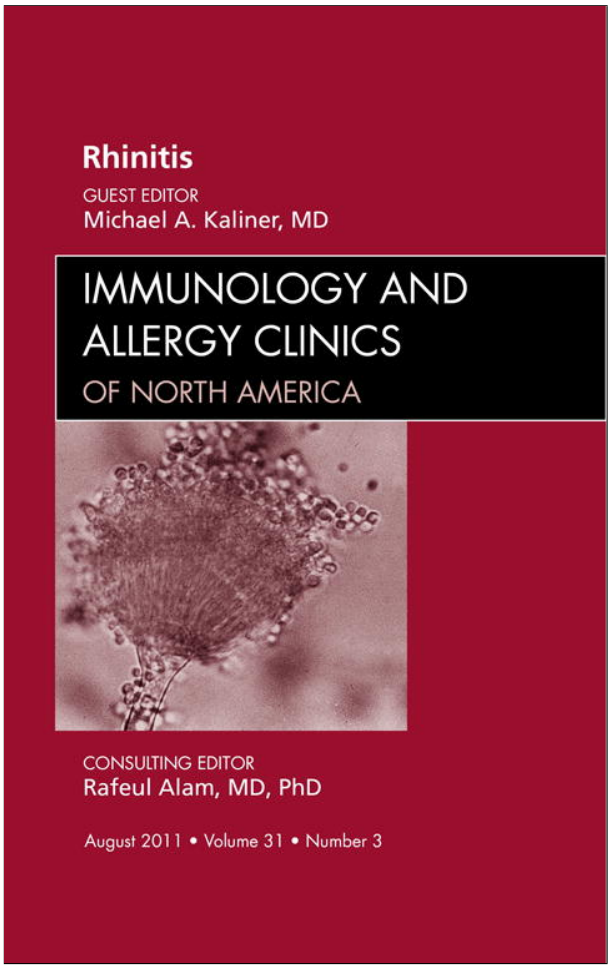

The Role of Decongestants, Cromolyn, Guafenesin, Saline Washes, Capsaicin, Leukotriene Antagonists, and Other Treatments on Rhinitis

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KEYWORDS

• Decongestants • Rhinitis • Saline wash • Allergy
• Alternative treatment • Herbal treatment • Acupuncture
• Leukotriene antagonist

Treatment of rhinitis should be selected based on careful diagnosis.[1] Clinical symptoms of allergic and nonallergic rhinitis are similar despite the significant difference in underlying mechanisms.[2,3] Most of the treatments reviewed in this article are available over the counter (OTC) and thus are a likely choice of patients suffering from acute or chronic rhinitis. Patients seek OTC medications to relieve their symptoms, such as congestion, rhinorrhea, and nasal pruritus, regardless of cause, which is sometimes difficult to establish.[4] Primary care physicians are more likely to recommend OTC products for mild symptoms of rhinitis.[5] According to surveys in chronic rhinitis, sufferers' dissatisfaction with prescribed treatments leads to decreased compliance and an increased reliance on multiple alternative options and OTC products.[6] Combination and single-ingredient nonprescription medications that are approved by the US Food and Drug Administration (FDA) as generally safe, although they do have side effects and, if used inappropriately, can cause worsening of the condition. Primary care physicians and subspecialists (eg, allergists, ear, nose, and

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throat specialists) face the issue of self-treatment, overdose, and related complications such as rhinitis medicamentosa,[7] atrophic rhinitis,[8] and septal perforation.[9]

OTC treatments can be used as effective and affordable therapeutic modalities when recommended by a physician. Adjunct treatments, such as herbal medicine, acupuncture and homeopathy, have become increasingly popular.[10] This article provides an overview of treatment suggestions, benefits, and side effects for available OTC, prescription drug, and alternative choices in addition to the therapies described in other articles.

DECONGESTANTS AND GUAIFENESIN

Decongestants and guaifenesin are most frequently used as symptomatic relief in acute viral and bacterial rhinosinusitis, and for congestion associated with chronic rhinitis or sinusitis.[11] Topical preparations such as sprays, drops, and mist produce immediate relief that usually lasts 12 to 24 hours. Oral preparations have delayed onset of action, last 12 to 24 hours, and are almost universally manufactured as ingredients of combination pills marketed for cold, sinus pressure, or sinus headache relief. Decongestants are indicated for treatment of vasomotor rhinitis, and as an add-on therapy in the optimum management of allergic rhinitis, viral illness, sinusitis, otitis media, and eustachian tube dysfunction.[12] It is important to remind patients that decongestants do not treat underlying cause, and thus should be only considered as adjunct and temporary options.

The desired intranasal effect of decongestants occurs through direct and indirect activation of postsynaptic α-adrenergic receptors located on the muscles lining the walls of blood vessels on nasal mucosa.[13] When activated through sympathomimetic mechanisms, the muscles contract, causing vasoconstriction. The constricted blood vessels now allow less fluid extravasation, which results in decreased edema of nasal tissues, as well as decreased mucus production, which in turn decreases airflow resistance.

A major limitation of the topical decongestants is rebound hyperemia and worsening of the symptoms that occur with chronic use (rhinitis medicamentosa).[14] Therefore, topical decongestants generally are used on a short-term basis for less than 5 days. Patients who continue to use nasal decongestant sprays beyond this point may become reliant on the medication to relieve their chronic congestion. If long-term therapy is needed, oral agents should be recommended.[15]

Systemic effects are unavoidable and undesirable. Because of nonselective activation of sympathetic systems, the most common side effects include hypertension, central nervous system (CNS) stimulation, sleepiness, nervousness, excitability, dizziness, and anxiety.[16] Infrequent adverse reactions include tachycardia and/or palpitations. Rarely, therapy may be associated with hallucinations, arrhythmias, seizures, and ischemic colitis.[17–20]

Decongestants are not indicated, or should be used with extreme caution, in diabetes mellitus, cardiovascular disease, hypertension, prostatic hypertrophy, hyperthyroidism, closed angle glaucoma, or those who are pregnant. Most decongestants are pregnancy category C.[21]

OTC cold and cough medicines do not work for children less than 6 years of age, and giving these medicines to young children cannot be recommended according to the recent ruling of the FDA committee.[22] Significant concern caused several fatalities associated with OTC decongestant use in children who are younger than 2 years, who are at the highest risk for toxicity and for whom safe dosing recommendations are lacking. Concerning patterns of use include taking more than 1 decongestant-containing

product concurrently, using decongestant for extended periods, and using adult medicines for children.[23,24] Combination products can be particularly susceptible to problems with overdosing, because parents sometimes do not realize they are duplicating ingredients (**Table 1**).

Pseudoephedrine is a diastereomer of ephedrine and a precursor of methamphetamine and methcathinone. Pseudoephedrine is a chiral molecule, meaning it occurs in both left-handed and right-handed configurations, which can not be superimposed.[25] It causes the release of endogenous norepinephrine (noradrenaline) from storage vesicles in presynaptic neurons. The displaced noradrenaline is released into the neuronal synapse where it is free to activate the postsynaptic adrenergic receptors located on the smooth muscle lining the walls of blood vessels. When activated by pseudoephedrine, the muscles contract, causing the blood vessels to constrict (vasoconstriction).[26] The constricted blood vessels now allow less fluid to leave the blood vessels and enter the nose, throat, and sinus linings, which results in decreased inflammation of nasal membranes as well as decreased mucus production. The same vasoconstriction action can also result in hypertension, which is a noted side effect of pseudoephedrine.

The advantage of oral pseudoephedrine compared with topical nasal preparations, such as oxymetazoline, is that it does not cause rebound congestion (rhinitis medicamentosa). However, it is more likely to cause adverse effects, including hypertension, sweating, and anxiety. Pseudoephedrine should not be used if the patient has taken any monoamine oxidase inhibitors such as isocarboxazid (Marplan), phenelzine (Nardil), rasagiline (Azilect), selegiline (Eldepryl, Emsam), or tranylcypromine (Parnate) within at least 14 days. Serious, life-threatening side effects can occur.[16] Pseudoephedrine should be used with caution in patients with heart disease, high blood pressure, diabetes, or thyroid disorder.

Some brand names of medications that contain pseudoephedrine are found in **Box 1**.

The United States Congress has recognized that pseudoephedrine is used in the illegal manufacture of methamphetamine. Congress passed the Combat Methamphetamine Epidemic Act of 2005 (CMEA). The law was mainly directed at pseudoephedrine products, but it also applies to all OTC products containing ephedrine, pseudoephedrine, and phenylpropanolamine, as well as their salts, optical isomers, and salts of optical isomers. Pseudoephedrine was defined as a scheduled listed chemical product, and the products were taken off the shelves and sold only by pharmacists with certain regulations and personal identification checks.

Phenylephrine, or Neo-Synephrine, is used as a decongestant and sold as an oral medicine, as a nasal spray, or as eye drops. Phenylephrine is now the most common OTC decongestant in the United States, surpassing pseudoephedrine; oxymetazoline is a more common nasal spray. Phenylephrine has recently been marketed as a substitute for pseudoephedrine (eg, Sudafed, original formulation), although some research suggests that oral phenylephrine may be no more effective as a decongestant than a placebo[1] because it is extensively metabolized by monoamine oxidase.[2] It was believed to decrease objective signs of respiratory distress in infants with bronchiolitis. A large controlled study did not show any changes in the clinical course.[27] Phenylephrine is a direct selective α-adrenergic receptor agonist, and is less likely to cause side effects such as CNS stimulation, insomnia, anxiety, irritability, and restlessness. The primary side effect of phenylephrine is hypertension. As a nasal spray, phenylephrine is available in 1% and 0.5% concentrations. It causes some rebound congestion effects, similar to oxymetazoline.

Some examples of products available in the United States that contain phenylephrine are listed in **Box 2**.

Table 1
Decongestants

Decongestant	Mode of Action	Local Side Effects (Topical Preparations)	Systemic Side Effects (Oral Preparations)	OTC Preparation
Pseudoephedrine	Release of endogenous norepinephrine		Hypertension, sweating, anxiety, insomnia, headache. Pregnancy category C, found in breastmilk	Afrinol, Novafed, Sudafed (Johnson & Johnson [formerly Pfizer]) Actifed, Contac, Dimetapp® Decongestant, Dimetapp® 12-Hour Non-Drowsy®, Triaminic® Allergy Congestion Mucinex D, Eltor, ChlorTrimeton Nasal Decongestant, Contac Cold, Drixoral Decongestant
Phenylephrine	Direct selective α-adrenergic receptor agonist	Stinging, burning, sneezing, increased nasal discharge, drying of the nostrils, and altered taste. Rhinitis medicamentosa with prolonged use	Dizziness, rapid or pounding heartbeat, trouble sleeping, shaking of the hands, tremors, unusual weakness, hypertension, headache. Pregnanacy category C	Ah-Chew D, Dimetapp Cold Drops, Lusonal, Nasop, Nasop12, PediaCare Children's Decongestant, Phenyl-T, Sudafed PE, Sudogest PE, Triaminic Thin Strips Cold, Neo-Synephrine, Despec-SF, Sudafed PE Extra Strength, Triaminic Thin Strips Nasal Congestion, Dime
Oxymetazoline	Nonselectively agonizes α1 and α2 adrenergic receptors	Rhinitis medicamentosa with prolonged use. Burning, stinging, increased nasal discharge, dryness inside the nose, sneezing	Nervousness, nausea, dizziness, headache, difficulty falling asleep or staying asleep, fast or slow heartbeat	Afrin, Sudafed OM, Dristan, Vicks Sinex, Mucinex Full Force, Allerest 12 Hour Nasal Spray, Duramist Plus, Duration, Four-Way Nasal Spray, Genasal, Neo-Synephrine 12 Hour, Nostrilla, NRS Nasal, NTZ Long Acting Nasal, Oxyfrin, Oxymeta-12, Sinarest Nasal, Si
Guaifenesin	Acts as an expectorant by increasing the volume and reducing the viscosity of secretions		Dizziness, nausea, vomiting	Anti-Tuss, Bidex, Breonesin, Duratuss G, Fenesin, Ganidin NR, GG 200 NR, Guaifenesin LA, Guaifenex G, Guaifenex LA, Humibid LA, Humibid Pediatric, Liquibid, Muco-Fen 1200, Muco-Fen 800, Muco-Fen LA, Naldecon-EX Senior, Organidin NR, Pneumomist, Q-Bid LA

Box 1
Medications that contain pseudoephedrine

Sudafed (Johnson & Johnson [formerly Pfizer])

Actifed (Burroughs Wellcome)

Contac (GlaxoSmithKline)

Dimetapp Decongestant, Dimetapp 12-Hour Non-Drowsy (Wyeth)

Triaminic Allergy Congestion

Claritin-D (loratadine + pseudoephedrine)

Zyrtec-D 12 Hour (pseudoephedrine hydrochloride + cetirizine hydrochloride)

Mucinex D (Reckitt Benckiser)

Eltor (Sanofi-Adventis)

Oxymetazoline is an adrenomimetic that nonselectively agonizes α1 and α2 adrenergic receptors.[28] Because vascular beds widely express α1 receptors, the action of oxymetazoline results in vasoconstriction. In addition, the local application of the drug also results in vasoconstriction because of its action on endothelial postsynaptic α2 receptors. As a result, it increases the diameter of the airway lumen and reduces fluid exudation from postcapillary venules.[25] Patients who continue to use oxymetazoline beyond this point may become reliant on the medication to relieve their chronic congestion.[29]

Examples of US products that contain oxymetazoline are found in **Box 3**.

Guaifenesin, or guaiphenesin (formerly BAN), also known as glycerol guaiacolate, is derived from guaiacol, a component of creosote. The efficient flow of respiratory mucus is a first level of immune defense that requires an appropriate viscosity and elasticity for optimal barrier and ciliary functions. In rhinitis, increased thick mucus is a common symptom that is difficult to manage. Guaifenesin is believed to act as an expectorant by increasing the volume and reducing the viscosity of secretions. Although there are subjective improvements, there is only partial evidence that the improvement is associated with changes in the characteristics and volume of the sputum.[30] When given in high doses, guaifenesin acts as an emetic.

Box 2
Products that contain phenylephrine

Alka-Seltzer Cold Formula Effervescent (Bayer)

Sudafed PE Non-Drowsy Nasal Decongestant (Pfizer)

Robitussin CF (Wyeth)

Tylenol Sinus, Tylenol Sinus Congestion & Pain (McNeil-PPC)

DayQuil Capsules (Procter & Gamble)

Dristan (Wyeth)

Theraflu (Novartis)

Benadryl Allergy & Sinus Headache (Warner-Lambert)

Excedrin Sinus Headache (Acme United Corporation)

Box 3
Products that contain oxymetazoline

Afrin

Sudafed OM (Pfizer)

Dristan (Wyeth)

Vicks Sinex (Procter & Gamble)

Mucinex Full Force (Reckitt Benckiser Pharmaceuticals, Inc.)

There have been few recent studies on the use of guaifenesin as decongestant. In patients infected with rhinovirus, guaifenesin leads to a subjective thinning of mucus quality.[31] In patients with human immunodeficiency virus (HIV) with chronic nasal congestion and postnasal drip, 1200 mg of guaifenesin twice daily led to a significant decrease in nasal congestion and a thinning of postnasal drainage compared with placebo.[32] The thinning of postnasal secretions seems to be the one consistently reported benefit of guaifenesin, although the effect is rarely profound and other nasal symptoms are not altered.

Guaifenesin is included in more than 100 products, such as:

Mucinex (Reckitt Benckiser Pharmaceuticals, Inc.)
Robitussin DAC, Robitussin AC (Wyeth)
Cheratussin DAC, Cheratussin AC (Qualitest)
Bidex 400 (Stewart-Jackson Pharmacal Inc.).

LEUKOTRIENE ANTAGONISTS

Cysteinyl leukotrienes (CysLTs) are a family of inflammatory lipid mediators synthesized from arachidonic acid by a variety of cells, including mast cells, eosinophils, basophils, and macrophages. CysLTs are increased in patients with allergic rhinitis and are released following allergen exposure.[33] The corticosteroid-resistant leukotriene pathway may contribute to the development of inflammation in allergic diseases that do not respond to the introduction of corticosteroids. Inhibition of this pathway has potential therapeutic benefit in various allergic diseases that have involvement of corticosteroid insensitivity.[34]

Two cysteinyl leukotriene receptor antagonists (LTRA) are available in the United States. Zafirlukast (Accolate, AstraZeneca, Wilmington, DE, USA) and montelukast (Singulair, Merck Co., Inc., Whitehouse Station, NJ, USA) were initially approved as chronic controlling therapies for asthma. Studies have shown both to be effective in treating patients with allergic rhinitis, and montelukast has an indication for seasonal allergic rhinitis. Two-week trials using zafirlukast for allergic rhinitis showed a significant reduction in nasal congestion, sneezing, and rhinorrhea compared with placebo.[35] Montelukast has been shown to improve multiple allergic rhinitis parameters including both allergen-induced nasal and ocular symptoms as well as rhinitis symptom scores. Published clinical evidence undoubtedly establishes montelukast as a viable alternative for the treatment of seasonal allergic rhinitis. Its benefits are equivalent to antihistamines when used as monotherapy, but less than intranasal corticosteroids. The addition of an antihistamine to montelukast does seem to have added benefits and, at times, is reported to be equivalent to intranasal corticosteroids.[36]

Leukotriene receptor antagonists (LTRA) tend to be well tolerated with few side effects. Zafirlukast can cause transaminitis. Both zafirlukast and montelukast are

pregnancy category B, and montelukast is frequently used in young children. Their effect is roughly equivalent to nonsedating antihistamines in some patients, and LTRAs tend to provide more relief of congestion and less relief of itch and rhinnorhea.[37] LTRAs have never been shown to be superior to, or even comparable with, intranasal corticosteroids. Objective and subjective evidence suggests that leukotriene receptor antagonist–antihistamine combination therapy is more effective than antihistamine alone in the control of allergic rhinitis symptoms.[38] However, they are often considered as single-agent therapy to treat patients with both mild allergic rhinitis and asthma. These agents have been found to be safe and effective in reducing symptoms associated with allergic rhinitis in children. Alternative forms such as liquids or oral disintegrating tablets are available for most agents, allowing ease of administration to most young children and infants.[39]

CROMOLYN

Cromolyn (also referred to as cromoglicic acid, cromoglycate, or cromoglicate) is traditionally described as a mast cell stabilizer, and is commonly marketed as the sodium salt sodium cromoglicate or cromolyn sodium. This drug prevents the release of inflammatory chemicals such as histamine from mast cells. It has no intrinsic bronchodilator, antihistaminic, or antiinflammatory activity but can be added to the treatment regimens as a mast cell stabilizer.[40]

In vitro and in vivo animal studies have shown that cromolyn sodium inhibits the degranulation of sensitized mast cells that occurs after exposure to specific antigens. Cromolyn sodium inhibits the release of histamine and the slow-acting substance of anaphylaxis (SRS-A).[41] Rhinitis induced by the inhalation of specific antigens can be inhibited to varying degrees by pretreatment with cromolyn sodium nasal solution. Another activity shown in vitro is the capacity of cromolyn sodium to inhibit the degranulation of nonsensitized rat mast cells by phospholipase A and the subsequent release of chemical mediators. Cromolyn sodium is poorly absorbed and thus considered safe.[42] Its clinical efficacy in patients with mild or moderate persistent asthma and allergic rhinitis is well documented.[40,43] There is no clinical evidence that cromolyn can be overdosed. It can be used during pregnancy and in children.[44,45] However, it is not effective if used less then 4 times a day and may take up to 1 to 4 weeks to produce noticeable effect. Thus it is not effective for immediate relief of symptoms and is considered more useful as preventive treatment of allergic rhinitis. It represents a good choice when other nasal sprays are contraindicated or not tolerated.

Available forms include Nasalcrom (United States), Prevalin (Netherlands), and Rynacrom (United Kingdom).

NASAL WASH

Nasal irrigation (wash) has been practiced in India for centuries as one of the disciplines of yoga; it is believed to promote good nasal health and healthy breathing. This technique was adapted by modern medicine and now widely used by allergists and otolaryngologists in the treatment of sinus and nasal problems in patients with acute and chronic rhinosinusitis including symptoms of facial pain, headache, halitosis, cough, anterior rhinorrhea (watery discharge), and nasal congestion.[46,47] Various devices are available on market, such as neti pot, saline nasal spray, and pressure rinse bottles. Neti pots are more traditional devices used for yoga practices. They can be made of metal, glass, or ceramic, and rely on gravity alone, along with head positioning and repeated practice, to rinse the outer sinus cavities. Nasal irrigation or nasal lavage or nose douche is the personal hygiene practice in which the nasal

cavity is washed to flush out excess mucus and debris from the nose and sinuses. A more advanced yoga exercise, vyutkrama kapalbhati, involves pouring the same salt water solution into one nostril while the other is held closed, so that the solution runs out of the mouth. It allows more thorough irrigation of the nasal cavity and the sinuses. The irrigation bottle made by Neilmed allows any nonsophisticated user to perform the irrigation with excellent results; the squeeze bottle delivers user-controlled pressure to create turbulent solution flow in the nasal cavity. A typical home recipe for an isotonic solution varies and consists of 1 cup of water (240 mL), one-quarter of a teaspoon of salt, and a pinch of baking soda for an isotonic solution. For a hypertonic solution, the amount of salt would be doubled or tripled (**Fig. 1**).

As a treatment modality in rhinitis or sinusitis, nasal irrigation achieves 3 goals: it removes the allergen, shortening exposure during pollen seasons; it removes pollutants that are otherwise deposited on the mucus membranes; and it reduces the amount of mucus, thus helping with reduction of postnasal drip. Hypertonic solutions also work as decongestants, reducing swelling by natural osmosis. Therefore, although isotonic solution is recommended for daily use, hypertonic solution can be used in conditions accompanied by congestion. A small amount of baking soda is used as an optional buffering ingredient to adjust the pH value to that of the body.

Spraying the solution into the nostrils is more convenient but also less effective. The most effective methods ensure that the liquid enters through one nostril and then either runs out of the other nostril or goes through the nasal cavity to the back of the throat from where it may be spat out. The necessary pressure comes from gravity, from squeezing a plastic bottle or a syringe, or from an electrical pump.

Physicians generally agree that iodized table salt is not acceptable, and that pickling salt or sea salt is preferred because it also does not contain any other additives such as anticaking agents. Most sources advise that tap water should be boiled for several minutes to ensure sterility before it is cooled and used, but it is not clear whether this is really necessary. Nasal saline irrigation can be considered as a good adjunctive

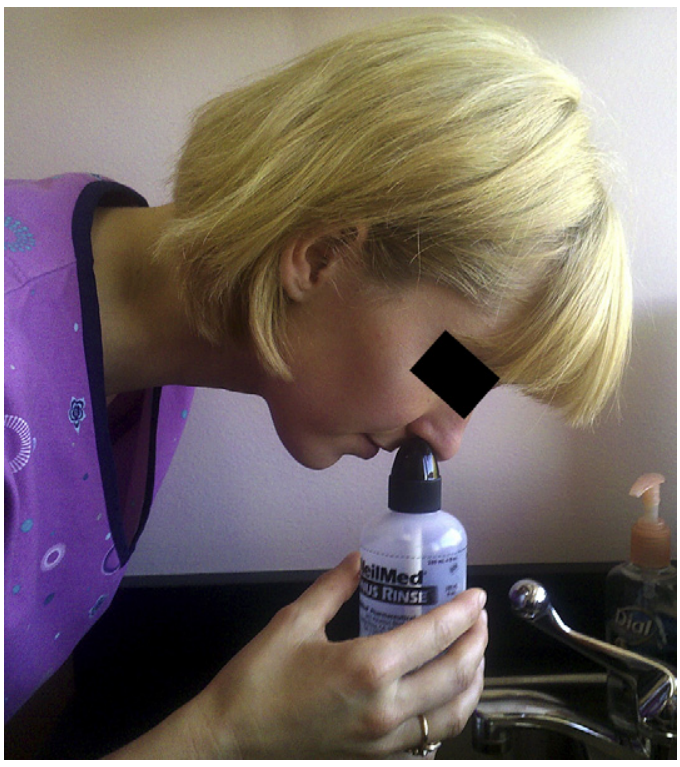

Fig. 1. Nasal wash procedure.

treatment option for allergic rhinitis. It permitted the use of less topical steroids for controlling allergic rhinitis in children, which contributes to fewer side effects and less economic burden. However, these solutions should be selectively prescribed rather than used based on anecdotal evidence. Further studies should be conducted to develop a protocol for standardized use of saline solution irrigation in various nasal pathologies.

CAPSAICIN

Capsaicin was first isolated in impure form as the active component of chili peppers, which are plants belonging to the genus *Capsicum*. The compound was first isolated in pure, crystalline form in the eighteenth century by John Clough Thresh, who gave it the name capsaicin. Pure capsaicin is a hydrophobic, colorless, odorless, crystalline to waxy compound. Later, German pharmacologist Rudolf Buchheim and, in 1878, the Hungarian doctor Endre Hőgyes, stated that capsicol (partially purified capsaicin) caused the burning feeling when in contact with mucous membranes and increased secretion of gastric juices. Similar substances were isolated from chili peppers by the Japanese chemists Kosuge and Inagaki, who named them capsaicinoids. Capsaicin is a phenolic chemical contained within the oil of the *Capsicum* pepper.[48] Capsaicin is initially irritating to its targeted area. However, the area becomes desensitized to the irritation after repeated use. Nerve endings responsible for rhinorrhea, sneezing, and congestion become desensitized when capsaicin is applied to the nasal mucosa.[49] Beneficial effects of drug treatment may be caused by its specific action on the peripheral endings of primary sensory neurons leading to their functional blockade.[50]

Capsaicin is used as a pharmacologic agent in research studies in mice and rats. An intranasal spray of capsaicin was evaluated in many clinical studies.[50–54] In one such study, capsaicin nasal spray was used as a once-weekly treatment for 5 weeks. The subjective intensity of their nasal obstruction, rhinorrhea, and sneezing frequency were evaluated throughout the study and the vascular effects of capsaicin on the nasal mucosa were recorded by anterior rhinomanometry and laser Doppler flowmetry. Intranasal capsaicin application evoked a larger vascular response in patients with rhinitis than in controls. Both nasal vascular responses and subjective discomfort following capsaicin were markedly reduced after the fifth application. All symptoms were significantly improved throughout a 6-month follow-up period. No significant side effects occurred and weaning from nasal vasoconstrictor agents was possible. Both the subjective symptom score and objective measurements of vascular reactivity suggest that repeated intranasal capsaicin application could be beneficial for patients with chronic rhinitis, possibly by reducing hyperreactive nasal reflexes.[55] Capsaicin use has been targeted to patients presenting with congestion, rhinorrhea, sneezing, or a combination of these symptoms. No consensus is reported for dosages of capsaicin. Suggested regimens range from 3.3×10^{-3} mol capsaicin dissolved in 70% ethanol sprayed into each nostril once a week for 5 weeks to a solution containing capsaicin 0.15 mg/0.5 mL applied to each nostril every 2 or 3 days for 7 treatments.[54] A capsaicin formulation called Sinol Nasal Spray is available OTC at pharmacies.

OTHER TREATMENTS

Menthol is a compound obtained from peppermint or other mint oils. It is marketed for many different conditions such as muscle aches, sore throat, and congestion. It is available in lozenges, nasal sprays, vaporubs, inhalers, and cough syrups, and is widely used as a treatment of rhinitis that is associated with acute upper respiratory

tract infection and allergy. Menthol as a plant extract has been used in traditional medicine in Asia for the treatment of respiratory diseases for hundreds of years, but it was only introduced to the West as a medicine at the end of the nineteenth century. With the recent discovery of a menthol receptor on the sensory nerves that modulate the cool sensation, menthol has graduated from the realms of herbal medicine into molecular pharmacology.[56] Menthol is not known to cause any significant side effects but should be discontinued if there are any signs of personal hypersensitivity.

Herbs and Alternative Treatments

For centuries, herbs were used to treat rhinitis, and most of the modern drugs are isolates of active herbal ingredients. The specialty of allergy and immunology has seen the second largest increase in the popularity of complementary and alternative medicine (second only to practitioners who treat lower back pain).[10] However, herbs can trigger side effects and can interact with other herbs, supplements, or medications. For these reasons, herbs should only be taken under the supervision of a health care practitioner trained in their use. Pregnant women and young children should not use herbal preparation because safety studies are not available and toxic levels may be easily reached because of higher absorption rates in these patients.

Ephedrine is an alkaloid derived from various plants in the genus *Ephedra* (family Ephedraceae). It is most usually marketed in the hydrochloride and sulfate forms. Ephedrine is a sympathomimetic amine commonly used as a decongestant, but it is also a stimulant, appetite suppressant, concentration aid, and is used in some countries to treat hypotension. Ephedrine is similar in structure to the semisynthetic derivatives amphetamine and methamphetamine. Ephedrine is not sold as part of OTC cold or decongestant medications, but is available in health stores outside the United States as diet or weight-loss pills, or as a herb. On February 6, 2004, the FDA issued a final rule prohibiting the sale of dietary supplements containing ephedrine alkaloids (ephedra) because such supplements present an unreasonable risk of illness or injury. Major safety concerns have been associated with ephedra or ephedrine use, including hypertension (high blood pressure), tachycardia, CNS excitation, arrhythmia, myocardial infarction (heart attack), and stroke (**Fig. 2**).

In traditional Chinese medicines, the herb má huáng (*Ephedra sinica*) contains ephedrine and pseudoephedrine as its principal active constituents.

Fig. 2. *Ephedra fragilis*. (*From* Wikipedia, The Free Encyclopedia. February 26, 2011. Available at: http://en.wikipedia.org/wiki/Ephedra_fragilis. Accessed June 15, 2011.)

Butterbur (*Petasites hybridus*, 500 mg per day) has traditionally been used to treat asthma and bronchitis and to reduce mucus, and several scientific studies show that it can be helpful. One study of 125 people with hay fever found that an extract of butterbur was as effective as cetirizine. Another study compared butterbur with phenofexadine, with similar findings. One of the mechanisms of action is protection against AMP-induced nasal responsiveness during the grass pollen season in sensitized patients.[57] It has not been established whether taking butterbur for longer than 12 to 16 weeks is safe. Butterbur can cause stomach upset, headache, and drowsiness (**Fig. 3**).

Goldenseal (*Hydrastis canadensis*) is sometimes included in herbal remedies for allergic rhinitis. Laboratory studies suggest that berberine, the active ingredient in goldenseal, has antibacterial and immune-enhancing properties,[58] but there is no evidence that it is effective specifically for allergic rhinitis (**Fig. 4**).

Stinging nettle (*Urtica dioica*, 600 mg per day for 1 week) is indicated for the treatment of multiple conditions, including allergic rhinitis.[59] It is commonly used as freeze-dried leaves. Studies so far are lacking. Only 1 small study suggested that stinging nettle might help relieve symptoms of allergic rhinitis (**Fig. 5**).

Sho seiryu to, also known as TJ-19, is a Japanese herbal formula often used for short periods of time to ward off, and help a patient recover from, colds in the absence of fever. In Chinese, this same herbal formula is known as xiao qing long tang, and the indications are identical to those of sho seiryu to. The ingredients are equal proportions of licorice root, schizandra fruit, ephedra, cinnamon twig, ginger root, peony root, asarum herb, and pinella. Traditionally, 1 dose of sho seiryu to contains 9 g of each ingredient. This formula is not recommended for prolonged use and may be used in combination with acupuncture. The mechanism of action of sho seiryu to was studied extensively. It was found to inhibit allergen-induced synthesis of tumor necrosis factor α by peripheral blood mononuclear cells in patients with perennial allergic rhinitis,[60] and to suppress histamine signaling at the transcriptional level.[61]

Fig. 3. *Petasites hybridus*. (Photo by Richard Bartz, Munich, Germany.)

Fig. 4. *Hydrastis canadensis*. (*From* Wikipedia, The Free Encyclopedia. May 18, 2009. Available at: http://commons.wikimedia.org/wiki/Hydrastis_canadensis. Accessed June 15, 2011.)

Biminne is another Chinese herbal formula used to treat allergic rhinitis. It is not known how biminne works, or whether it is safe to use for extended periods. In a study of 58 people with year-round allergic rhinitis, biminne relieved at least some symptoms in most of the participants. People in the study took the formula 5 times a day for 12 weeks, and they still showed the benefit of biminne even after 1 year. Biminne contains Chinese skullcap (*Scutellaria baicalensis*), *Ginkgo biloba*, horny goat weed (*Epimedium sagittatum*), *Schizandra chinensis*, Japanese apricot (*Prunus mume*), *Ledebouriella divaricata*, and astragalus (*Astragalus membranaceus*).

Acupuncture

In traditional Chinese medicine it is thought that the body has energy pathways known as meridians. Each meridian corresponds to specific internal organs through which it

Fig. 5. *Urtica dioica*. (Photo by Uwe H. Friese, Bremerhaven, Germany.)

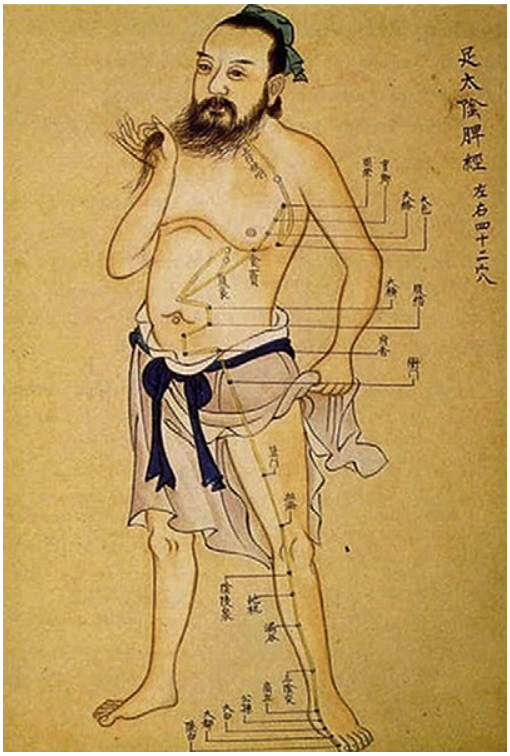

Fig. 6. Acupuncture: ancient drawing of meridian points.

passes (**Fig. 6**). Acupuncture involves the use of hair-fine needles to stimulate specific points on the body along the meridians by removing energy blockages in the meridians and regulating the overall flow of energy so that the body can return to a state of balance and health. Acupressure is a similar method (**Fig. 7**), but instead of needle use, points are pressed or massaged in certain pattern by fingers. Some evidence suggests that acupuncture may be a useful complementary or alternative treatment for people with allergic rhinitis, although not all studies have found any benefit.[62–67] In one study that included 45 people with hay fever, acupuncture worked as well as antihistamines in improving symptoms, and the effects seemed to last longer. One study suggested that combining acupuncture with traditional Chinese herbs did help relieve symptoms. A randomized controlled trial (Acupuncture in Seasonal Allergic Rhinitis [ACUSAR]) that investigates the efficacy of acupuncture in the treatment of seasonal allergic rhinitis (SAR) is currently being conducted in Germany, and results will be available in 2011.[68]

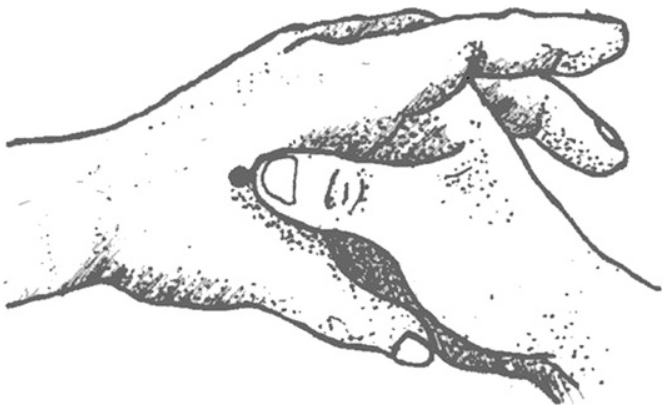

Fig. 7. Acupressure.

Homeopathy

Homeopathy involves the use of herbal preparations in extremely small concentrations that are taken orally in increasing concentrations. The preparation of homeopathic drugs is based on potentiation, with the primary substance specially mixed with a carrier in the ratio 1:10. In a controlled, randomized, strictly double-blind trial with 164 patients, the effectiveness of homeopathically prepared *Galphimia* was investigated in patients with allergic rhinitis. The average duration of treatment was about 5 weeks. Although no statistical significance was achieved, it is remarkable that there was a clear trend for the superiority of *Galphimia* compared with placebo.[69]

Some other known preparations

Nux vomica is used for stuffiness with nasal discharge and dry, ticklish, and scraping nasal sensations with watery nasal discharge and a lot of sneezing; an appropriate person for this remedy is irritable and impatient.

Arsenicum album is used for stuffiness with copious, burning nasal discharge and violent sneezing; an appropriate candidate for arsenicum feels restless, anxious, and exhausted.

Allium cepa is used for frequent sneezing, a lot of irritating nasal discharge, and tearing eyes; people taking this tend to feel thirsty.

Euphrasia is used for bland nasal discharge, with stinging, irritating tears; a suitable person for this remedy has worse nasal symptoms when lying down.

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