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Myrrh

Scientific Name(s): Commiphora abyssinica (Bevg.) Engl., Commiphora molmol Engl., Commiphora myrrha (T. Nees) Engl.
Common Name(s): African myrrh, Arabian myrrh, Bal, Bol, Bola, Gum myrrh, Heerabol, Myrrha, Myrrhe, Somali Myrrh, Yemen myrrh

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Clinical Overview

Use

Myrrh is used as a fragrance in cosmetics and as a flavoring agent in foods and beverages. Traditionally, it has been used as an astringent and as an antiseptic for application to inflamed lesions of the throat and mouth, as well as for treatment of gingival conditions. Clinical data suggest myrrh has a potential role in the treatment of schistosomiasis and fascioliasis as an antiparasitic. Analgesic effects have been suggested. However, there is limited clinical information to support these uses.

Dosing

Myrrh may be administered as a tincture or as part of dental powders, teas, mouth rinses, and gargles.

Contraindications

Contraindications have not been identified.

Pregnancy/Lactation

Avoid use. Harmful effects have been documented. Myrrh is considered an emmenagogue and an abortifacient.

Interactions

Myrrh may interact with warfarin and other coumarin derivatives, resulting in a reduction in the international normalized ratio (INR).

Adverse Reactions

Several cases of dermatitis have been reported.

Toxicology

No data.

Scientific Family

- Burseraceae

Botany

The Commiphora species that serve as sources of myrrh are thorny shrubs or small trees that grow up to 3 m in height. They are native to Africa, eastern Mediterranean countries, and Southern Arabia. A pale yellow-white viscous liquid exudes from natural cracks or fissures in the bark or from fissures cut intentionally to harvest the material.Evans 1989 When air-dried, this exudate hardens into a reddish-brown mass that often contains white patches. These tears are approximately the size of a walnut and form the basis of myrrh resin. Myrrh is usually collected in the summer months.Evans 1989, Leung 1980, Michie 1991 Though related, Commiphora mukul or "false" myrrh does not provide a source of myrrh, but rather guggulu resin, which is believed to lower cholesterol levels.Michie 1991 See Guggul monograph for more information.

History

Myrrh has been used for centuries as incense and for medicinal purposes.Evans 1989, Michie 1991 Myrrh played a key role in religious ceremonies of the ancient Egyptians.Lotfy 2006 In the Bible, myrrh is cited as 1 of the 3 gifts (in addition to gold and frankincense) presented to Jesus by the Magi following his birth (Matthew 2:11) and was offered in a mixture of wine to Jesus during his crucifixion as an anesthetic (Mark 15:23).Michie 1991 These gifts were a sign of wealth because they were rare and expensive.Greene 1993 Myrrh is also a part of African, Middle Eastern, and Chinese traditional medicine. The Arabic term "murr" means "bitter" and describes myrrh's taste and balsamic odor.El Ashry 2003, Michie 1991 Myrrh was commonly included in mixtures used to treat worms, wounds, and sepsis during the fourth century BC. During the 10th century, Arabic and European texts recommended myrrh to protect against plagues when travelling in endemic areas. It was also believed by the Greeks and Romans to be effective in the treatment of snake bites and is still used in parts of East Africa for this indication. In Chinese medicine, myrrh has been used in the management of a variety of skin and mouth infections. Other traditional uses of myrrh include as an astringent, antiseptic, antiparasitic, antitussive, emmenagogue, and antispasmodic agent.Michie 1991 Myrrh has also been reported to treat gout, headache, jaundice, throat ailments,

indigestion, fatigue, and paralysis.Greene 1993 It has been used in a variety of infectious diseases, including leprosy and syphilis, and to treat certain cancers.Leung 1980 Myrrh was one of the first treatments of cough in children. Additionally, myrrh was incorporated as part of the mummification and cremation processes.Michie 1991 Today, myrrh is used as a component of fragrances and as an astringent in mouthwashes and gargles.Ernst 2002, Leung 1980 It is sometimes used to flavor beverages and foods. The French and British continue to use myrrh in mixtures for the treatment of cough and in suppository form to treat proctitis.Michie 1991 Lotions containing myrrh have been used as cleansing agents, moisturizers, skin lesion treatments, and fragrances.Greene 1993

Related/similar drugs

Ginkgo Biloba, turmeric, saw palmetto

Chemistry

Myrrh is an oleo-gum resin obtained from the stem of C. molmol that consists of 2% to 10% of a volatile oil composed predominantly of sesquiterpenes, sterols, and steroids.Evans 1989, Michie 1991 The water-soluble gum portion (30% to 60%) contains polysaccharides and proteins as well as ethanol-soluble resins (25% to 40%). After undergoing hydrolysis, the gum produces a variety of sugars.Hanus 2005 Furanosesquiterpenes are responsible for myrrh's odor and are believed to exert anesthetic, antibacterial, antifungal, and hypoglycemic effects.Hanus 2005, Zhu 2003 Additionally, 2 sesquiterpenes extracted from C. molmol, furaneudesma-1-3-diene and curzerene, have demonstrated activity on CNS opioid receptors.Dolara 2000 The gum has been reported to contain an oxidase enzyme.Evans 1989 The related C. guidottii contains the sesquiterpene (+)-T-cadinol.Claeson 1991 When the oleo-gum resin is mixed with water, it forms an emulsion.El Ashry 2003

The combination of frankincense and myrrh often has better therapeutic outcomes on diseases than either entity alone. It has been proposed that chemical composition changes take place when frankincense and myrrh are combined, such as increases or decreases in the main active ingredients, disappearance of native chemical components, and emergence of new chemical components.Cao 2019

Uses and Pharmacology

In vitro and animal studies have demonstrated a wide range of pharmacological activity, including anti-inflammatory, hypoglycemic, lipid-lowering, analgesic, cytoprotective, and cytotoxic activities.Barnes 2007 Myrrh also has a wide range of herbal and traditional

uses, such as for the treatment of pharyngitis, respiratory catarrh, common colds, wounds and abrasions, and mouth ulcers and gingivitis.Barnes 2007

Analgesic activity

Clinical data

The analgesic properties of myrrh (C. myrrha) depend on the presence of bioactive sesquiterpenes with furanodiene skeletons. MyrLiq, a C. myrrha extract with a standardized content of curzerene, furanoeudesma-1,3-diene, and lindestrene (12.31±0.05 g kg^{-1}, 18.84±0.02 g kg^{-1}, and 6.23±0.01 g kg^{-1}, respectively) and a high total furanodiene content (40.86±0.78 g kg^{-1}), was investigated in a pilot study. Volunteers (N=184; age range, 18 to older than 60 years) exhibiting different pain pathologies, such as headache, fever-dependent pain, joint pain, muscle aches, lower back pain, and menstrual cramps, were divided into 2 groups. The experimental group received 1 capsule per day containing either 200 mg or 400 mg of MyrLiq (corresponding to 8 mg and 16 mg of bioactive furanodienes, respectively) for 20 days, and the placebo group was given the same number of placebo capsules. For the male volunteers, pain alleviation was obtained with MyrLiq 400 mg/day for almost all pathologies; for female volunteers, alleviation of lower back pain and fever-dependent pain was observed with only MyrLiq 200 mg/day. Results suggest that MyrLiq has analgesic properties.Germano 2017

Antimicrobial effects

Animal data

An in vitro study of 2 sesquiterpenes derived from myrrh (furanodiene-6-one and methoxyfuranoguaia-9-ene-8-one) discovered antibacterial activity against Pseudomonas aeruginosa (minimum inhibitory concentration [MIC] 1.4 mcg/mL), Staphylococcus aureus (MIC 0.18 mcg/mL), and Escherichia coli (MIC 2.8 mcg/mL). Additionally, these sesquiterpenes demonstrated antifungal activity against Candida albicans (MIC 1.4 mcg/mL). Local anesthetic activity was also noted in mammalian nerve cells.Dolara 2000

Antiparasitic effects

Myrrh has been used for its antiparasitic effects against various schistosome species, including Schistosoma mansoni, Schistosoma haematobium, and Schistosoma japonicum. Myrrh's effectiveness against these species may be caused by a separation of male and female couples through a loss of the musculature. As a result, the worms are shifted to the liver where they undergo phagocytosis.Barakat 2005 Additionally, myrrh

has been used to treat fascioliasis, a zoonotic condition resulting from infection by Fasciola hepatica, a liver fluke that commonly infects sheep, goats, and cattle.Massoud 2001

Clinical data

In a field survey in Egypt, 1,019 individuals were examined for schistosomal infections. The prevalence of S. haematobium was 4%, and the prevalence of S. mansoni was 2%. All cases were treated with 600 mg of Mirazid (the oleo resin extract from myrrh [C. molmol]) 1 hour before breakfast for 6 consecutive days. Patients were followed and assessed for parasitic infections via urinalysis and stool analysis. After 3 months, the parasitological cure rate was 97% and 96% for S. haematobium and S. mansoni, respectively. Patients did not experience any adverse drug reactions. The authors of this study suggest that Mirazid is safe and effective for the treatment of S. haematobium and S. mansoni infections.Abo-Madyan 2004

Another study in Egypt included patients ranging from 12 to 68 years of age with schistosomiasis (N=204). Infected patients were divided into 1 of 2 groups: those with schistosomal colitis or those with compensated or decompensated hepatosplenic schistosomiasis. All patients received a formulation of myrrh at a dose of 10 mg/kg/day for 3 consecutive days on an empty stomach 1 hour before breakfast. After 2 months, patients who still had evidence of ova received another course of myrrh for 6 days. The overall cure rate was 91% for all infected patients. The cure rates for patients with schistosomal colitis, compensated hepatosplenic schistosomiasis, and decompensated hepatosplenic schistosomiasis were 90%, 94%, and 90%, respectively. For 12 patients who had never received treatment with praziquantel, the cure rate associated with myrrh was 100%. All 4 patients with S. hematobium infections experienced a 100% cure rate, and those with S. mansoni had a 91% cure rate. The most common adverse reactions reported by 12% of patients included giddiness, somnolence, mild fatigue, and abdominal pain.Sheir 2001

Another study in Egyptian patients (459 children between 12 and 18 years of age and 672 household contacts) was conducted to assess the efficacy of Mirazid compared with praziquantel for treatment of S. mansoni infection. Of the 1,131 individuals in the sample population, 379 tested positive for S. mansoni (144 children, 235 household members). The 379 patients were stratified into 3 groups based on tissue egg loads: low infection (ie, less than 100 eggs/g of feces), moderate infection (ie, 100 to 400 eggs/g of feces), and heavy infection (ie, more than 400 eggs/g of feces). Within each stratum, patients were randomized to receive Mirazid 300 mg/day for 3 days on an empty stomach or a

single dose of praziquantel 40 mg/kg, with those not complying with treatment determined to be controls. Children were assessed 4 weeks following treatment, and household contacts were reassessed between 5 and 6 weeks following treatment. At the end of the study, the overall cure rate for children receiving Mirazid was 9%, compared with 63% for those receiving praziquantel and 0% for controls. The overall cure rate for household contacts receiving Mirazid was 9%, compared with 80% for those receiving praziquantel. A cure rate of 27% was reported for the household contact control group. For the infection subgroups in children, the low-infection group had a cure rate of 18% with Mirazid, compared with 71% with praziquantel and 0% for control ($P<0.001$); the cure rates for patients in the moderate- and heavy-infection groups were 0% for all 3 treatment groups. Regarding infection subgroups in household contacts, the low-infection group had a cure rate of 12% with Mirazid, 83% with praziquantel, and 33% for control ($P<0.01$); the moderate-infection group had cure rates of 0% with Mirazid, 71% with praziquantel, and 0% for control ($P<0.01$); and the heavy-infection group had cure rates of 0% with Mirazid, 67% with praziquantel, and 0% for control. The observed cure rate could be considered the false cure rate; a spontaneous cure rate of 27% was reported in the household contact control group, defined as those who did not comply with treatment protocol, but it should be noted those patients reported that they had not received any antischistosomal drugs. Based on study results, the value of myrrh in the treatment of schistosomiasis is questionable.Botros 2005

In one Egyptian village, prevalence of S. mansoni was determined to be 15% (104 infected subjects). Infected patients were randomized to receive either myrrh (2 capsules of Mirazid on an empty stomach for 3 consecutive days) or 2 doses of praziquantel (40 mg/kg after breakfast) given within a 3-week interval as antischistosomal therapy. The medications were offered twice because the study was conducted during schistosomiasis transmission season, and the investigators wanted to eliminate any immature worms that might not have been eradicated with the first treatment. After the first treatment, the cure rate for subjects treated with myrrh was 16% compared with 74% with praziquantel ($P<0.05$). After the second treatment, the cure rate for patients treated with myrrh was 9%, compared with 76% with praziquantel ($P<0.05$). Patients in either treatment group who did not respond to the first 2 doses were given praziquantel; after 4 weeks of receiving praziquantel, 95% of these patients stopped passing schistosomal eggs in stool. The findings from this study cast doubt on the antischistosomal effects of myrrh.Barakat 2005

A small 3-month study was conducted to assess the effects of myrrh on fascioliasis. The study included 7 patients between 10 and 41 years of age with confirmed fascioliasis as

well as 10 healthy subjects with a negative stool analysis. All infected patients passed *Fasciola* eggs in the stool, with an average egg load of 36±5 eggs/g of stool. All participants were given a formulation of myrrh at a dose of 12 mg/kg/day for 6 consecutive days on an empty stomach in the morning. By completion of therapy, the average egg count in fascioliasis patients had decreased to 6±2 eggs/g of stool. Eggs had completely disappeared within 3 weeks following treatment and remained eradicated up to the 3-month follow-up. No adverse reactions were reported.Massoud 2001

In another study, 21 children with fascioliasis (mean age, 10 years) and 8 children with S. mansoni (mean age, 11 years) received 10 mg/kg/day of myrrh (Mirazid) 1 hour before breakfast for 6 consecutive days (fascioliasis) or 3 consecutive days (schistosomiasis). A control group of 10 healthy children was included. Four weeks following treatment, 91% of patients with fascioliasis and 100% of patients with schistosomiasis who received Mirazid experienced a parasitological cure. Total immunoglobulin E levels declined significantly following 12 weeks of treatment with myrrh in patients with fascioliasis and schistosomiasis (P=0.001 and P=0.036, respectively, vs control). In both groups, interleukin 5 (IL-5) levels (P=0.005 and P=0.012, respectively) and IL-1beta levels (P<0.001 and P<0.003, respectively) also declined significantly compared with control. IL-4 levels were not significantly different from control prior to treatment with myrrh for patients with fascioliasis and schistosomiasis (P=0.58 and P=0.72, respectively) but increased significantly following treatment (P=0.04 and P=0.02, respectively). This study concluded that the Mirazid formulation of myrrh demonstrated efficacy as a fasciolicidal and schistosomicidal agent. It was also suggested that cytokine levels may be evaluated to assess cure.Soliman 2004

Antitumor/Anticarcinogenic effects

Animal data

Mice with Ehrlich solid tumors were given C. molmol and followed at 25 and 50 days of administration. Doses of 250 to 500 mg/kg/day were found to be cytotoxic in these solid tumor cells, with effects comparable with cyclophosphamide. However, after 50 days of therapy, the effects were not as significant. C. molmol may be of interest as an anticarcinogenic agent for solid tumors.al-Harbi 1994

In another study of cyclophosphamide-treated mice, C. molmol doses of 125 to 500 mg/kg were not mutagenic. Mitodepressant effects in the femoral cells and reductions in RNA levels in liver cells were demonstrated and were dose dependent.al-Harbi 1994

Dental effects

In vitro data

An in vitro study of the anti-inflammatory effects of myrrh oil on human gingival fibroblasts and epithelial cells was conducted. Myrrh oil inhibited the production of prostaglandin E_2 via interleukin-1beta stimulation by fibroblasts (P=0.001) but not by epithelial cells.Tipton 2006

Clinical data

In a double-blind trial to examine the wound healing effects of myrrh, 60 healthy adult participants who underwent dental extraction under local anesthesia using standard protocol were randomized to receive C. molmol (myrrh) extract as a mouthwash (n=20) or normal saline mouthwash as control (n=20). The participants used the mouthwashes twice a day for 7 days starting from the first postextraction day. Clinical examination data were recorded and analyzed. The results showed a statistically significant between-group difference in postoperative surgical-site edema, tenderness, and socket size, with the test group showing greater improvements. It was concluded that myrrh mouthwash enhanced wound healing during the early period after tooth extraction.Al Eid 2020 Further studies of myrrh's effects for gingival conditions are warranted.

Diabetes mellitus

Animal data

A plant mixture extract containing myrrh reduced the rate of gluconeogenesis in hepatocytes of diabetic rats. Additionally, blood glucose levels were lowered from an average of 16.7 mmol/L at baseline to 8.5 mmol/L. Levels were compared with those of rats treated with phenformin, in which blood glucose levels at baseline averaged 15.1 mmol/L and following treatment averaged 10.7 mmol/L. Results suggest myrrh may be of interest in the management of diabetes mellitus, although clinical studies were lacking at the time.al-Awadi 1991

Clinical studies

A descriptive review evaluating the effectiveness of myrrh to treat diabetes concluded that there is insufficient evidence to support this use.Alsanad 2018

GI effects

Animal and in vitro data

Myrrh has a locally stimulating action on smooth muscle tissue and may stimulate

peristalsis.Morton 1977, Spoerke 1980 By contrast, T-cadinol has a concentration-dependent smooth muscle relaxing effect on isolated guinea pig ileum and a dose-dependent inhibitory effect on cholera toxin–induced intestinal hypersecretion in mice.Claeson 1991

In rats, pretreatment with an aqueous solution of C. molmol provided dose-dependent protection against the development of GI ulcers caused by ethanol 80%, sodium chloride 25%, sodium hydroxide 0.2 M, indomethacin, and combined ethanol-indomethacin treatment. This protective effect is believed to be attributed to C. molmol's effects on gastric mucus secretion and its ability to increase nucleic acid and nonprotein sulhydryl concentrations.al-Harbi 1997

Myrrh also exerted barrier-stabilizing and tumor necrosis factor alpha–antagonizing effects in human intestinal epithelial cell models via inhibition of PI3K and STAT6 signaling. This suggests therapeutic application of myrrh in intestinal diseases associated with barrier defects and inflammation.Rosenthal 2017

In one study, the effects of myrrh on wound healing and gastric-ulcer healing in rats demonstrated an increase in white blood cell levels, suggesting an antigen-driven response.Walsh 2010

Nephroprotective effects

Animal data

Animal models using Wistar rats show that C. molmol protects against nephrotoxicity induced by methotrexate via upregulation of Nrf2/ARE/HO-1 signaling.Mahmoud 2018

Wound healing effects

Clinical data

Limited clinical studies suggest myrrh is successful in treating wounds and ulcers, largely due to its anti-inflammatory qualities. In addition, myrrh has sufficient antioxidant and analgesic properties that provide additional benefits. Myrrh is useful as a topical agent to facilitate drying and provide wound cleansing.Walsh 2010

Dosing

Myrrh may be administered as a tincture or as part of dental powders, teas, mouth rinses, and gargles. Myrrh doses and formulations used in studies evaluating its antiparasitic effects (ie, in schistosomiasis, fascioliasis) have varied.Abo-Madyan 2004,

Botros 2005, Massoud 2001, Sheir 2001, Soliman 2004

Pregnancy / Lactation

Avoid use. Adverse reactions have been documented.Ernst 2002, Hanus 2005, Newall 1996 Myrrh is considered to be an emmenagogue and an abortifacient. Excessive use of myrrh might result in adverse effects such as acute abdominal pain, infertility, and recurrent miscarriages.Al-Jaroudi 2016

Interactions

Antidiabetic drugs: Myrrh has demonstrated the ability to lower blood sugar levels. Use caution in individuals also receiving antidiabetic medications, especially those that can lead to hypoglycemia. Careful monitoring of blood glucose is warranted.(al-Awadi 1991, Hanus 2005)

Warfarin: Myrrh may diminish the therapeutic effect of warfarin. No action needed.(Al Faraj 2005)

Adverse Reactions

Although myrrh is generally considered to be nonirritating, nonsensitizing, and nonphototoxic to human and animal skin, several cases of dermatitis caused by myrrh have been reported.Lee 1993, Leung 1980 In case reports of 2 patients using transdermal myrrh formulations for tendonitis, both developed contact dermatitis at the application sites within a few weeks of administration. Both reactions resolved within several weeks to 1 month with topical corticosteroid therapy.Gallo 1999

Toxicology

No serious toxicities have been reported with myrrh. Myrrh is approved by the Food and Drug Administration for use in food and was given generally recognized as safe (GRAS) status as a flavoring agent.Massoud 2001

Index Terms

- *Commiphora mukul*

References

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