Compounding for Otolaryngology

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Upon successful completion of this article, the pharmacist should be able to:

1. Identify the common organisms responsible for the infectious ear, nose, and throat diseases discussed in this article.
2. List the recommended antimicrobials for the various conditions described in this article.
3. Describe the basic pathophysiology of the diseases described in this article.
4. List the common active ingredients used in compounds to treat the conditions described in this article.

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INTRODUCTION

Prescriptions for ear, nose, and throat conditions are ordered from a variety of practitioners, such as otolaryngologists, family practitioners, allergists, internal medicine specialists, emergency medicine physicians, and even obstetrics practitioners. Compounding treatment options are plentiful in this arena for many patient needs and offer unique solutions to often challenging problems. This is especially true when there are no commercially manufactured options available such as ingredient combinations, unique dosage forms or discontinued products.

This article is designed to systematically discuss many of the opportunities where a compounded medication is a valuable option to aid in treatment. We will begin with otic preparations then move to nasal, sinus, pharyngeal, and finally, oral formulations.

THE EARS

The otic system is known to be responsible for hearing and balance, and any disruption to these functions can cause extreme discomfort and limit daily function. Ear infections are common and can cause itching, swelling, redness, pain, and purulence. Ear infections are categorized as either otitis externa or otitis media. Otitis externa is an infection of the external ear canal and/or an infection of the outer ear/earlobe. Otitis media is an infection of the middle ear.

OTITIS EXTERNA

Treatment of otitis externa most commonly involves topical anti-infective agents that target the likely pathogen. Due to the diversity of pathogens cultured from infected ears, it is recommended to use an agent that is broad spectrum and includes coverage of *Pseudomonas aeruginosa*, which in the case of a bacterial infection is the most common pathogen (Ninkovic G, 2008) (Roldan PS1, 2002). Broad spectrum agents, which include anti-pseudomonal coverage, are listed in Table 1.

Table 1. Antibiotic Classes With Anti-Pseudomonal Activity

Aminoglycosides
Fluoroquinolones
Cephalosporins
Penicillins
Carbapenems
Monobactams
Polymyxins

Source: El Solh AA, 2009

Table 2. Active Ingredient Combinations for Otitis Externa*

Formulation
Bacterial
Gentamicin/Polymixin/Neomycin/Hydrocortisone solution
Chloramphenicol solution
Ciprofloxacin/Hydrocortisone suspension
Fungal
Amphotericin B gel
Cresol Acetate
Ketoconazole poloxamer gel
Bacterial AND fungal
Acetic Acid/Aluminum Acetate
Ketoconazole/Ciprofloxacin poloxamer Gel
Ketoconazole/Ciprofloxacin/Triamcinolone poloxamer gel
Chloramphenicol/Sulfanilamide/Amphotericin B insufflation powder capsules
Chloramphenicol/Sulfacetamide/Amphotericin B insufflation powder capsules
Neomycin/Polymyxin B sulfate/Triamcinolone/Nystatin otic suspension

**Consult published monograph or other reference for complete formulation and dosing.*

It's also important that physician examination reveals the general type of organism to determine if the infection is bacterial or fungal in nature, since yeasts and molds may also cause otitis externa. Common topical antifungals used in otitis externa include ketoconazole, clotrimazole, boric acid, amphotericin B, and acetic acid.

Other agents that can be useful in the adjunctive treatment of otitis externa include corticosteroids, astringents, vasoconstrictors, and anesthetics. These additional ingredients are added for side effect management of otitis externa in particularly painful cases, and have limited literature to show significant improvement of outcome in treating infection.

Common compounded formulations for treatment of otitis externa are contained in Table 2. Poloxamer gels are very useful in resistant/recurrent cases of otitis externa because of its extremely effective contact time in the ear canal. When a poloxamer gel is at cooler temperatures, it

is a free flowing liquid. However, at temperatures above 78 degrees Fahrenheit, the liquid turns to a gel consistency that coats the application site for several days.

A combination of acetic acid and aluminum acetate is used to treat both bacterial and fungal otitis externa due to its direct action as an antibacterial and antifungal, in addition to causing a drying of the ear canal, leading to the elimination of moisture which the microbes need to survive (Kashiwamura M, 2004).

OTITIS MEDIA

Otitis media is most commonly caused by ßlactamase–producing *Haemophilus influenzae* and *Moraxella catarrhalis,* followed less commonly by *Streptococcus pneumonia.* Table 3 lists oral agents with activity against ßlactamase–producing *Haemophilus influenza* and *Moraxella catarrhalis.* Treatment duration for otitis media is typically 10 days.

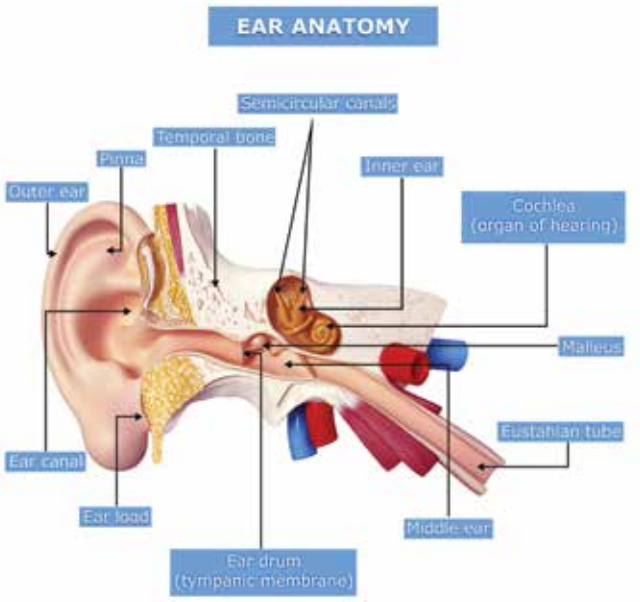
Compounding for otitis media is often accomplished by creating oral liquids that are commercially unavailable or altering flavor of commercial products to improve compliance. Another compounding opportunity for treatment of otitis media includes topical anesthetic solutions. Compounded anesthetic formulations for treatment of otitis media are outlined in Table 3.

Prevention of otitis media deserves as much attention as treatment of active cases. A meta-analysis of a number of small studies reports that the use of xylitol in children may reduce occurrence by 25 percent (Azarpazhooh A). The mechanism of xylitol prophylaxis is not fully understood but believed to inhibit the growth of bacterial biofilm by diminishing adherence of the pneumococcus to the nasopharynx cells, which makes their migration difficult up to the middle ear, an important acute otitis media pathophysiology stage. Xylitol also influences the adhesiveness of *S. pneumoniae, H. influenzae and M. catarrhalis* to epithelial cells (Perera

Table 3. Active Ingredient Combinations for Treatment of Otitis Media Pain*

Therapeutic Class	Agent
Anesthetic	Antipyrine/Benzocaine solution
	Benzocaine solution
	Phenylephrine HCl/Antipyrine/ Benzocaine solution

**These suggestions come from products that were once commercially available. Consult published monograph or other reference for complete formulation and dosing. It is imperative to ensure that these products are no longer available at the time of compounding.*



AFF, 2009). Another study looked at xylitol syrup, xylitol chewing gum, and xylitol lozenges to provide a dose of 8.4–10 grams per day, and found a 20–40 percent reduction in occurrence of acute otitis media (Uhari M, 1998). Xylitol 2 gram lollipop and xylitol 40 percent oral solution are common compounded formulas that make administration of xylitol convenient for children. Xylitol products should be kept away from pets. It is a common sweetener in food and drug products but is particularly poisonous to dogs.

TYMPANIC PERFORATION

The tympanic membrane is the structure that separates the middle and outer ear, and in addition to keeping foreign matter out of the middle ear, conducts sound waves for the brain to interpret. Perforations can result from infection or physical injury of the tympanic membrane. Examples of this type of physical injury include improper wax removal (inserting cotton swab too deep into ear canal) or rapid and drastic pressure changes on the tympanic membrane (such as scuba diving or riding in an airplane). When tympanic perforations are the result of an infection, or an infection has taken place with a perforation that was the result of trauma, physicians may request anti-infective solutions for irrigation or instillation to the middle ear. (Xiaojuan Khoo, 2013) It is then required that these solutions be prepared in a sterile manner per USP Chapter <797> standards. These same precautions would apply for compounded topical otic drugs which will be given to patients with tympanostomy tubes.

Another concern when preparing anti-infective solutions for administration to the tympanic membrane and/or the middle ear is the ototoxicity potential of the agent being

Table 4. Compounded Formulas for Cerumenolytics	
Formula	**Usual dosage/frequency**
Trolamine Oleate Otic Solution	Tilt head, fill ear canal once a day as needed. Plug with cotton for 15-30 minutes. Flush ear canal with warm water.
Docusate Sodium 2% Otic Solution	Tilt head, fill ear canal once a day as needed. May be used 2 days in a row.

used. It is well known that aminoglycosides administered systemically can cause permanent hearing damage, and while the effects of topically administered aminoglycosides to patients with tympanic perforations are largely unknown, it is best to avoid aminoglycosides altogether when safer alternatives are available.

A novel compounding opportunity for treatment of middle ear infections with tympanic perforation is the instillation of poloxamer gel-based antibiotics directly to the middle ear and tympanic membrane (Xiaojuan Khoo, 2013). Polxamer gel is easily sterilized via autoclave, and the benefits of bioadhesion as previously described in the otitis externa section can be extremely effective on chronic/resistant cases of otitis media (Cunha-Filho MS, 2012) (Wang X, 2014).

EXCESSIVE EARWAX/IMPACTION

Cerumen (earwax) is a yellowish substance that is secreted to protect the ear canal, assist in cleaning and lubrication, and protect from bacteria, fungus insects, and water. There are two types of earwax (wet and dry) and the amount produced is genetically determined. The primary components of cerumen are shed layers of skin, which mostly consists of keratin, followed by saturated and unsaturated long-chain fatty acids, alcohols, squalene, and cholesterol. Excessive earwax can cause hearing impairment and sometimes requires mechanical removal.

Aside from hearing impairment, earwax impaction and plugging can cause earache, dizziness, vertigo, and tinnitus. Treatment is focused on breaking up the cerumen with medications called cerumenolytics. The most commonly used cerumenolytics are various oils (including oleic acid), carbamide peroxide with glycerin, docusate, and trolamine. Sometimes corticosteroids are used. Commonly compounded formulas are outlined in Table 4.

MENIERE'S DISEASE

Meniere's disease is a disorder of the inner ear which affects hearing and balance. Typical presentation begins with one symptom and gradually progresses to include hearing and balance impairment as well as tinnitus. However, not all symptoms must be present to confirm. Meniere's disease is linked to endolymphatic hydrops, an excess amount of fluid in the inner ear that bursts from its normal channels in the ear and flows into other areas, causing damage.

Treatment of Meniere's disease includes a low salt diet, avoidance of alcohol, allergy desensitization, and symptomatic treatment of nausea and vomiting during episodes. Antihistamines are the mainstay of pharmacologic treatment. Meclizine is especially useful because of its properties as an H1-receptor antagonist and its anticholinergic, central nervous system depressant, and local anesthetic effects. The anticholinergic effects are partially responsible for the antiemetic action. Meclizine is available commercially as tablets; however, it can be compounded if needed due to allergies of fillers used. Meclizine appears to have very poor aqueous stability and requires novel preparation like cyclodextrin encapsulation for any type of practical beyond use date.

Betahistine has also shown potential for Meniere's disease (Lcour M, 2007) (Djelilovic-Vranic J, 2012). Betahistine is an analog of histamine with weak agonist properties at histamine H1 receptors and more potent antagonistic effects at histamine H3 receptors. Betahistine is not available commercially in the United States, and is commonly compounded as oral capsules for treatment of Meniere's disease. Dosing is typically 8-16 mg orally three times daily or 24 mg twice daily.

A small study examined the temporal bones of eight patients with Meniere's disease and reported morphologic changes that could indicate a viral pathology (Gacek RR, 2001). An open-label study of 301 patients reported that effectiveness of treatment with acyclovir was found to decrease with increasing duration of the disease, probably

Table 5. Active Ingredient Combinations for Epistaxis*
Formula
Tranexamic Acid mucoadhesive nasal drop
Tranexamic Acid nasal spray
Tranexamic Acid poloxamer nasal spray
Aminocaproic Acid nasal spray
Aminocaproic acid poloxamer nasal spray
Phenylephrine HCl/Tetracaine HCl nasal pack solution

**Consult published monograph or other reference for complete formulation and dosing.*

because viral suppression does not reverse damage (Shichinohe, 1999). Six months of treatment may be needed for an appreciable effect on symptoms. Dosing is acyclovir 400 mg orally twice daily for up to 12 months. Commercial formulations are available as solid and liquid oral dosage forms; therefore, compounding is reserved for altering flavor to increase compliance or to avoid certain allergens contained in commercially prepared forms.

THE NOSE/SINUSES

Nose Bleeds

Epistaxis (nose bleed) is usually a self-limiting phenomenon that can be linked to trauma, medications, and/or blood clotting disorders. Many cases can be controlled simply by plugging the nose and tilting the head forward slightly while breathing through the mouth. Over-the-counter topical decongestant nasal sprays can be useful in cases that don't spontaneously resolve within a few minutes. The most commonly used compounded formulations are listed in Table 5. Mucoadhesive and poloxamer sprays have the benefit of creating a long-lasting moisturizing effect, as well as increasing the amount of time that the active ingredients are exposed to the tissue.

Nasal Polyps

Nasal polyps are polypoidal masses arising mainly from the mucous membranes of the nose and paranasal sinuses. They are overgrowths of mucosa that frequently accompany allergic rhinitis and are freely movable/non-tender. Medications can shrink or eliminate nasal polyps, but surgery is sometimes needed to remove them.

Symptoms of nasal polyps include nasal congestion, sinusitis, loss of smell, and secondary infection leading to headache (Chaaban, Walsh, & A., 2013). Approximately 30 percent of patients with nasal polyps test positive for environmental allergies, so treatments include nasal steroids and antihistamines. Intranasal steroid sprays may reduce or retard the growth of small nasal polyps, but they are relatively ineffective in massive nasal polyposis.

Table 6. Active Ingredient Combinations for Treatment of Nasal Polyps*

Formula
Furosemide/Xylitol poloxamer irrigation
Mometasone Furoate poloxamer nasal spray
Mometasone Furoate mucoadhesive nasal spray
Mometasone Furoate/Xylitol poloxamer irrigation
Amphotericin B/Xylitol poloxamer irrigation

**Consult published monograph or other reference for complete formulation and dosing.*

A small study of 12 patients showed that topical furosemide has short-term symptom relief in patients with nasal polyps (Masieri S, 1997). The mechanism targeted in this treatment type appears to be inhibition of the K+/Na+ channels in the respiratory epithelium, resulting in a decrease in sodium content, thus inhibiting water absorption by the tissue.

A small study of 12 patients demonstrated the presence of bacterial biofilms in patients with nasal polyps (Zernotti ME, 2010). The study authors suggest that chronic inflammation due to biofilms might contribute to nasal mucosa damage, increased inflammatory cells in tissue, and subsequent hyperplasic process.

Compounded formulations useful for treatment of nasal polyps are listed in Table 6. Several formulas use a commercially available dry powder base that contains xylitol and poloxamer. This base is intended to be compounded with active ingredients as a capsule which is opened and mixed with sterile normal saline for irrigation or sterile water for irrigation at the time of use. Xylitol is a well-known biofilm disrupter and poloxamer serves as a suspending agent with exceptional mucoadhesive properties (Badet C, 2008).

Sinusitis

Sinusitis is classified as acute, chronic, or recurrent. Acute sinusitis consists of symptoms lasting fewer than eight weeks, while chronic sinusitis has symptoms recurring or lasting longer than eight weeks. Recurrent sinusitis is defined as having three of more acute episodes per year. Some symptoms of sinusitis include discomfort, pain or pressure in the forehead, temples, cheeks, nose and behind the ears; nasal congestion; nasal discharge; and postnasal drip.

A treatment method for sinusitis that has been investigated in small, clinic-based studies is nasal nebulization or irrigation with antibiotics, antihistamines, mast cell stabilizers, antifungals, corticosteroids, biofilm disrupters, and mucolytics, to name a few (Vaughan WC1, 2002). A significant limitation to these preparations has traditionally been the need for sterile preparation of sinus irrigations; however, commercial bases of dry powders for reconstitution at the time of use is considered a substitute for costly and time-consuming sterile preparations. The commercial base was previously mentioned in the nasal polyp section, which contains xylitol and various poloxamers. Again, this base allows the incorporation of active pharmaceutical ingredients (API) while serving as a suspending vehicle with biofilm disruption and mucoadhesive properties. Compounding patient-specific

Table 7. Apis Commonly Used in Compounded Sinus Irrigation Formulas*	
Therapeutic Class	**Drug**
Antifungal	Amphotericin B
	Fluconazole
	Itraconzole
Corticosteroid	Betamethasone
	Budesonide
	Dexamethasone
	Fluticasone Propionate
	Mometasone Furoate
Antibiotic	Azithromycin
	Ciprofloxacin
	Clindamycin
	Colistimethate
	Gentamicin
	Levofloxacin
	Metronidazole
	Mupirocin
	Sulfamethoxazole/Trimethoprim
	Tobramycin
	Vancomycin
Antihistamines	Levocetirizine Dihydrochloride
	Loratadine
Leukotriene Antagonist	Montelukast Sodium
Antioxidant	Glutathione
Chelating Agent	EDTA

**Consult published monograph or other reference for complete formulation and dosing.*

formulations with this base allows for customized API content to treat the specific pathogens and symptoms that each patient is experiencing. An outline of medications that are typically used in these formulations is given in Table 7.

The disruption of bacterial biofilms is extremely important for the successful treatment of sinus infections (Blanchette KA, 2012). Fungal biofilms are also being focused on in recent years due to the discovery of possible harboring of mycotoxin producing mold in the sinus cavities (Brewer JH, 2013). It is because of this concentration on biofilm disruption that xylitol has become a mainstay of treatment in sinusitis. Studies have shown that xylitol itself, without inclusion of antibiotics, has helped prevent infection for high risk subjects (Azarpazhooh A L. H., 2011).

Nasal irrigations can be administered with either a "nasal nebulization" device or with a sinus irrigation bottle. The nasal nebulization device is a powered irrigation device which is different than an inhalation nebulization device. The medication intended to be irrigation is mixed with diluent and added to a reservoir on the nasal irrigation device. The nasal irrigation device then delivers a fine mist very effectively to the sinus cavities through both nostrils simultaneously. Sinus irrigation bottles are a squeeze bottle with a nasal tip which delivers the irrigation to one nostril at a time without the benefit of the finer mist and with much more dilute strengths of the active ingredients, making nebulization the preferred method of delivery. Specific instructions are included with each device and may vary between manufacturers, so it is important to consult these documents for proper safe/effective use (Yuri M. Gelfand, Samer Fakhri, Amber Luong, & Seth J. Isaacs, 2010).

THROAT

Laryngitis

Laryngitis is an inflammation of the larynx typically caused by upper respiratory infection, overuse of voice box, gastroesophageal reflux, chronic irritation, or any combination of these. Treatment has traditionally revolved around saline gargles, rest, hydration, and humidified air. Pharmacologic treatment focuses on pain control, including acetaminophen, ibuprofen, and in more severe cases, corticosteroids. If the cause of the laryngitis is reflux of stomach acid, treatment is focused on H2-blockers, prokinetic agents, and proton pump inhibitors. Other treatment considerations are antacids, avoiding large meals, avoiding spicy foods, avoiding fried foods, limiting caffeine, and remaining upright 2-3 hours after eating. One formula that has much success returning voice with laryngitis patients is menthol 0.3 percent oral solution, one-quarter to one-half teaspoonful swallowed every four hours.

Pharyngitis

Pharyngitis is an inflammation of the pharynx which is usually painful, especially when swallowing. Forty percent of pharyngitis cases are of viral origin. Traditional treatment for pharyngitis includes rest, increased amounts of oral fluids, and saltwater gargling. Pharmacologic treatment includes acetaminophen, ibuprofen, viscous lidocaine, and

Table 8. Active Ingredients for Treatment of Pharyngitis*
Formula
Mucoadhesive base (without APIs)
Tetracaine mucoadhesive base popsicles
Budesonide mucoadhesive base oral suspension
Lidocaine HCl mucoadhesive base oral rinse
Acyclovir/Lidocaine HCl/Deoxy-D-Glucose (2) mucoadhesive base oral rinse

**Consult published monograph or other reference for complete formulation and dosing.*

benzocaine lozenges. Compounded medications useful for treatment of pharyngitis are outlined in Table 8. Several of these formulas are made with a commercially available mucoadhesive base that contains the alcohol sugar isomalt. This base also contains poloxamer, which as previously described aids in suspension of APIs as well as promotes superior mucoadhesive properties. This base is useful both alone and in combination for pain relief and moisturization of mucous membranes.

About 15-30 percent of pharyngitis complaints are caused by group A beta-hemolytic streptococcus. Oral antibiotics are commercially available for treatment of this condition, but as always, compounding can help increase compliance by altering flavor of commercial products as well as avoiding allergens in these products.

Tonsillitis

Tonsillitis is the inflammation of the tonsils, which can be of viral or bacterial origin. Symptoms typically include sore throat, swollen tonsils and pain, as well as fever, chills, and other flu-like symptoms. If the tonsillitis is bacterial, it should be treated with commercially available oral antibiotics, or compounded oral antibiotics if commercially unavailable. Local anesthetics are also very useful in tonsillitis, such as viscous lidocaine or benzocaine lozenges.

Table 9. Active Ingredients for Tonsillitis Pain*
Formula
Tetracaine HCl mucoadhesive base popsicles
Tetracaine HCL/Sorbitol lollipop base
Hydrocodone/Acetaminophen oral suspension (alcohol free for post-tonsillectomy)

**Consult published monograph or other reference for complete formulation and dosing.*

Table 10. Active Ingredient Combinations for the Treatment of Mucositis*
Formula
Modified Stanford Mouthwash in Mucoadhesive Oral Base (Tetracycline 1.25%/Nystatin 12,000 units/mL/hydrocortisone 0.05%/Diphenhydramine 0.125%) (LV, 2011)
Roentsch Mouthwash in Mucoadhesive Oral Base (Tetracycline HCl 1.2%/Nystatin 12,000 units/mL/Triamcinolone 0.1%/ Chlorpheniramine Maleate 0.02%/Deoxy-D-Glucose 0.1%)
Dexamethasone 3.3 mcg/mL/Tetracycline HCl 13.5 mg/mL/ Diphenhydramine HCl 1.25 mg/mL in Mucoadhesive Oral Base
Misoprostol/Diphenhydramine HCl/Lidocaine HCl oral rinse in mucoadhesive base
Misoprostol/Ketoconazole oral rinse in mucoadhesive base
Beta Glucan/Dexpanthenol/Vitamin E Acetate oral rinse in mucoadhesive base
Morphine Sulfate mouthwash in mucoadhesive base
Doxepin Mouthwash in oral mucoadhesive base
Lidocaine/Glutamine/Beta Glucan/Dexpanthenol/Vitamin E Acetate oral popsicles in mucoadhesive base
Calcium Phosphate Mouthwash in mucoadhesive base

**Consult published monograph or other reference for complete formulation and dosing. http://www.uspharmacist.com/content/s/172/c/29044/*

Another relatively novel treatment is the use of transdermal nonsteroidal anti-inflammatory agents applied to the front of the neck, a method that was likely developed after success of pain treatment with patients postoperatively undergoing tracheostomy surgery (Ozaki M, 2001). Other commonly compounded medications for tonsillitis are given in Table 9.

Mucositis

Mucositis is an inflammation and ulceration of the mucous membrane in the digestive tract which can have many causes, such as chemotherapy and/or radiotherapy. Mucositis is especially common in patients being treated with fluorouracil, doxorubicin, and methotrexate. Symptoms include altered taste perception, sores, and varying degrees of pain. Treatment is mainly supportive and involves both non-pharmacologic and pharmacologic methods. For compounded preparations such as mouthwashes, there are various formulations that can be used based on the experience and needs of the individual patient. The previously mentioned commercially available mucoadhesive

oral base is extremely effective at coating the mouth and throat with APIs known to cause relief of mucositis. Prevention of mucositis with systemic zinc supplementation and calcium phosphate has been shown to be effective (B., 2013) (Ertekin MV, 2004). Compounded formulas used in the treatment of mucositis are given in Table 10.

Xerostomia

Xerostomia (dry mouth) often has no identifiable cause; however, it is a common side effect of many medications. Other causes can include dehydration, radiation, chemotherapy, and Sjögren's syndrome. Signs and symptoms of xerostomia, other than the dry mouth itself, include bad breath, difficulty swallowing, gum irritation, altered taste, and altered sense of smell, as well as many others. Complications of xerostomia can include oral candidiasis and infected salivary glands. Drug-induced xerostomia is a side effect of about 63 percent of the top 200 most commonly prescribed drugs in the United States. Treatment usually revolves around finding a therapeutic alternative to the drug, artificial saliva substitutes as well as saliva production stimulants. Xylitol by itself has shown salivary stimulant characteristics and is quite useful for this condition (Ribelles Llop M, 2010). Saliva substitutes can improve xerostomia, but tend to not improve the other problems associated with salivary gland dysfunction. Common compounding formulations for xerostomia are listed in Table 11.

Burning Mouth Syndrome

Burning mouth syndrome (BMS) is burning pain experienced in the mouth which can be localized to the tongue only or more diffusely throughout the entire mouth. The pain can also be experienced as numbness or tingling.

Table 11. Active ingredients used in treatment of xerostomia*

Formula
Amitriptyline HCl/Gabapentin/Lidocaine oral rinse in mucoadhesive base
Salicylic Acid mouthwash in mucoadhesive base
Doxepine HCl mouthwash in mucoadhesive base
Ketamine HCl/Amitriptyline HCl/Gabapentin/Liodcaine HCl oral rinse in mucoadhesive base
Amitriptyline HCl 2%/Gabapentin 6%/Liodcaine HCl 0.5% Oral Rinse in Mucoadhesive Base
Capsaicin Troche

**Consult published monograph or other reference for complete formulation and dosing.*

Cause of primary BMS is often unknown, and is thought to be caused by damage to the nerves that control pain and taste. BMS can also be caused by other medical problems, in which case will resolve upon treatment of the causative issue. Common causes of secondary BMS include hormonal changes (diabetes or thyroid), allergies to dental products or food, dry mouth, certain hypertension medications, nutritional deficiencies, oral candidiasis, and acid reflux.

Treatment of primary BMS is generally supportive and often includes oral benzodiazepines, tricyclic antidepressants, and anticonvulsants.

Other considerations for treatment of BMS include reduction of excessive stress, increased intake of oral fluids, avoidance of acidic foods and liquids, avoidance of spicy foods and alcohol, avoidance of tobacco, and use of sensitive tooth toothpaste formulations. Nutritional supplements thought to improve BMS symptoms are alpha-lipoic acid 200mg orally three times daily as well as thiamine, riboflavin, folic acid, and vitamin b-12 (Gaby, 2011). Commonly compounded formulations for treatment of BMS are given in Table 11.

CONCLUSION

The vast variety of compounding options to help treat many otolaryngeal problems certainly offers pharmacist many ways solve problems for patients and practitioners. In addition to being an alternative to commercially manufactured products, in many instances, compounded medications have advantages by providing customized options for combining various APIs, omitting offensive ingredients, and providing a unique delivery system to improve compliance and/or therapeutic outcomes. ■

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Continuing Education Quiz

Select the correct answer.

Use the following case to answer questions 1-5.

1. Kim is a 17-year-old female who has recently been diagnosed with otitis externa. There has been no culture and sensitivity performed, but the doctor would like to prescribe something to be compounded as soon as possible to begin treatment. Kim has no known drug allergies.

1. What is the most likely common pathogenic organism involved in otitis externa?
a. Pseudomonas aeruginosa
b. E-coli
c. Herpes simplex
d. Bhemolytic streptococcus

2. Which of the choices below could be prescribed for this patient's otitis?
a. Gentamicin
b. Ciprofloxacin
c. Polymyxin B
d. All of the above

3. Poloxamer gel formulations would be useful for the topical treatment of otitis externa because they:
a. Have natural antibiotic activity
b. Decrease pain
c. Form a gel at body temperature
d. Stay in the ear for months

4. After a week with no improvement, Kim has returned to the doctor complaining of additional pain and trouble hearing. Upon examination, it is discovered that Kim has otitis media with a perforated tympanic membrane. What route of delivery is most common for treating otitis media?
a. Oral
b. Otic
c. Transdermal
d. Sublingual

5. Topical aminoglycosides should be avoided in cases of perforated tympanic membranes because of the possible risk of ototoxicity.
a. True
b. False

6. Which of the following treatment options may relieve symptoms of Meniere's disease?
a. Low salt diet
b. Avoidance of alcohol
c. Meclizine
d. All of the above

7. Which of the following active ingredients are commonly used for compounding to treat epistaxis?
a. Tranexamic acid
b. Diphenhydramine
c. Lidocaine
d. All of the above

8. Which is true concerning nasal polyps?
a. They are caused by cigarette smoking.
b. They may be treated with topical nasal spray corticosteroids.
c. They have shown symptomatic improvement with hydrochlorothiazide nasal spray.
d. They never involve the presence of biofilms.

9. Compounded nasal nebulization treatments for sinusitis may include combinations of active ingredients such as:
a. Biofilm disruptor, cerumenolytic, antibiotic
b. Corticosteroid, antifungal, antibiotic
c. Mucolytic, local anesthetic, antibiotic
d. Mast cell stabilizer, antihistamine, decongestant

10. Topical furosemide may be an effective treatment of nasal polyps.
a. True
b. False

11. Laryngitis treatment typically involves pain management rather than antimicrobial agents.
a. True
b. False

12. The microbial cause of tonsillitis is commonly:
a. Viral
b. Bacterial
c. Protozoan
d. Both a and b

13. Xylitol is mentioned several times in this article for which two effects?
a. Anesthetic and antimicrobial
b. Biofilm disrupter and salivary stimulant
c. Antihistamine and anesthetic

14. The exact cause of burning mouth syndrome is still unknown. However, it is hypothesized that the condition is caused by:
a. Overuse of opioids
b. Viral infection
c. Damage to the nerves that control pain and taste

15. The following agents are thought to help prevent mucositis caused by radiation treatment or chemotherapy:
a. Zinc supplementation
b. Calcium Phosphate supplementation
c. Iron supplementation
d. a and b
e. a, b and c.