This widely available herb has diverse therapeutic uses, including antiphlogistic, sedative and antimicrobial effects.

Chamomile

by George Nemecz, PhD

Among the oldest known medicinal herbs, chamomile was used by the Egyptians to cure ague and as an offering to their gods. The aroma of the fresh flowers is similar to the scent of certain apples. The Greeks, noting this characteristic, called it 'kamai-melon' (ground apple).

The Arab herb physician Abul Abbas mentions how the use of this plant spread from the Middle East to Spain. Hippocrates described this herb as helpful in the treatment of congestion and dysmenorrhoea. Dioskurides, Galen and Plinius also recommended chamomile tea for inflammation of the mouth, and a sitz bath with chamomile tea or tincture added in cases of painful menstruation. The essential oils of chamomile and chrysanthemum were frequently used in the treatment of malaria. Oil infusions of chamomile or the distilled essential oils are also popularly used to treat stomach ulcer, as described by Saladin in the fifteenth century.

Chamomile extract, oil, tea, poultice, vapour, and ointment are folk remedies but also have been used by medical practitioners throughout history. A comprehensive list of chamomile uses would be very long, but the most common applications are for the treatment of anxiety, insomnia, vertigo, gastritis, colitis, teething, conjunctivitis, inflamed skin, bronchitis and laryngitis.

There are actually two herbs commonly called chamomile: Roman (common) chamomile and German (Hungarian camomile, wild chamomile, scented mayweed). Roman chamomile (*Chamaemelum nobile, Anthemis nobilis*) is native in southwestern and northwestern regions of Europe (Spain, France, England) and is scattered around the eastern Mediterranean, the Balkans and Crimea. German chamomile (*Matricaria recutita, Chamomilla recutita*) is originally native to southeastern and southern Europe. It is one of the most commonly distributed medicinal herbs all over the world, except the tropical and the arctic regions. Both chamomiles are used in traditional herbalism and medicine; however, German chamomile is more frequently preferred for medicinal use. In addition, chamomile extract and essential oils are frequently used as components in several cosmetic and hygienic products.

Chamomilla recutita is an annual herb with short but widespread roots. It varies in size (from small to two feet) depending on the locality and the soil. The leaves are finely divided — the lower ones grow in threes, the middle are paired and the upper is a single pinnate. The mildly scented flowers are arranged in flower heads, which are convex when they first bloom and later become conical in shape. The head is surrounded by 12-18 tongue-shaped, white ray florets and the disk florets. The flowers are collected from May to July.

Roman chamomile is a very aromatic perennial herb and is more robust than *Chamomilla recutita*. The flower heads are hemispherical and densely surrounded by silvery white florets. It is a low-growing plant — less than 25cm in height. The hairy and branched stems are covered with leaves divided into threadlike segments. This fineness gives the whole plant a feathery appearance.

Chemical composition and pharmacological action

Chamomilla recutita, the sun-loving plant of the plains is rich in active ingredients and has remained one of the most popular herbs since ancient times. There are different classes of active constituents, which have been isolated and used individually in medical practice and cosmetics. The plant contains 0,24%-1,9% volatile oil, which is a wonderful blend of different individual oils. This oil, extracted from flower heads by steam distillation, can range in colour from brilliant blue to deep green when fresh but fades over time to dark yellow. Despite fading, the oil does not lose its potency. The oil contains α- bisabolol (up to 50%) chamazulene cyclic sesquiterpenes, which directly reduce inflammation and are mild antibacterials. The essential oil also contains bisabolol oxides, farnesene and spiro-ether which have anti-inflammatory and antispasmodic actions.

The essential oil of Roman chamomile contains less chamazulene and is mainly constituted from esters of angelic acid and tiglic acid. It also contains farnesene and α-pinene. When a mild sedative is required, Roman chamomile is preferred.

Important flavonoids have been identified in German chamomile, including apigenin, luteolin and quercetin. Recent research indicates that they display more or less inhibitory effects on certain malignant cell proliferation *in vitro*. Some alkylated flavonoids, such as chrysoplenin, chrysoplenol and jaceidin, also have been traced. These compounds have recently been shown to possess anti-inflammatory and antispasmodic activity. Other classes of compounds identified are coumarins, hemiarin and umbelliferone. These have anti-

Reproduced by Sabinet Gateway under licence granted by the Publisher (dated 2012)

inflammatory properties. In addition, *Matricaria recutita* contains phenolic carboxylic acids such as vanillic, anisic, syringic and caffeic acids. Other relevant constituents are anthemic acid, anthemidine tannin and matricarin.

Roman chamomile contains up to 0,6% of sesquiterpene lactones of the germacranolide type, mainly nobilin and 3-epinobilin. Some of the important flavonoids identified in matricaria, such as apigenin, luteolin and apiin, are also found in Roman chamomile, as is phenolic carboxylic acids (caffeic, ferulic), coumarins and thiophene derivatives.

KEY POINTS

- Chamomile extract, oil, tea, poultice, vapour, and ointment are folk remedies but also have been used by medical practitioners throughout history.
- Chamomile is one of the most commonly distributed medicinal herbs all over the world, except the tropical and the arctic regions.
- There are different classes of active constituents, which have been isolated and used individually in medical practice and cosmetics.
- This oil, extracted from flower heads by steam distillation, can range in colour from brilliant blue to deep green when fresh but fades over time to dark yellow.

Medicinal and other uses of chamomile

Chamomile contains a wide variety of active constituents. Each expresses a specific action, but the fascinating holistic effect is a result of all of the components working together. Relatively few clinical and animal studies were carried out using whole plant extract or essential oil. In 1927, Arnold and co-workers started to study the antiphlogistic effect of chamomile. In 1933, Heuber and Graube identified a major component of chamomile oil (chamazulen) responsible for the antiphlogistic effect. However, recently isolated components have been researched for further information on medicinal value.

Antiphlogistic effects: The antiphlogistic action of chamomile has been recognized for many years. The standardization of the chamomile extract for main components raised questions about which has the most potent antiphlogistic effect. Experiments conducted in rat paw oedema (carrageenin) showed that (-)α-bisabolol has prominent antiphlogistic effects more marked than that of bisabolol oxides and the synthetic racem bisabolol. Chamazulene and guajazulene were also less effective compared to (-)α-bisabolol. However, chamazulene showed almost constant effects up to four hours after administration, while quajazulene's effect declined after two hours. The marked antiphlogistic effect of (-)α-bisabolol was further substantiated in a number of different experimental models such as UV-erythema of guinea pig, yeast fever of rats and in adjuvant arthritis of rats.

Oxygen free radical-related reactions are implicated in numerous pathophysiological conditions such as inflammation, gastric ulceration, neuronal degeneration and tumour promotion. Chamazulene was found to produce a significant protection against lipid peroxidation induced by Fe^{2+}/ascorbate. Active oxygen species attacking membrane lipids (mainly polyunsaturated fatty acids) generate inflammatory responses and tissue damage. Therefore, chamazulene as a potent antioxidant with low IC_{50} (18 μM) is comparable to known antioxidants such as quercetin (IC_{50} 17μM) or propyl gallate (IC_{50} 10μM), which have therapeutic value in the anti-inflammatory processes. Oxygen free radicals are also essential for the activation of 5-lipoxygenase enzyme, a key enzyme in leukotriene production. Since leukotrienes are involved in the initiation and maintenance of a variety of inflammatory diseases, it was reasonable to test the effect of chamazulene on leukotriene synthesis. Indeed, chamazulene inhibited the formation of leukotriene B_4 in rat peritoneal neutrophilic granulocytes, in a concentration-dependent manner.

(-)α-bisabolol was studied in experimental ulcer models with rats. One of the following were used to induce ulcers: 20mg/kg indomethacin, 3,5ml 50% ethanol, 0,05ml 80% acetic acid, or stress produced by periodic noise. (-)α-bisabolol inhibited occurrence of ulcers induced by indomethacin, stress or ethanol and shortened healing time of acetic acid-induced ulcers.

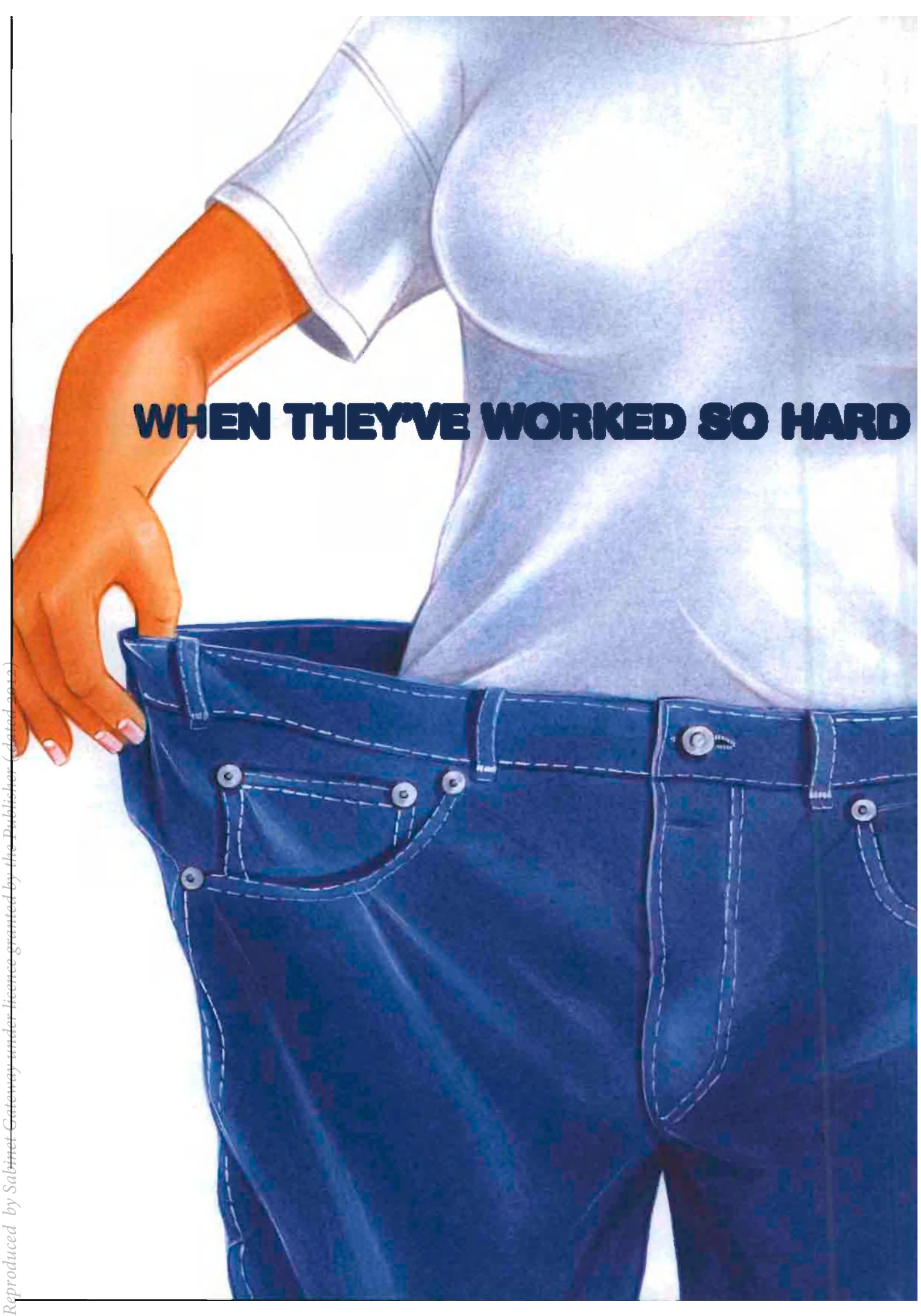
The influence of chamazulene, α-bisabolol and one of the dicycloethers (components of essential oil) was studied on protamine sulfate-provoked degranulation of mast ceils from Lewis-1a rats. The degranulation effect was determined by measuring histamine liberation. Chamazulene and α-bisabolol had no distinct inhibition but dicycloether above 10^{-4} M inhibited degranulation.

Spasmolytic effect: A systematic comparison of spasmolytic action of the hydrophilic and lipophilic compounds of chamomile was carried out on isolated guinea pig ileum. Series of tests showed that the total extract and some of the ingredients had a dose-dependent spasmolytic effect on the smooth muscles of the instestine. The lipophilic (-)α-bisabolol, bisabolol oxides showed a marked papaverine-like musculotropically spasmolytic action while the essential oil had the least effect. The chamomile flavones apigenin, luteolin patuletin and quercetin were also very active in their spasmolytic action. These studies showed that the lipophilic as well as the

About the author

George Nemecz, PhD, is assistant professor of biochemistry, Department of Pharmaceutical Sciences, Campbell University School of Pharmacy, USA.

Reproduced by Sabinet Gateway under licence granted by the Publisher (dated 2012)



Reproduced by Sabinet Gateway under licence granted by the Publisher (dated 2013)

When approximately 18% of South Africans and one third of Americans are obese, it's not surprising that the World Health Organization has declared an obesity epidemic on a global scale.[1]

Not only is obesity a risk factor for hypertension, type 2 diabetes, hypercholesterolaemia and cancer, but it also increases the rate of mortality.[1]

...THE LAST THING THEY WANT IS TO SEE IT REAPPEAR.

A moderate weight loss of only 5-10% of your patients' initial body weight can significantly reduce these risk factors and vastly improve their quality of life.[2]

Xenihealth, Roche's Patient Support Programme will assist your patient to achieve and maintain their goal weight. Equipped with all the necessary support items to facilitate a comfortable weight management programme, they will feel both inspired and motivated to commence their weight loss journey.

So if your patients' excess body weight has become a hazardous burden, Xenihealth's supporting role will help them to decrease it.

XENICAL™
orlistat

XENIHEALTH
Gain Health By Losing Weight

GAIN HEALTH BY LOSING WEIGHT.

References: 1. WHO International Obesity Task Force (IOTF). Obesity – Preventing and managing the global epidemic. Report of a WHO Consultation on Obesity; Geneva, 3-5 June 1997. Geneva: World Health Organization 1998; xv, 7-40. 2. Xenical Product Monograph, Roche, Switzerland.

Full details are available on request from Roche Products (Pty) Ltd.
Reg. No. 05/27044/07. P.O. Box 129, Isando 1600. Tel. (011) 928-8742.

S3 *Xenical™ Orlistat 120 mg per capsule. Reg. No. S2/11.2.1/0475. Pack size 84's.* X054 38025

Reproduced by Sabinet Gateway under licence granted by the Publisher (dated 2012)

hydrophilic components take part in the therapeutic action.

Sedative, hypnotic, analgesic effects: Chamomile tea is known for its sedative and hypnotic effects. In a psychological study, images were used to induce slight negative and positive moods in 22 subjects. Subjects visualized 20 positive and 20 negative scenes while under the influence of either chamomile oil or a placebo. Chamomile oil significantly increased the latency of all images and shifted the mood ratings and frequency judgements in a positive direction.

The development of depression and anxiety is frequent in menopausal women. In an experimental model, inhalation of chamomile oil vapour reduced restriction stress-induced elevation of plasma ACTH level in ovariectomized rats. One mg/kg oral diazepam also effectively decreased the stress-induced ACTH level. Combined application of diazepam and chamomile oil vapour further decreased the stress-related elevation of ACTH. The authors suggested that chamomile oil might affect the GABAergic system in the rat brain, similarly as the benzodiazepine agonist.

The anxiolytic effect of apigenin was tested in mice. Apigenin, isolated from the aqueous extract of *Matricaria recutita*, had a clear anolytic activity in mice, as tested in the elevated plus-maze. A dosage up to 10mg/kg produced no sedation or muscle relaxant effect. However, a ten-fold increase in dosage produced a mild sedative effect. Binding studies of apigenin on

Chamomile tea is known for its sedative and hypnotic effects.

synaptosomal membrane, prepared from bovine cerebral cortex, showed significant affinity for the central benzodiazepine receptor. Apigenin competitively inhibited the binding of flunitrazepam, a benzodiazepine receptor ligand, with a K_i of 4 µM, and had no effect on muscarinic receptor, α_1-adrenoceptors and on the binding of muscimol to $GABA_A$ receptors. The authors concluded that apigenin is a ligand for the benzodiazepine receptors, exerting anxiolytic and slight sedative effects but not being anticonvulsant or myorelaxant.

The effect of chamomile tea on the cardiovascular system is unclear. Twelve patients with cardiac disease underwent cardiac catheterization. Haemodynamic data obtained prior to and 30min after ingestion of chamomile tea demonstrated a small but statistically significant ($p<0,05$) increase in the mean brachial artery pressure. No other significant haemodynamic changes were observed. However, 10 of 12 patients fell into deep sleep shortly after drinking the tea.

Antimicrobial activity of essential oil: The volatile oil prepared from flower heads (fresh or dried) by steam distillation has been tested against Gram-positive (*Staphylococcus aureus, Bacillus subtilis*) and Gram-negative bacteria (*E coli, Pseudomonas aeruginosa*) as well as a fungus, *Candida albicans*. Oil concentrations above 0,05% were very effective against the Gram-positive bacteria and Candida. The Gram-negative bacteria were relatively less sensitive except for *Bacillus subtilis*. The antibacterial effect may depend on the concentration of chamazulen, bisabolol and bisabolol oxides in the extract. Even at low concentrations, <100-µg/ml, α-bisabolol and its spiro-ether were effective antibacterial agents and exhibited fungicide activity.

A partial antiviral effect of aqueous and hydroalcoholic extract of *Matricaria chamomilla* has also been described in cell culture and animal studies. The aqueous extract lowered the tick-borne encephalitis virus titre in kidney cells, and induced the resistance in virus-infected mice. In addition, hydroaicoholic extract in the early stage of poiiovirus development inhibitis cellular and viral RNA synthesis.

Topical applications: Chamomile preparations are widely used in skin care products to reduce cutaneous inflammation and other dermatological disease. In a double-blind trial, chamomile extract was tested on 14 patients after dermabrasion of tatoos. The drying effect on weeping wound areas was followed as an objective parameter. Researchers observed statistically significant decreases of the wound areas as well as a drying tendency. Anti-inflammatory activity of witch hazel distillate (*Hamamelis virginiana*), applied topically on 24 patients, was compared to chamomile and to 1% hydrocortisone cream. Erythema and moist desquamation, which are side-effects of radiotherapy, were treated with chamomile cream and almond ointment. Fifty women who had undergone breast cancer surgery were included in the study. Each woman received 2 Gy per treatment, five times a week (6 MeV electron beam on the scar area). Researchers found a small advantage in the protection (skin changes appeared later) in the chamomile cream group but in the comparison no statistically significant differences were observed in the areas tested. In another clinical test erythema was induced by UV irradiation and was treated with either hamamelis extract with

Reproduced by Sabinet Gateway under licence granted by the Publisher (dated 2012)

phosphatidyl-cholin emulsion, chamomile cream, or 1% hydrocortisone. Skin blanching was qualified by visual scoring and chromametry. Both the hamamelis and the chamomile reduced redness, but the hydrocortisone had a greater effect when compared to the herb cream.

In a recent *in vivo* study with nine female volunteers, chamomile flavons — apigenin, luteolin and apigenin 7-O-ß-glukoside — adsorbed at the skin surface and penetrated into deeper skin layers. This observation supports their use as topical antiphlogistic agents to treat inflammations in deep tissues.

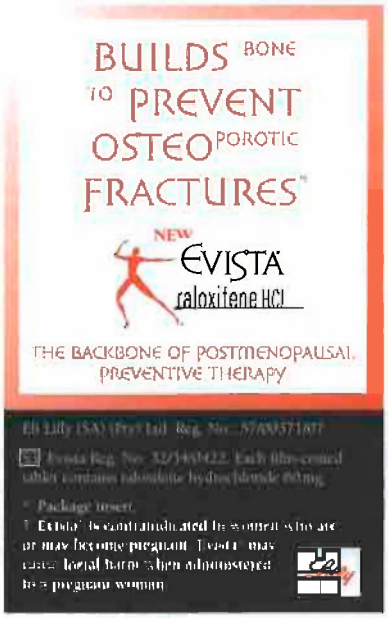
The anti-inflammatory effects of a hydroalcoholic extract of *Chamomilla recutita* was tested in mice (1ml of extract contained 50mg of dry product). A 2,5% emulsion of croton oil was used on the ears of animals to produce oedema. A dose-dependent response was observed when chamomile extract was used to reduce oedema.

Stomatitis is a frequent dose-limiting side-effect of 5-fluorouracil-based (5-FU) chemotherapy. The ulceration can be painful and may limit future cytotoxic therapy. In a radomized trial, 164 patients used chamomile mouthwash or placebo, along with 30-min oral cryotherapy to reduce developing stomatitis from 5-FU treatment. In a 14-day trial, chamomile or placebo was administered three times daily starting at the first day of chemotherapy. Combined results from this trial did not support significant differences between chamomile- and placebo-treated groups.

However, subset analysis based on gender revealed that chamomile might be benefical for males but detrimental for females. No plausible explanation was found for these results.

Adverse effects, allergic reactions

A relatively low percentage of people are sensitive to chamomile and develop allergic reactions. People sensitive to ragweed and chrysanthemums or other members of the Compositae family are more prone to develop contact allergies to chamomile, especially if they take other drugs that help to trigger the sensitization.



A large-scale clinical trial was conducted in Hamburg, Germany, between 1985 and 1991 to study the development of contact dermatitis against a so-called Compositae mix. Twelve species of the Compositae family, including German chamomile, were selected and tested individually when the mixture induced allergic reactions. During the study; 3851 individuals were tested using a patch with the plant extract. Of these patients, 118 (3,1%) experienced an allergic reaction. Further tests revealed that feverfew elicited the most aliergic reactions (70,1% of patients) followed by chrysanthemums (63,6%) and tansy (60,8%). Chamomile fell in the middle range (56,5%). A study involving 686 subjects exposed either to a sesquiterpene lactone mixture or a mixture of Compositae extracts led to allergic reactions in 4,5% of subjects.

Chamomile tea is also a folk remedy to treat conjunctivitis and other ocular reactions. A clinical study on seven hay fever patients with conjunctivitis showed that washing the eye with chamomile tea further provoked the inflammatory reactions. In contrast, no symptoms were observed after oral challenges with tea. Only a few cases reported that ingestion of chamomile tea caused an anaphylactic reaction. All patients suffered from hay fever and one of them had bronchial asthma caused by a variety of pollens. In one case the patient additionally ingested aspirin, which might be suspected to trigger the anaphylactic shock.

Dosage recommendation

Chamomile may be used medicinally in many forms. Infusion can be prepared from fresh or dried flower heads, usually two to three teaspoonsfuls in a cup of boiling water, infused for ten minutes and taken orally three times a day. Fom tincture, 1-4ml can be diluted in a cup of spring or filtered water, taken orally three times a day. The same preparation can be used externally as a fomentation. An infusion of one teaspoonful of flower heads can be given to children for pain of dentition, stomachache, earache or neuralgic pain. In aromatherapy the essential oil of chamomile is a valued part of blended preparations and is also used as a component of massage oils.

Conclusion

Chamomile has been used in herbal medication since ancient times, is still popular today and probably will continue to be used in the future. Recent research on heteropoly-saccharides isolated from chamomile flowers showed immunomodulating action. Apigenin, a plant flavonoid found in chamomile, showed inhibitory effect of TPA-mediated tumour promotion and antimutagenicity. Initial studies also showed the topical use of apigenin reduced UV-induced skin tumourogenesis. Acute HIV-1 infection of H9 and C8166 cell cultures could be suppressed by certain flavonoids, including apigenin. This might be a potential therapeutic strategy to maintain the cellular state of HIV-1 latency. With a large list of recent basic research accruing, chamomile is a perfect example of a herb having diverse therapeutic uses.

Reproduced by Sabinet Gateway under licence granted by the Publisher (dated 2012)