

# WOHRC FACT SHEET

WOMEN'S OCCUPATIONAL HEALTH RESOURCE CENTER



## Handling Chemotherapeutic Drugs

Drugs for treatment of cancer have been used so widely in recent years that concern is growing over the health hazards they may pose to the health care workers who handle them. The very chemical properties that make antineoplastic drugs effective weapons against cancer — their ability to interfere with the cellular replication of rapidly dividing cancer cells — may also make these drugs hazardous to workers who are exposed to them. These workers include not only nurses, who mix and administer most of the drugs, but doctors, pharmacists and the main-

tenance workers who clean up after all are finished.

Research on these hazards is still incomplete, but one study showed increased mutagenic activity in the urine of nurses who handled cancer chemotherapeutic agents. This is of concern because mutagens change the cellular DNA that controls cell division and heredity. Many mutagens also cause cancer. There are other, anecdotal reports of lightheadedness, dizziness, facial flushing and nausea by nurses and pharmacists who were unprotected while preparing the drugs.

A recent survey by the Women's Occupational Health Resource Center and the Comprehensive Cancer Center at Columbia University of two large teaching hospitals and three affiliated community hospitals found marked inconsistency in policies and procedures for safely handling cancer chemotherapeutic drugs. Practices varied not only from hospital to hospital, but even within the same institution and among individual practitioners. In some hospitals there were no safety policies at all. In others, even when safeguards were available, they often were not employed.

### Who is at risk

In most hospitals, chemotherapeutic drugs are mixed and administered by nurses. Pharmacists and physicians — mainly residents and fellows rather than attending physicians — handle them to a lesser degree. Whereas pharmacists in this study tended to dispense all the cancer drugs at a single time of day, nurses are likely to use them at their stations throughout the day, depending on their arrival from the pharmacy and on the times prescribed for the patients. Individual nurses usually mix and administer between two and twenty doses per day.

Thus, although the risk to individual workers from handling the drugs a few times may be small, the fact that so few people handle them so frequently intensifies the potential hazards and makes safety practices all the more necessary and important.



Barbara Aufero

**A preferred safeguard in mixing chemotherapeutic drugs is a vertical laminar flow hood like this one.**

### Physical facilities

In the hospitals surveyed, 80 percent of the drugs were prepared under a laminar flow hood, which is the preferred method for shielding workers from contaminants. Three percent of the drugs were prepared under a horizontal flow hood, which is less effective, and 17 percent were mixed without any hood at all.

Even if hoods are used, however, they may not be sufficient protection. Those observed by the survey team all used HEPA (high efficiency particulate air) filters whose efficacy has not been tested specifically for chemotherapeutic drugs.

In no instance did the surveyers find a charcoal or other filter designed to chemically scrub the air.

The placement of the hoods also tended to reduce their efficiency. Most were installed in small rooms with high traffic where the movement of workers would interfere with the flow of ventilating air. Industrial hygiene data show that this kind of installation, in addition to the movement of the worker's arms within the hood, can decrease protection. In fact, unless the hoods are carefully installed, maintained and used, they may exacerbate rather than prevent exposure. This is especially so if hood blowers are not adjusted to make sure that no contaminated air blows back into the worker's face or into the workroom.

Several of the procedures used also increased risk of exposure to the drugs through the skin as well as the respiratory tract. In the survey, 49 percent of the drugs were purchased in ampules that had to be broken before use. This procedure has been experimentally shown to leave particles in the air even when it is performed under a hood. Other leaks can come from syringes, tubing and stopcock connections and the expelling of air from an infusion line.

### Personal protective equipment

Seventy-five percent of those surveyed used gloves while mixing drugs, but none of the nurses continued to wear the gloves when administering the drugs to patients. No one used a chemical fume mask during either mixing or administering the

drugs.

Similarly, routine wearing of laboratory coats varied. Only about a third of the physicians wore them. Most of the nurses considered their uniforms to be their lab coats, with fewer than 25 percent wearing additional protection. All of the nurses wore their uniforms home. There were no laundry facilities available for nurses' uniforms.

None of the housekeeping staff members who disposed of contaminated trash were seen wearing protective clothing.

### Training

Although several of the institutions surveyed had extensive training programs centered on patients' reactions to the drugs, none provided basic training in safety for the hospital personnel. None demonstrated safe practices for either mixing or administering chemotherapeutic agents. Nurses, because they received information about toxic effects of drugs on patients, may have been somewhat aware of the hazards to themselves. However, in no case were nonprofessional staff provided with information, training or guidance to indicate that there might be danger, or that certain work practices might reduce their exposure.

### Disposal techniques

The survey found many unsafe practices in the disposal of contaminated equipment and trash. In some of the preparation areas, the leavings from chemotherapeutic procedures were not separated from other trash. In 60 percent of these areas survey personnel found needle destructor clippers, a disposal device that clips needles from syringes containing drugs. No special precautions were taken when the needles broke. In all cases, I.V. bottles were dumped with the regular refuse.

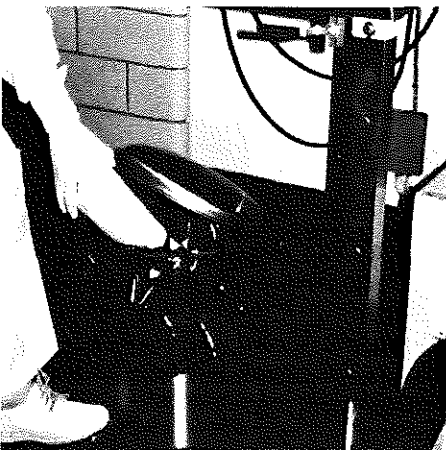
The hospital with the best practices had all drug-contaminated equipment except I.V. bottles packaged into ziplock bags and delivered to the pharmacy for incineration. But even here, as in all others surveyed, no special arrangements were made for the collection and disposal of patient excreta or regurgitation. Personnel who handled it took no special precautions and wore no special protective equipment.

This is particularly dangerous since drugs are often not entirely absorbed by the body, and trace amounts can be expected in the excreta and regurgitation of cancer patients who have been treated with chemotherapeutic drugs.

### An additional warning

This survey, it should be noted, concentrated only on university medical centers and community hospitals. Private doctors' offices and private practice pavilions within institutions were not examined. However, it is likely that potential exposure in these areas is even greater, since few are equipped with hoods and personal protective equipment, or practice protective disposal techniques.

It is also important to note that some of the substances used in chemotherapeutic drugs, such as alkylating agents, interact directly with DNA, the material that controls cell replication and heredity. It is generally accepted by the toxicological community that exposure to these drugs should be avoided as far as possible.



Barbara Auliero

**Drug-contaminated trash should be kept separate from other trash and disposed of in covered receptacles with removable linings.**

### What can be done

More data is still needed for a decision on the best kind of hoods. But there are immediate steps that can be taken for the protection of personnel handling these drugs. Scandinavian research has already indicated lower mutagenic activity in the urine of hospital staff members who observe proper industrial hygiene.

The following checklist indicates some of the protective procedures already available:

- ☐ Are all personnel who handle chemotherapeutic drugs and the trash resulting from their use wearing long sleeved protective clothing, such as a lab coat, while performing these duties?
- ☐ Are they also wearing disposable gloves?
- ☐ When intravenous pushes or infu-

sions are being injected, or when a syringe is being cleared of air bubbles, is cotton gauze wrapped around the needle and I.V. tubing to prevent particles escaping into the room?

☐ In disposing of patient wastes, are disposable urinals with tight-fitting caps used? (See American Hospital Supply catalog #13592, 13593, 13595.)

☐ Are wastes from regurgitation collected in boxes lined with disposable trash lining?

☐ Are syringes, unclipped needles, vials, gloves and the like discarded in a specially designated waste container that is covered and remains separate from the general trash?

☐ Are uniforms and reusable isolation gowns kept separate from the regular laundry?

☐ Are mixing procedures carried out in a hood demonstrated to give operator protection? (Horizontal hoods do not suffice.)

☐ Before and after mixing drugs, is the hood and whole mixing area wiped down thoroughly with a detergent-based solution?

☐ In vertical hoods, are surfaces under the air grills wiped thoroughly at least once every two weeks?

☐ Is the hood inspected routinely by the hood contractor?

*This fact sheet is based on research by Jeanne Stellman, Ph.D.; Barbara Auliero, MPH; and Robert Taub, M.D., Ph.D., presented at the American Society for Preventive Oncology, March 26, 1982.*

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