree is a common way of cleaning the teeth in the rural and semi-urban population. These twigs are also believed to possess medicinal properties. The present study was conducted to evaluate the antimicrobial effects of these chewing sticks on the microorganisms *Streptococcus mutans*, *Streptococcus salivarius*, *Streptococcus mitis*, and *Streptococcus sanguis* which are involved in the development of dental caries. An additional objective was to identify an inexpensive, simple, and effective method of preventing and controlling dental caries. **MATERIALS AND METHODS:** The sticks were sun dried, ground into a coarse powder, and weighed into 5 gm, 10 gm, and 50 gm amounts. These were added to 100 ml of deionized distilled water. After soaking for 48 h at 4 degrees C, the water was filtered. The filtrate was inoculated onto blood agar plates containing individual species of microorganisms and incubated at 37 degrees C for 48 h. **Results:** Mango extract, at 50% concentration, showed maximum zone of inhibition on *Streptococcus mitis*. Neem extract produced the maximum zone of inhibition on *Streptococcus mutans* at 50% concentration. Even at 5% concentration neem extract showed some inhibition of growth for all the four species of organisms. **INTERPRETATION AND CONCLUSION:** A combination of neem and mango chewing sticks may provide the maximum benefit. We recommend the use of both the chewing sticks.

PMID: 17938488 [PubMed - indexed for MEDLINE]

[J Ethnopharmacol.](#) 2007 May 22;111(3):607-12. Epub 2007 Jan 21

Antibacterial, antisecretory and antihemorrhagic activity of *Azadirachta indica* used to treat cholera and diarrhea in India.

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http://www.ncbi.nlm.nih.gov/pubmed/17314018?ordinalpos=3&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

Indigenous uses of *Azadirachta indica* A. juss (Maliaceae) (locally known as neem) leaves in different parts of India for curing gastrointestinal disorder such as diarrhea and cholera is wide spread. The objective of the present study was to evaluate the antibacterial and antisecretory activity of neem extract against *Vibrio cholerae*, a causative agent of watery diarrhea such as cholera. The methanol extract of neem leaf was tested for its antibacterial, antisecretory and antihemorrhagic activity against *Vibrio cholerae*. *Azadirachta indica* extract had significant antibacterial activity against the multi-drug-resistant *Vibrio cholerae* of serotypes O1, O139 and non-O1, non-O139. The minimum inhibitory concentration reached by 50% (MIC50) and 90% (MIC90), and minimum bactericidal concentration for the extract were 2.5, > 5, and 10 mg/ml, respectively. Neem extract showed antisecretory activity on *Vibrio cholerae* induced fluid secretion in mouse intestine with inhibition values of 27.7%, 41.1%, 43.3%, 57.0%, and 77.9% at doses of 100, 200, 300, 450 and 1800 mg/kg, respectively. Oral administration of the extract inhibited hemorrhage induced by *Vibrio cholerae* in mouse intestine at a dose > or = 300 mg/kg. The results obtained in this study give some scientific support to the uses of neem employed by the indigenous people in India employed for the treatment of diarrhea and dreadful disease cholera.

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[Braz J Med Biol Res.](#) 2005 Jun;38(6):943-7. Epub 2005 Jun 1

Extracts of *Azadirachta indica* and *Melia azedarach* seeds inhibit folliculogenesis in albino rats.

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http://www.ncbi.nlm.nih.gov/pubmed/15933789?ordinalpos=4&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

The seed oil of *Azadirachta indica* A. Juss (neem) is used in traditional medicine for its antidiabetic, spermicidal, antifertility, antibacterial, and wound healing properties. The present study was undertaken to investigate the quantitative aspects of follicular development in cyclic female albino rats (135 +/- 10 g; 8 groups with 6 animals in each group) after oral administration of polar (PF) and non-polar (NPF) fractions of *A. indica* seed extract at 3 and 6 mg kg body weight-1 day-1 and *Melia azedarach* Linn. (dharek) seed extract at 24 mg kg body weight-1 day-1 for 18 days. The extracts were prepared using a flash evaporator at 35 degrees

C and then dissolved in olive oil to prepare doses on a per kg body weight basis. There was a significant reduction ($P = 0.05$) in the number of normal single layered follicles (*A. indica*: 0.67 ± 0.33 and 4.67 ± 2.03 after 3 and 6 mg/kg NPF, and 3.33 ± 1.67 and 1.00 ± 1.00 after 3 and 6 mg/kg PF vs control: 72.67 ± 9.14 and *M. azedarach*: 0.60 ± 0.40 and 1.80 ± 1.2 after 24 mg/kg PF and NPF, respectively, vs control: 73.40 ± 7.02) and follicles in various stages (I-VII) of follicular development in all treatment groups. These extracts also significantly reduced ($P = 0.05$) the total number of normal follicles in the neem (14.67 ± 5.93 and 1.00 ± 1.00 after 3 and 6 mg/kg PF and 3.67 ± 0.88 and 5.33 ± 2.03 after 3 and 6 mg/kg NPF) and dharek (13.00 ± 3.58 and 14.60 ± 2.25 after 24 mg/kg NPF and PF) treatments compared to control (216.00 ± 15.72 and 222.20 ± 19.52 , respectively). Currently, indiscriminate use of persistent and toxic rodenticides to control rodent populations has created serious problems such as resistance and environmental contamination. Therefore, it becomes necessary to use ecologically safe and biologically active botanical substances that are metabolized and are not passed on to the next trophic level, and that interfere with the reproductive potential particularly growth and differentiation of follicles. This may help elevate the socio-economic status of the country. Thus, the present study is an attempt to investigate the effects of *A. indica* and *M. azedarach* seed extracts on reproduction of albino rats.

PMID: 15933789 [PubMed - indexed for MEDLINE]

[Curr Med Chem Anticancer Agents](#). 2005 Mar;5(2):149-6.

Medicinal properties of neem leaves: a review.

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http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=15777222&query_hl=53&itool=pubmed_docsum

Azadirachta indica, commonly known as neem, has attracted worldwide prominence in recent years, owing to its wide range of medicinal properties. Neem has been extensively used in Ayurveda, Unani and Homoeopathic medicine and has become a cynosure of modern medicine. Neem elaborates a vast array of biologically active compounds that are chemically diverse and structurally complex. More than 140 compounds have been isolated from different parts of neem. All parts of the neem tree- leaves, flowers, seeds, fruits, roots and bark have been used traditionally for the treatment of inflammation, infections, fever, skin diseases and dental disorders. The medicinal utilities have been described especially for neem leaf. Neem leaf and its constituents have been demonstrated to exhibit immunomodulatory, anti-inflammatory, antihyperglycaemic, antiulcer, antimalarial, antifungal, antibacterial, antiviral, antioxidant, antimutagenic and anticarcinogenic properties. This review summarises the wide range of pharmacological activities of neem leaf.

Publication Types: [Review](#)

PMID: 15777222 [PubMed - indexed for MEDLINE]

[Indian J Dent Res.](#) 2001 Jul-Sep;12(3):133-44.

Erratum in:

Indian J Dent Res 2001 Oct-Dec;12(4):193.

The effect of indigenous *Neem Azadirachta indica* [correction of (*Adirachta indica*)] mouth wash on *Streptococcus mutans* and lactobacilli growth.

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http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11808064&query_hl=53&itool=pubmed_docsum

Neem is one of the most widely researched tropical tree, with almost all its parts being put for a variety of uses. In the present study, the antibacterial effect of Neem mouthwash against salivary levels of streptococcus mutans and lactobacillus has been tested over a period of 2 months. Also its effect in reversing incipient carious lesions was assessed. While streptococcus mutans was inhibited by Neem mouthwashes, with or without alcohol as well as chlorhexidine, lactobacillus growth was inhibited by chlorhexidine alone. The initial data appears to prove its effect in inhibiting *S. mutans* and reversing incipient carious lesions, longer term clinical trials are essential.

Publication Types: [Clinical Trial](#) [Randomized Controlled Trial](#)

PMID: 11808064 [PubMed - indexed for MEDLINE]

[Microbios.](#) 2001;105(412):183-9.

Antibacterial activity of Karanj (*Pongamia pinnata*) and Neem (*Azadirachta indica*) seed oil: a preliminary report.

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http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=11414503&query_hl=53&itool=pubmed_docsum

The antibacterial activity of Karanj (*Pongamia pinnata*) and Neem (*Azadirachta indica*) seed oil in vitro against fourteen strains of pathogenic bacteria was assessed. Using the tube dilution technique, it was observed that 57.14 and 21.42% of the pathogens were inhibited at 500 microl/ml; 14.28 and 71.42% at 125 microl/ml; and 28.57 and 7.14% at 250 microl/ml of Karanj and Neem oils, respectively. The activity with both the oils was bactericidal and independent of temperature and energy. Most of the pathogens were killed more rapidly at 4 degrees C than 37 degrees C. The activity was mainly due to the inhibition of cell-membrane synthesis in the bacteria.

PMID: 11414503 [PubMed - indexed for MEDLINE]

[J Ethnopharmacol.](#) 2000 Aug;71(3):377-82.

Anti-microbial activity of a new vaginal contraceptive NIM-76 from neem oil (*Azadirachta indica*).

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http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10940573&query_hl=53&itool=pubmed_docsum

Efficacy of NIM-76, a spermicidal fraction from neem oil, was investigated for its antimicrobial action against certain bacteria, fungi and Polio virus as compared to whole neem oil. The NIM-76 preparation showed stronger anti-microbial activity than the whole neem oil. It inhibited growth of various pathogens tested including Escherichia coli and Klebsiella pneumoniae which were not affected by the whole neem oil. NIM-76 also exhibited antifungal activity against Candida albicans and antiviral activity against Polio virus replication in vero cell lines. It also protected mice from systemic candidiasis as revealed by enhanced % survival and reduced colony forming units of C. albicans in various tissues. This shows that NIM-76 has a potent broad spectrum anti-microbial activity.

PMID: 10940573 [PubMed - indexed for MEDLINE]

[Indian J Dent Res](#). 1999 Jan-Mar;10(1):23-6.

The antimicrobial effects of extracts of Azadirachta indica (Neem) and Salvadora persica (Arak) chewing sticks.

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http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10865390&query_hl=53&itool=pubmed_docsum

Chewing sticks (Miswak) is most commonly used in the Middle East and Indian Subcontinent. *Salvadora persica* (Arak) and *Azadirachta indica* (Neem) are commonly used as oral hygiene tools in different parts of the world. Several studies have demonstrated the anti-plaque, anticariogenic and antibacterial effect of these sticks. The aim of this study was to compare the effectiveness of antimicrobial activity of Neem and Arak chewing stick's aqueous extracts at various concentrations. The microbial inhibition was measured using blood agar and ditch plate method up to 48 hours. The pH of Neem extract was 6.1 and of Arak was 4.9. Data suggested that both chewing stick extracts are effective at 50% concentration on streptococci and *Streptococcus faecalis*. Arak extract was more effective at lower concentrations for *Streptococcus faecalis*. The effect may be due to the difference of their chemical composition and variability in their pH. Further research is needed to extrapolate other plants used for oral hygiene. Chewing sticks are recommended as oral hygiene tools for health promotion in developing countries.

PMID: 10865390 [PubMed - indexed for MEDLINE]

[Indian J Exp Biol](#). 1999 Nov;37(11):1097-100.

Neem (*Azadirachta indica*) extract as an antibacterial agent against fish pathogenic bacteria.

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http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10783742&query_hl=53&itool=pubmed_docsum

Aquaneem, an emulsified product prepared from the neem (*A. indica*) kernel was tested against four pathogenic bacteria of fish (i.e. *Aeromonas hydrophila*, *Pseudomonas fluorescens*, *Escherichia coli* and *Myxobacteria* spp.) to test its efficacy as an antibacterial agent. Growth inhibitory property of the product at 10, 15 and 20 ppm has been noticed and recorded. The percentage reduction of bacterial cell population was noted to be maximum on 9th day at 20 ppm concentration (i.e. 70.14%, 74.15% and 61.75% for *A. hydrophila*, *P. fluorescens* and *E. coli* respectively) with the only exception of myxobacteria which showed maximum reduction percentage (63.90%) on 15th day. Among all the bacteria tested *A. hydrophila*, *P. fluorescens* and *Myxobacteria* spp. exhibited maximum sensitivity to Aquaneem in terms of percentage reduction of bacterial cell population in comparison to *E. coli*.

PMID: 10783742 [PubMed - indexed for MEDLINE]

[Vet Parasitol.](#) 1999 Jun 30;83(3-4):177-85.

Treatment of psoroptic mange with reference to epidemiology and history.

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http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=10423001&query_hl=53&itool=pubmed_docsum

Treatment methods in the last century involved the use of substances such as sulphur, mercury, hellebore, arsenic, nicotine and others, applied in various ways. The advent of dips in 1843 signalled an advance. However, the biology of the mite, *Psoroptes ovis*, the epidemiology of sheep scab and the lack of persistence of the acaricides necessitated repeated laborious treatments to ensure success. In 1947 this changed with the use of organo chlorines (OCs) which had up to 3 months residual activity. The use of OCs led to the eradication of psoroptic mange of sheep in USA. Organo phosphates (OPs) were introduced in the late fifties and synthetic pyrethroids (SPs) in the early seventies. In 1985, due to sheep tissue residues, lindane (OC) was withdrawn from the market and this greatly reduced the capacity for effective sheep scab control. Before the arrival of the endectocidal avermectin, ivermectin in 1978 and its successful use as an acaricide in 1992, control of psoroptic mange was limited to plunge dipping. In 1994 moxidectin, a milbemycin, was found to be effective and to have the added benefit of at least 4 weeks persistent activity. Another avermectin doramectin was shown, in 1995, to successfully treat scab and recently an ivermectin bolus has been introduced which has a 100 days' activity and is fully therapeutic and prophylactic. Strict attention to detail in the use of injectable products is essential in order to achieve satisfactory results. Work is progressing on the use insect growth regulators (IGRs) and also on naturally occurring substances such as linalool, neem and lavender oil. At the CVRL Dublin, promising results have been achieved with neem and some IGRs. Other areas of interest are allemones, synergists, microclimate manipulation, sheep breed resistance and vaccines. Successful control

depends on epidemiological knowledge, accurate diagnostic techniques, intimate knowledge of the mite's life cycle, its behaviour on and off the host, its macro and molecular biology, the nature of the pathogenesis of the disease, sheep husbandry practices, nutritional and environmental factors; also farmer awareness and attitudes. The variable responses of sheep to the mite, the unpredictable incubation period, course, manifestations and outcome make this an intriguing and perplexing disease. Ways to overcome these problems and to achieve possible eradication are discussed.

Publication Types: [Historical Article](#)

PMID: 10423001 [PubMed - indexed for MEDLINE]

[Immunol Cell Biol.](#) 1997 Apr;75(2):190-2.

Plant immunomodulators for termination of unwanted pregnancy and for contraception and reproductive health.

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http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=9107574&query_hl=38&itool=pubmed_docsum

Neem (*Azadirachta indica*) seed and leaf extracts have spermicidal, anti-microbial, anti-fungal and anti-viral properties. They are also immunomodulators that induce primarily a TH1 type response. These properties are being exploited to develop two different useful methods of fertility control. Neem extracts given orally at early post-implantation stage terminate pregnancy in rodents and primates. Treatment has no residual permanent effect and fertility is regained in subsequent cycles. The mechanism by which the action occurs is not fully clear. A transient increase in CD4 and more significantly in CD8 cells is noticed in mesenteric lymph nodes and spleen. A rise in immunoreactive and bioactive TNF-alpha and IFN-gamma in draining lymph nodes, serum and foetal-placental tissue is observed. A polyherbal cream and pessary have been developed containing three active ingredients of plant origin. These have synergistic spermicidal properties on human sperm as determined by the Sander Cramer test. Their use before mating has high contraceptive efficacy in rabbits and baboons. Another interesting property is their inhibitory action on a wide spectrum of micro-organisms, including *Candida albicans*, *C. tropicalis*, *Neisseria gonorrhoeae*, the multidrug-resistant *Staphylococcus aureus* and urinary tract *Escherichia coli*, Herpes simplex-2 and HIV-1. Phase I clinical trials have been completed in India, Egypt and the Dominican Republic, and indicate the safety of the formulation, its acceptability and beneficial action invaginosis due to infections.

PMID: 9107574 [PubMed - indexed for MEDLINE]

[J Dent Res.](#) 1996 Feb;75(2):816-22.

The inhibiting effect of aqueous *Azadirachta indica* (Neem) extract upon bacterial properties influencing in vitro plaque formation.

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http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=8655780&query_hl=53&itool=pubmed_docsum

The purpose of this investigation was to examine the inhibitory effects of aqueous extracts derived from the bark-containing sticks (Neem stick) of *Azadirachta indica* upon bacterial aggregation, growth, adhesion to hydroxyapatite, and production of insoluble glucan, which may affect in vitro plaque formation. Neem stick extracts were screened for minimal bacterial growth inhibition (MIC) against a panel of streptococci by means of a broth dilution assay. Initial bacterial attachment was quantified by the measurement of the adhesion of ³H-labeled *Streptococcus sanguis* to saliva-conditioned synthetic hydroxyapatite. The effect of the Neem stick extract upon insoluble glucan synthesis was measured by the uptake of radiolabeled glucose from ¹⁴C-sucrose. Aggregating activity of the Neem stick extracts upon a panel of streptococci was also examined. No inhibition of bacterial growth was observed among the streptococcal strains tested in the presence of < or = 320 micrograms/mL of the Neem stick extract. The pre-treatment of *S. sanguis* with the Neem stick extract or the gallotannin-enriched extract from *Melaphis chinensis* at 250 micrograms/mL resulted in a significant inhibition of the bacterial adhesion to saliva-conditioned hydroxyapatite. Pre-treatment of saliva-conditioned hydroxyapatite with the Neem stick or gallotannin-rich extract prior to exposure to bacteria yielded significant reductions in bacterial adhesion. The Neem stick extract and the gallotannin-enriched extract from *Melaphis chinensis* inhibited insoluble glucan synthesis. Incubation of oral streptococci with the Neem stick extract resulted in a microscopically observable bacteria aggregation. These data suggest that Neem stick extract can reduce the ability of some streptococci to colonize tooth surfaces.

PMID: 8655780 [PubMed - indexed for MEDLINE]

[J Nat Prod.](#) 1992 Mar;55(3):303-10.

Constituents of *Azadirachta indica*: isolation and structure elucidation of a new antibacterial tetranortriterpenoid, mahmoodin, and a new protolimonoid, naheed.

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http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=1593280&query_hl=53&itool=pubmed_docsum

Mahmoodin [1], a new limonoid, has been isolated from *Azadirachta indica* (neem) oil, along with seven known tetranortriterpenoids, azadirone, epoxyazadiradione, nimbin, gedunin, azadiradione, deacetylnimbin, and 17-hydroxyazadiradione. A new protolimonoid, naheed [3], has been obtained from the neem fruits along with azadirachtol. Their structures have been elucidated through chemical and spectral analyses including 2D nmr studies. The absolute configuration of 1 was established by comparison of its cd spectrum with those of the known tetranortriterpenoids. Mahmoodin showed significant antibacterial activity against various Gram-positive and Gram-negative organisms. Four hydrocarbons, icosane, docosane, 2-methyltricosane, and docosene, have also been identified by gc-ms of the EtOH extract of the fruit coats. Only docosane has earlier been reported from neem, while the remaining three are unreported from this plant.

PMID: 1593280 [PubMed - indexed for MEDLINE]

[Mem Inst Oswaldo Cruz.](#) 1992;87 Suppl 5:69-72.

Effects of azadirachtin on *Rhodnius prolixus*: immunity and *Trypanosoma* interaction.

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http://www.ncbi.nlm.nih.gov/pubmed/1342719?ordinalpos=61&itool=EntrezSystem2.PEntrez.Pubmed.Pubmed_ResultsPanel.Pubmed_RVDocSum

The effects of azadirachtin, a tetranortriterpenoid from the neem tree *Azadirachta indica* J., on both immunity and *Trypanosoma cruzi* interaction within *Rhodnius prolixus* and other triatomines, were presented. Given through a blood meal, azadirachtin affected the immune reactivity as shown by a significant reduction in numbers of hemocytes and consequently nodule formation following challenge with *Enterobacter cloacae* beta 12, reduction in ability to produce antibacterial activities in the hemolymph when injected with bacteria, and decreased ability to destroy the infection caused by inoculation of *E. cloacae* cells. A single dose of azadirachtin was able to block the development of *T. cruzi* in *R. prolixus* if given through the meal at different intervals, together with, before or after parasite infection. Similarly, these results were observed with different triatomine species and different strains of *T. cruzi*. Azadirachtin induced a permanent resistance of the vector against reinfection with *T. cruzi*. The significance of these data is discussed in relation to the general mode of azadirachtin action in insects.

Publication Types: [Review](#)

PMID: 1342719 [PubMed - indexed for MEDLINE]

[Indian J Med Res.](#) 1986 Sep;84:314-6.

In vitro antibacterial activity of Neem oil.

[Rao DV, Singh I, Chopra P, Chhabra PC, Ramanujalu G.](#)

http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abstract&list_uids=3102364&query_hl=53&itool=pubmed_docsum

PMID: 3102364 [PubMed - indexed for MEDLINE]

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