



# Nurse Advise-ERR™

Educating the healthcare community about safe medication practices

April 2005 ■ Volume 3 Issue 4

## Confusion between liposomal and conventional forms of drugs

Some medications are available in both a conventional formulation and a liposomal formulation. Common examples include amphotericin B (an antifungal agent), and doxorubicin and daunorubicin (both antineoplastic agents). However, the liposomal and conventional forms of these drugs and some others are dosed differently and are not interchangeable.

Liposomal drugs demonstrate enhanced activity because the medication, which is entrapped in synthetic fat globules, can circulate in the bloodstream for several hours after injection and selectively accumulate at the targeted disease site. As a result, healthy cells are better shielded from the drug's toxic effects, less medication is concentrated in vulnerable tissues such as the kidneys and liver, and side effects (e.g., nausea, fatigue, hair loss) of specific cancer drugs are often lessened.

Confusion between liposomal and conventional forms of the same drug has resulted in serious patient harm, including death. Consider the following examples.

**Amphotericin B.** Doses of conventional amphotericin B desoxycholate (AMPHOCIN, FUNGIZONE) should not exceed 1.5 mg/kg/day, while doses of the liposomal form (ABELCET, AMPHOTEC, AMBISOME) are higher but vary from product to product. Giving the conventional product at a higher liposomal dose has led to deaths. In one case, while the pharmacy was closed, a nurse retrieved seven 50 mg vials of conventional amphotericin B instead of what was actually ordered—350 mg of the liposomal form, Abelcet. This significant overdose resulted in a fatal event.

**Doxorubicin.** While both are given at 3 to 4 week intervals, conventional doxorubicin hydrochloride (ADRIAMYCIN) and liposomal doxorubicin (DOXIL) are dosed differently as well as administered differently. Giving the liposomal form of the drug IV push, without further dilution, can lead to serious harm. In one example, conventional doxorubicin 35 mg had been prescribed, but the dose had been prepared using the liposomal form, Doxil. The nurse noticed that the red medication in the syringe appeared cloudy (both forms are red, but the conventional product is clear). However, since the pharmacist and another nurse had already checked the drug, the nurse decided to administer it IV push, as prescribed. When the patient became cyanotic, the nurse quickly realized the mistake and stopped administering the medication, averting further harm.

**Daunorubicin.** Liposomal daunorubicin (DAUNOXOME) is typically dosed at 40 mg/m<sup>2</sup> every 2 weeks, while doses of conventional daunorubicin hydrochloride vary greatly and may be administered more frequently. Again, confusion has led to dosing errors. In one case, a patient who was to receive 85 mg of conventional daunorubicin daily for 3 days received DaunoXome instead. Fortunately, the error was caught after the first dose and the patient wasn't harmed.

Similar names and unfamiliarity with the different forms of these drugs are the most common causes of errors. See **Check it out!** for suggestions on how to prevent these types of errors.

**Liposomal and conventional forms of the same drug may be dosed differently.**

### check it out! ✓✓✓✓

To prevent errors between liposomal and conventional forms of drugs:

- ✓ **Dispense from pharmacy.** All antineoplastics and other products available in both liposomal and conventional forms should be stored in and dispensed by the pharmacy to preserve a nurse-pharmacist double check system.
- ✓ **Differentiate names.** Encourage physicians to include the brand name when prescribing liposomal products. (Various brands of liposomal amphotericin B are dosed differently.) List both the brand and generic names for liposomal products on protocols, preprinted orders, pharmacy labels, and medication administration records. When listing generic names, place the words "liposomal form" with the drug name to enhance recognition.
- ✓ **Use special warnings.** Ask pharmacy to add bold cautionary labels to liposomal products (e.g., "Doxil, **LIPOSOMAL** doxorubicin"). Also add these prominent statements to medication administration records.
- ✓ **Perform double checks.** Require an independent double check before administering all chemotherapy, amphotericin B, and liposomal forms of other medications. Also, stop and verify that the correct drug is being used if staff, patients, or family members notice a change in the medication's appearance from previous doses.
- ✓ **Increase awareness.** Ask pharmacy to provide a list of drugs in the hospital for which there are both liposomal and conventional forms, with notations about dosing differences. Alert nurses to the risk of patient harm if these products are confused.

## Go SAFELY with enteral solutions!

Would any nurse ever use IV tubing and/or an IV pump to administer an oral solution or liquid nutrition to patients via a gastric or nasogastric tube? Before you say no, consider the following: **GoLYTELY** (PEG-3350 and electrolytes) bowel prep is sometimes administered via nasogastric tube to patients due to vomiting or intolerance to the large volume necessary for effectiveness. For some patients, a typical enteral infusion pump is not capable of delivering the solution at the desired infusion rate (e.g., 600-1,000 mL over an hour). Thus, we have heard about multiple instances in which IV tubing and an IV pump have been used to administer GoLyteLy.



This form of improvised drug delivery has resulted in accidentally connecting the IV tubing to an IV access site. In one example, a 4-year-old child received GoLyteLy intravenously. The child had been brought to the emergency department after ingesting a large number of 6-mercaptopurine (**PURINETHOL**) tablets, a chemotherapeutic agent. After treatment with activated charcoal, he was started on GoLyteLy, administered at 400 mL per hour using IV tubing attached to a nasogastric tube. After 1 hour, a nurse discovered that the solution was actu-

ally being administered through an IV access line; 391 mL had already infused. Luckily, the child showed no evidence of acidosis or renal failure, and glycol levels were undetectable. He was discharged several days later without further complication. Sadly, we have other examples of deadly errors involving IV administration of other oral or enteral solutions.

While using IV tubing and an IV pump may seem like a necessary “work around” when administering GoLyteLy, there are safer solutions to this nursing challenge. If enteral solutions like GoLyteLy must be administered quickly in large volumes, you might be able to use an adapter to connect two enteral feeding

pumps, each delivering half the desired volume simultaneously. Some nasogastric tubes have a dual port to facilitate such a connection. There are also a few enteral pumps capable of delivering higher volumes per hour (e.g., 500 mL per hour with the Ross Embrace pump). Also be sure to affix bold labels that state “WARNING! For enteral use only” on the containers of all enteral products. This, along with clear labeling of each access line, can help prevent the inadvertent connection of an enteral solution to an IV tubing port.

### safetywire



**Misheard verbal order.** A woman in premature labor with twins had received various tocolytic agents (used to slow uterine contractions) including magnesium sulfate. A perinatologist was consulted, who suggested administering “two 50 mg suppositories” of indomethacin (sometimes used as a tocolytic) if the other tocolytic agents proved ineffective. The next day, the attending physician called in a verbal order that was misheard as “250 mg” indomethacin suppositories. Read back of the order did not detect the error since the nurse said “two fifty” milligrams not “two hundred fifty” milligrams. The nurse hesitated to give the medication because five suppositories were required for the dose. However, in communicating her concerns with the prescriber, she ultimately became convinced that she should give the five suppositories as prescribed. Later, the perinatologist confirmed that two 50 mg suppositories (100 mg total) should have been prescribed. Fortunately, no injury occurred to the mother or her twins. This example illustrates several error prevention strategies. First, question any order that requires more than three of any dosage form for a single dose (as occurred in this case). If you still have concerns, don’t be easily convinced that it’s safe just because the prescriber thinks it is. To confirm safety, look up the drug in a current reference and talk to a pharmacist about your concerns. Finally, it would have been much clearer if the physician had simply stated the total dose (100 mg).

### nicecatch



**Clearly wrong.** When a nurse noticed that a vial of NPH insulin appeared to be a *clear* solution rather than the expected *cloudy* suspension, she notified the pharmacy and asked for an explanation. Having none, the pharmacist sent the vial to the manufacturer for analysis. It turns out that the vial had been contaminated with heparin. The manufacturer stated that heparin binds to protamine and causes the suspension to turn clear. The chemical interaction also changes properties of the insulin, which could affect the drug’s onset and duration of activity. How did contamination occur? The reporter of this error didn’t say, but since both drugs are measured in units and both vials are often kept near one another on nursing unit counters or on top of drug carts, mental slips can occur, resulting in vial mix-ups. In this case, it is thought that inadvertent contamination might have occurred as a result of entering the NPH insulin vial with a needle that contained residual heparin within the lumen. Even a small amount of heparin could cause the reaction. The event serves as a reminder to always investigate if a drug looks different than expected, and to never re-enter a vial of medication with a syringe that has been used before. Another safeguard would be to always keep heparin and insulin vials segregated.

**ISMP Medication Safety Alert! Nurse Advise-ERR** (ISSN 1550-6304) ©2005 Institute for Safe Medication Practices (ISMP). Permission is granted to subscribers to reproduce material for internal newsletters or communications. Other reproduction is prohibited without written permission. Unless noted, published errors were received through the USP-ISMP Medication Errors Reporting Program. **Editors:** Judy Smetzer, RN, BSN; Nancy Tuohy, RN, MSN; Michael R. Cohen, RPh, MS, ScD; Russell Jenkins, MD. **ISMP, 1800 Byberry Road, Suite 810, Huntingdon Valley, PA 19006.** Tel. 215-947-7797; Fax 215-914-1492; E-MAIL: [nursing@ismp.org](mailto:nursing@ismp.org). **Call 1-800-FAIL-SAF(E) to report errors.**