

Pediatric Dispensing Considerations

CIPROFLOXACIN, DOXYCYCLINE, AND AMOXICILLIN SUSPENSIONS

The Strategic National Stockpile has limited amounts of oral suspensions of ciprofloxacin, doxycycline, and amoxicillin in managed inventory for the following reasons:

- Limited market availability
- Relatively short shelf life
- Limited use in the private sector (thus making it difficult to rotate)
- Difficulty in predicting the numbers of people who might need these drugs

We recommend you consider creating a subcell in the pharmacy area of your POD whose job it is to mix suspensions.

WEIGHING CHILDREN

Young children cannot take the same regimen as larger children and adults. The regimen they need will depend on their age and weight, but weighing a child will take time and reduce throughput. You need to decide whether you will physically weigh children or use an average-weight chart based on age and height. The CDC provides these charts, and they can be found by clicking [HERE](#). Additionally, a small quantity of Broslow tapes is available in the Push Package.

COMPOUNDING CIPROFLOXACIN AND DOXYCYCLINE TABLETS

An alternative to preformulated suspensions is to convert ciprofloxacin and doxycycline tablets into oral suspensions. You can find information about this process at the Food and Drug Administration's website:

http://www.fda.gov/cder/drug/infopage/penG_doxy/doxycyclinePeds.htm.

If you decide to create the suspensions yourself, we suggest that you do it centrally and then distribute the suspensions to PODs. Pharmacists will have to perform this task; if they are in short supply, creating the suspensions centrally will minimize the number of pharmacists that you have to use.

We suggest you consider the amount of effort and staff that you will need to produce oral suspensions and then decide whether it makes sense to create them internally. All pharmacists learn how to compound drugs, but few do it frequently enough to be proficient. However, every community has a small number of pharmacies that specialize in compounding. You can find them by looking in the Yellow Pages® or by contacting your State Board of Pharmacy. We suggest that you establish contingency contracts with these pharmacies to produce oral suspensions during a response requiring antibiotics.

COMPOUNDING CIPROFLOXACIN ORAL SUSPENSION

The instructions below produce 100 ml of 50 mg/ml ciprofloxacin hydrochloride oral suspension. If your mortar and pestle allow, you can double or triple ingredient quantities if you are able to triturate sufficient tablets. Typically, however, the size of your mortar and pestle will limit the amount of tablets that you can crush, wet, and suspend at one time. Mechanized equipment can speed the process and becomes increasingly important if you need to prepare large quantities.

Our instructions use 500 mg Bayer brand ciprofloxacin (Cipro) tablets, which are in the SNS inventory. This tablet contains 500 mg of the active drug component. Our instructions do not require sieving, although the tablet contains a thin film coating.

Ingredients

The following ingredients prepare 100 ml of ciprofloxacin hydrochloride oral suspension in a strength of 50 mg/ml:

- Active ingredient: 10 Bayer Cipro 500 mg tablets
- Wetting agent: distilled water
- Suspending agent: Ora-Plus® (Paddock Laboratories), 50 ml
- Vehicle: Ora-Sweet® (Paddock Laboratories), to fill to (q.s.) to final volume (100 ml).

Directions

1. Triturate tablets in a mortar with pestle

Finely grind tablets with a ceramic or Wedgwood mortar and pestle. The finer the powder is ground, the better the suspension. The resultant powder should be uniform in color and particle size.

2. Wet powder with distilled water (CRITICAL STEP)

Wet the powder mass with a *minimal* amount of water to form a thick paste. A common mistake in compounding suspensions is to use too much wetting agent. Add water gradually to ensure minimal use and a thick paste. The mass should be smooth and uniform with no lumps when you are done.

3. Add 50 ml of Ora-Plus® in geometric dilution

Add Ora-Plus® to the powder in ever-increasing amounts, working in each addition until you form a uniform mix. The volume of the first addition of Ora-Plus® should be similar to that of the Cipro/water paste. Geometric dilution means that each addition of Ora-Plus® should approximately equal the volume of mixture in the mortar until you add all 50 ml.

We suggest you use Ora-Plus® as your suspending agent because its physical characteristics make it easier to achieve proper volume than with some other suspending agents. Veegum is a viable alternative to Ora-Plus® for this recipe. Other agents may work in an emergency after trial and error. Make sure you carefully inspect the resultant product for desired physical characteristics.

4. Q.S. to 100 ml with Ora-Sweet®

Transfer the mixture from Step 3 into the final container and use Ora-Sweet® as the vehicle to wash out the mortar. Add Ora-Sweet® in portions to the empty mortar to lift any drug mixture that sticks to the mortar's walls. Gradually add the washes to the final container. Top off the final container with Ora-Sweet® to the desired volume and shake well. It is helpful to use a container that is slightly larger than the final desired volume for this step to allow for even dispersion after vigorous shaking.

We recommend Ora-Sweet® in this step. It is a berry-flavored vehicle that masks the bitter taste of drugs. It is compatible with Ora-Plus®; the same manufacturer makes both.

You may find it more convenient to compound a volume that intentionally exceeds the desired dispensing volume so that you can pour the final volume directly from the mortar to the dispensing container even though some mixture will stick to the mortar walls.

Alternatives to Ora-Sweet® are cherry syrup, USP; sorbitol 70%; and simple syrup, USP. Cherry syrup, USP, is a good substitute because it effectively masks drug taste. If you use sorbitol or simple syrup, USP, you need to add a flavoring agent because their sweetness alone does not mask drug taste.

To achieve the proper final volume, you need to include the volume of the flavoring agent. A 3- to 4-ml addition of cherry flavor, USP (not the same as syrup), should be sufficient.

Taste the final product to confirm its sweetness. If it is unpleasant, make adjustments. Flavoring is very important to achieve patient compliance. Not all flavorings mask the taste of drugs equally. Cherry and berry flavors usually work well at hiding bitter drug taste, as does unsweetened Kool-Aid powder. Add small amounts of the flavoring until you mask the drug's bitterness.

The bitterness of ciprofloxacin suspension made from tablets makes it a particular challenge. Several compounding pharmacists have told us that it is very difficult to mask its bitter taste. They indicated that the flavorings we suggest above might not be acceptable to all patients. We suggest that you try giving patients a dab of Hershey's syrup (assuming no chocolate allergy) before and after administering the suspension. This is common practice in children's hospitals. We also suggest that the dispensing pharmacist witness the administration of the first dose to ensure compliance.

5. Label the container

Label the container as follows:

- Do not freeze; store in refrigerator.
- Preparation is stable for 2 months in refrigerator.
- Shake well before use.

We suggest you mark filling levels (based on patient weight) on the reusable calibrated oral dosing syringes in the SNS inventory and use them to dispense this suspension.

COMPOUNDING DOXYCYCLINE HYCLATE ORAL SUSPENSION

The instructions below produce 60 ml of doxycycline hyclate oral suspension in a strength of 10 mg/ml. If your mortar and pestle allow, you can double or triple ingredient quantities if you are able to triturate sufficient tablets. Typically, however, the size of your mortar and pestle will limit the amount of

tablets that you can crush, wet, and suspend at one time. Mechanized equipment can speed the process and becomes increasingly important if you need to prepare large quantities.

Our instructions use Zenith-Goldline and Schein brands of doxycycline tablet, which are in the SNS inventory. These brands do not contain excessive film coatings or other formulation characteristics that require additional preparation steps (e.g., sieving), which may not be true for other brands of doxycycline tablet. Note that a 100-mg doxycycline hyclate tablet contains 100 mg of doxycycline. Thus, you do not have to make complicated adjustments to compensate for the hyclate portion in the tablet to deliver 100% of the active drug component.

Ingredients

The ingredients below prepare doxycycline hyclate oral suspension, 10 mg/ml, 60 ml:

- Active ingredient: 6 doxycycline hyclate tablets
- Wetting agent: glycerin, USP, 1 ml
- Suspending agent: Ora-Plus® (Paddock Laboratories), 30 ml
- Vehicle: Ora-Sweet® (Paddock Laboratories), to q.s. to final volume (60 ml).

To provide flexibility, we mention some alternatives to the wetting agent, suspending agent, and vehicle in the directions.

Directions

1. Triturate tablets in a mortar with pestle

Finely grind tablets with a ceramic or Wedgwood mortar and pestle. The finer the powder is ground, the better the suspension. The resultant powder should be uniform in color and particle size.

2. Wet powder with 1 ml glycerin (CRITICAL STEP)

Wet the powder mass with *minimal* amounts of glycerin to form a thick paste (you may not need the full 1 ml). Adding too much wetting agent is a common mistake in compounding suspensions. Add glycerin gradually to ensure minimal use and a thick paste. The mass should be smooth and uniform with no lumps when you are done.

If glycerin, USP, is not available, you may also use ethanol, docusate sodium liquid, or Ora-Plus® as a wetting agent. Ora-Plus® is primarily a suspending agent but you can also use it as a wetting agent. Whichever wetting agent you use, make sure you produce a smooth, uniform, thick paste.

3. Add 30 ml Ora-Plus® in geometric dilution

Add Ora-Plus® to the paste in ever-increasing amounts, working in each addition until you form a uniform mix. The volume of the first addition of Ora-Plus® should be similar to that of the doxy/glycerin paste. Geometric dilution means that each addition of Ora-Plus® should approximately equal the volume of mixture in the mortar until you add all 30 ml.

We suggest you use Ora-Plus® as your suspending agent because its physical characteristics make it easier to achieve proper volume than some suspending agents. Scrip-Tech suggests no alternatives to Ora-Plus® for this recipe; therefore, we recommend no alternatives. Other agents may work in an emergency after trial and error. Make sure you carefully inspect the resultant product for desired physical characteristics.

4. Q.S. to 60 ml with Ora-Sweet®

Transfer the mixture from Step 3 into the final container and use Ora-Sweet® as the vehicle to wash out the mortar. Add Ora-Sweet® in portions to the empty mortar to lift any drug mixture that sticks to the mortar's walls. Gradually add the washes to the final container. Top off the final container with Ora-Sweet® to the desired volume and shake well. It is helpful to use a container that is slightly larger than the final desired volume for this step to allow for even dispersion after vigorous shaking.

We recommend Ora-Sweet® in this step. It is a berry-flavored vehicle that masks the bitter taste of drugs. It is compatible with Ora-Plus®; the same manufacturer makes both.

You may find it more convenient to compound a volume that intentionally exceeds the desired dispensing volume so that you can pour the final volume directly from the mortar to the dispensing container even though some mixture will stick to the mortar walls.

Alternatives to Ora-Sweet® are cherry syrup, USP; sorbitol 70%; and simple syrup, USP. Cherry syrup, USP, is a good substitute because it effectively masks drug taste. If you use sorbitol or simple syrup, USP, you need to add a flavoring agent because their sweetness alone does not mask drug taste.

To achieve the proper final volume, you need to include the volume of the flavoring agent. A 2-ml addition of cherry flavor, USP (not the same as syrup), should be sufficient.

Taste the final product to confirm its sweetness. If it is unpleasant, make adjustments. Flavoring is very important to achieve patient compliance. Not all flavorings mask the taste of drugs equally. Cherry and berry flavors work especially well at hiding bitter drug taste. Unsweetened Kool-Aid powder also works well as a flavoring agent. Add small amounts of it until you mask the drug's bitterness.

5. Label the container

Label the container as follows:

- Do not freeze; store in refrigerator.
- Preparation is stable for 2 months in refrigerator.
- Shake well before use.

We suggest you mark filling levels (based on patient weight) on the reusable calibrated oral dosing syringes in the NPS and use them to dispense this suspension.