

Pharmaceutical Technology

Lecture 9 and 10

Special application solution
and
oral solution

Nasal solutions

Nasal preparations:

- Most preparations intended for intranasal use contain adrenergic agents and are employed for their decongestant activity on the nasal mucosa.
- Most of these preparations are in solution form and are administered as nose drops or sprays; however, a few are available as jellies.

Nasal Decongestant Solutions

- Most nasal decongestant solutions are aqueous, rendered isotonic to nasal fluids (approximately equivalent to 0.9% sodium chloride), buffered to maintain drug stability while approximating the normal pH range of the nasal fluids (pH 5.5 to 6.5), and stabilized and preserved as required.
- The antimicrobial preservatives are the same as those used in ophthalmic solutions.

- The concentration of adrenergic agent in most nasal decongestant solutions is quite low, ranging from about 0.05% to 1%.
- Certain commercial solutions are available in adult and pediatric strengths, the pediatric strength being approximately half of the adult strength.

- Nasal decongestant solutions are employed in the treatment of rhinitis of the common cold, for vasomotor and allergic rhinitis including hay fever, and for sinusitis.
- Frequent or prolonged use may lead to chronic edema of the nasal mucosa, that is, rhinitis medicamentosa, aggravating the symptom that they are intended to relieve.
- Thus, they are best used for short periods (no longer than 3 to 5 days), and the patient should be advised not to exceed the recommended dosage and frequency of use

- Most solutions for nasal use are packaged in dropper bottles or in plastic spray bottles, usually containing 15 to 30 mL of medication.
- The products should be determined to be stable in the container and the package tightly closed while not in use. The patient should be advised to discard the solution if it becomes discolored and/or contains precipitated matter.
- The patient should also understand that there is a difference in the duration of the effect of topical decongestants.
- For example, phenylephrine should be used every 3 to 4 hours, whereas oxymetazoline, which is longer acting, should only be used every 12 hours.
- Patients should be advised to read and adhere to the directions for use to avoid misuse/overuse

Inhalation solutions

- Inhalations are sterile drugs or sterile solutions of drugs administered by the nasal or oral respiratory route.
- The drugs may be administered for local action on the bronchial tree or for systemic effects through absorption from the lungs.
- Certain gases, such as oxygen and ether, are administered by inhalation, as are finely powdered drug substances and solutions of drugs administered as fine mists.
- Sterile Water for Inhalation, USP, and Sodium Chloride Inhalation, USP, may be used as vehicles for inhalation solutions.

Otic solutions

- Otic preparations are sometimes referred to as ear or aural preparations.
- Solutions are most frequently used in the ear, with suspensions and ointments also finding some application.
- Ear preparations are usually placed in the ear canal by drops in small amounts for removal of excessive cerumen (earwax) or for treatment of ear infections, inflammation, or pain.

Cerumen-removing solutions

Cerumen is a combination of the secretions of the sweat and sebaceous glands of the external auditory canal. If the secretion is allowed to dry, it forms sticky semisolid which holds epithelial cells, fallen hair, dust and foreign bodies that make their way into the ear canal. Excessive accumulation of cerumen in the ear may cause itching, pain, impaired hearing

Cerumen-removing preparations

- Through the years,
 1. light mineral oil,
 2. vegetable oils, and
 3. hydrogen peroxide have been commonly used agents to soften impacted cerumen for its removal.
 4. Recently, solutions of synthetic surfactants have been developed for their ability to remove earwax.
- One commercial product uses carbamide peroxide in glycerin and propylene glycol (Debrox drops, GSK).
- On contact with the cerumen, the carbamide peroxide releases oxygen, which disrupts the integrity of the impacted wax, allowing its easy removal.

Anti-Infective, Anti-Inflammatory, and Analgesic Ear Preparations

- Drugs used topically in the ear for their anti-infective activity include such agents as ciprofloxacin, colistin sulfate, neomycin, ofloxacin, polymyxin B sulfate, and nystatin, the latter agent used to combat fungal infections.
- These agents are formulated into eardrops (solutions or suspensions) in a vehicle of anhydrous glycerin or propylene glycol.

Why vehicles such as anhydrous glycerin or propylene glycol are used in topical ear preparations?

- These viscous vehicles permit maximum contact time between the medication and the tissues of the ear.
- Their hygroscopicity causes them to draw moisture from the tissues thereby reducing inflammation and diminishing the moisture available for the life process of the microorganism present.
- These hygroscopic vehicles reduce the swelling of the tissues (and thus some pain), so used as vehicle for topical analgesic for the preparation of ear which contains the analgesic (antipyrine) and local anesthetic (benzocaine).

Table 17.6 SOME COMMERCIAL OTIC PREPARATIONS

PRODUCT	MANUFACTURER	ACTIVE INGREDIENT	VEHICLE	USE/INDICATIONS
Americaine otic	Insight Pharmaceuticals	Benzocaine	Glycerin, polyethylene glycol 300	Local anesthetic for ear pain, pruritus in otitis media, swimmer's ear, similar conditions
Cerumenex eardrops	Purdue Frederick	Triethanolamine polypeptide oleate condensate	Propylene glycol	Removes impacted earwax
Chloromycetin otic	Parke-Davis	Chloramphenicol	Propylene glycol	Anti-infective
Cortisporin otic solution	Glaxo Wellcome	Polymyxin B sulfate, neomycin sulfate, hydrocortisone	Glycerin, propylene glycol, water for injection	Superficial bacterial infections
Debrox drops	GlaxoSmithKline	Carbamide peroxide	Anhydrous glycerin	Earwax removal
PediOtic suspension	Glaxo Wellcome	Polymyxin B sulfate, neomycin sulfate, hydrocortisone	Mineral oil, propylene glycol, water for injection	Superficial bacterial infections

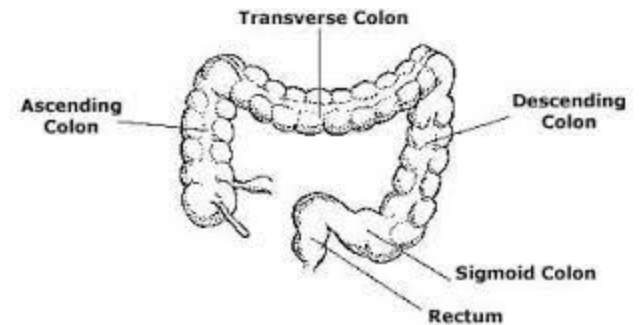
- Some liquid otic preparations require preservation against microbial growth.
- When preservation is required, such agents as chlorobutanol 0.5%, thimerosal 0.01%, and combinations of the parabens are commonly used.
- Antioxidants, such as sodium bisulfite, and other stabilizers are also included in otic formulations as required.
- Ear preparations are usually packaged in 5- to 15-mL glass or plastic containers with a dropper

Topical oral solutions

- Mouthwashes and gargles: aqueous solutions for the prevention and treatment of mouth and throat infections can contain antiseptics, analgesic and / or astringents. They are usually diluted with warm water before use.

Rectal solutions

- Rectal solutions (retention enemas); a retention enema means injecting a solution into the rectum and holding for a specific period of time.
- An implant or retention enema generally uses only enough liquid to fill the rectum and possibly the sigmoid colon.



Official solutions prepared from tablets

Halazone tablets for solution USP
(4mg of halazone).

Uses

Disinfectant

For the sterilization of drinking water

1 or 2 tablets per liter

The tablets should be labeled to indicate that they are not intended to be swallowed.

Official solutions prepared from tablets

Potassium permanganate tablet for solution USP 60,
125 and 300 mg of potassium permanganate

Uses

Topical anti-infective

Applied topically to the skin and mucous membranes as
0.004 to 1% solution or in a wet dressing

It has deep violet-red color when concentrated
and a pink color when diluted

Only distilled water should be used in preparing potassium permanganate solution why?

Since potassium permanganate is incompatible with organic materials such that might be present in tap water, only distilled water should be used in preparing solution of it.

Oral Solutions

- The pharmacist may be called on to
 1. dispense a commercially prepared oral solution
 2. dilute the concentration of a solution, as in the preparation of a pediatric form of an adult product;
 3. prepare a solution by reconstituting a dry powder mixture; or
 4. extemporaneously compound an oral solution from bulk ingredients.

- Knowledge of the solubility and stability characteristics of the medicinal agents and the solvents employed in the commercial products is useful to the pharmacist for informing the patient of the advisability (suitability or desirability) of mixing the solution with juice, milk, or other beverage upon administration.

Examples of oral solutions

1. Oral Rehydration Solutions

- Rapid fluid loss associated with diarrhea can lead to dehydration and ultimately death in some patients, particularly infants.
- During diarrhea, the small intestine secretes far more than the normal amount of fluid and electrolytes, and this simply exceeds the ability of the large intestine to reabsorb it. This fluid loss, which occurs mostly from the body's extracellular fluid compartment, can lead to a progressive loss of blood volume culminating (ending) in hypovolemic shock.

- Oral rehydration solutions are usually effective in treatment of patients with mild volume depletion, 5% to 10% of body weight. These are available OTC and are relatively inexpensive, and their use has diminished the incidence of complications associated with parenterally administered electrolyte solutions.

- A liter of typical oral rehydration solution contains 45 mEq Na^+ , 20 mEq K^+ , 35 mEq Cl^- , 30 mEq citrate, and 25 g dextrose.
- These formulations are available in liquid or powder packet form for reconstitution. It is important that the user add the specific amount of water needed to prepare the powder forms. Furthermore, these products should not be mixed with or given with other electrolyte containing liquids, such as milk or fruit juices.

2. Magnesium Citrate Oral Solution

- Magnesium citrate oral solution is a colorless to slightly yellow clear effervescent liquid having a sweet, acidulous taste and a lemon flavor. It is commonly referred to as citrate or as citrate of magnesia.
- The solution is prepared by reacting official magnesium carbonate with an excess of citric acid, flavoring and sweetening the solution with lemon oil and syrup, filtering with talc, and then carbonating it by the addition of either potassium or sodium bicarbonate.

- The solution provides an excellent medium for the growth of molds, and any mold spores present during the manufacture of the solution must be killed if the preparation is to remain stable.
- For this reason, during the preparation of the solution, the liquid is heated to boiling (prior to carbonation); boiled water is employed to bring the solution to its proper volume; and boiling water is used to rinse the final container. The final solution may be sterilized.

- The solution is employed as a saline cathartic, with the citric acid, lemon oil, syrup, carbonation, and the low temperature of the refrigerated solution all contributing to the patient's acceptance of the large volume of medication.
- For many patients, it is a pleasant way of taking an otherwise bitter saline cathartic.