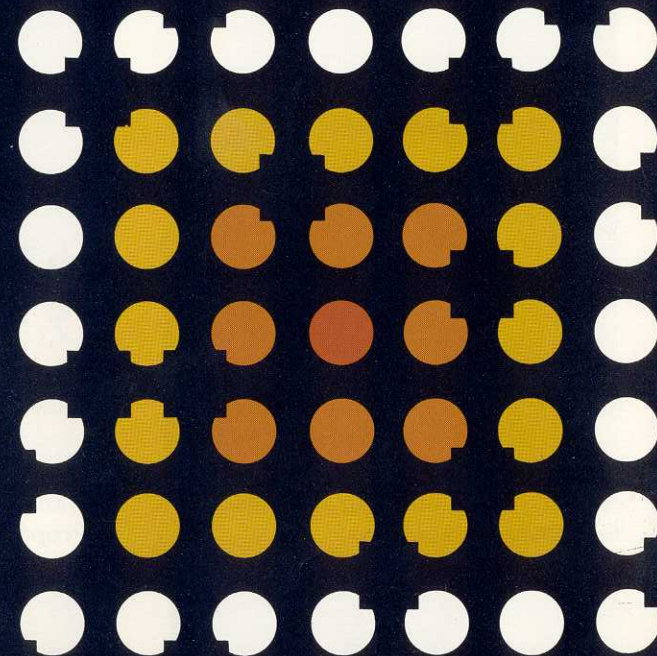


**Recommendations
for the
Safe Handling of**

**PARENTERAL
ANTINEOPLASTIC
DRUGS**



For sale by the Superintendent of Documents, U.S. Government Printing Office
Washington, D.C. 20402



Prepared by the Division of Safety, in collaboration
with Clinical Center pharmacy and nursing staff,
and the National Cancer Institute.

NIH Publication No. 83-2621

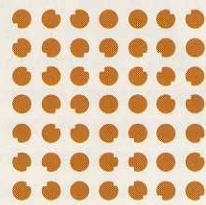
U.S. DEPARTMENT OF HEALTH AND HUMAN
SERVICES
Public Health Service
National Institutes of Health

Introduction

The majority of antineoplastic drugs are toxic compounds. Many are known to cause carcinogenic, mutagenic, or teratogenic effects. On direct contact, some antineoplastic drugs may cause irritation to the skin, eyes, and mucous membranes, and ulceration and necrosis of tissue. The toxicity of parenteral antineoplastic drugs dictates that the exposure of medical personnel to these drugs should be minimized. At the same time, the requirement for maintenance of aseptic conditions during drug preparation must be satisfied.

This brochure reviews routes through which exposure may occur and presents recommendations for the safe handling of parenteral antineoplastic drugs by pharmacists, nurses, physicians, and other personnel who are involved in the preparation and administration of these drugs to patients. This brochure was prepared in response to numerous inquiries received by NIH from practicing pharmacists, nurses, and physicians requesting information on safe handling practices for the preparation and administration of parenteral antineoplastic drugs.

Potential Routes of Exposure



The potential routes of exposure during the preparation and administration of antineoplastic drugs are primarily through inhalation of the aerosolized drug and by direct skin contact.

During the preparation of these drugs, a variety of manipulations are used which may result in aerosol generation, spraying, and splattering. Examples of these manipulations include: the withdrawal of needles from drug vials; the use of syringes and needles or filter straws for drug transfers; the breaking open of ampules; and the expelling of air from a syringe when measuring the precise volume of a drug.

Good pharmaceutical practice calls for the use of aseptic techniques and a sterile environment when preparing parenteral drugs. Many pharmacies provide this sterile environment by using a horizontal laminar flow clean work bench. While this type of unit provides product protection, it exposes the operator, and other room occupants, to aerosols generated during drug preparation procedures. A Class II laminar flow (vertical) biological safety cabinet will provide both product and operator protection. This is accomplished by filtering cabinet incoming and exhaust air through high-efficiency particulate air (HEPA) filters. It should be noted that these filters are not effective for volatile materials, because the filters do not capture vapors and gases.

During administration, clearing air from a syringe or infusion line and leakage at tubing, syringe, or stopcock connections present obvious opportunities for accidental skin contact and aerosol generation. The practice of clipping used needles and syringes will also produce a considerable aerosol.

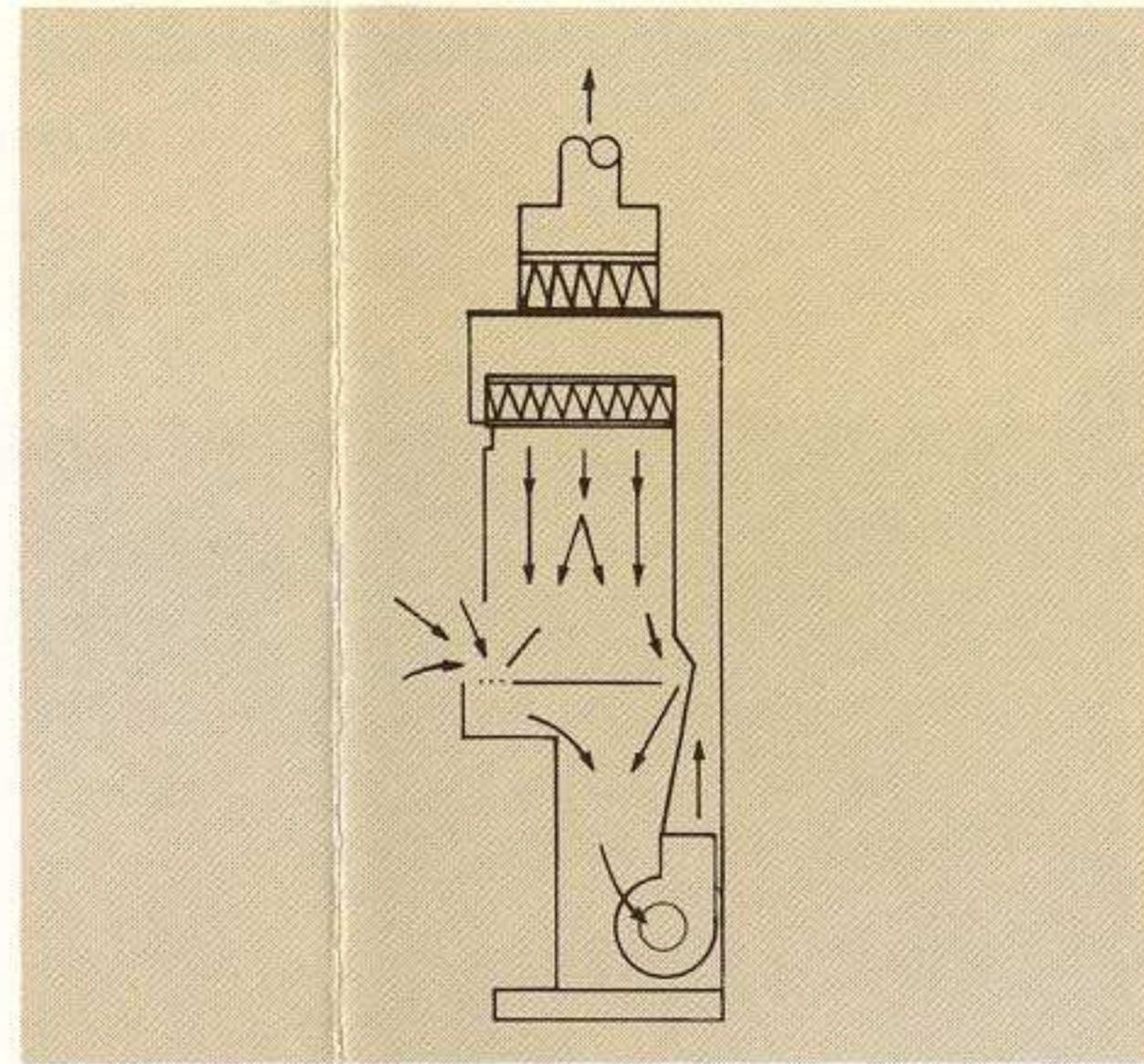
The disposal of antineoplastic drugs and trace contaminated materials (gloves, gowns, needles, syringes, vials, etc.), presents a possible source of exposure by these drugs to nurses, physicians, and pharmacists in addition to support and housekeeping personnel. Excreta from patients receiving certain antineoplastic drug therapy (e.g., high dose methotrexate) may contain high concentrations of the drug. Nursing personnel should be aware of this source of potential exposure to antineoplastic drugs and take appropriate precautions to avoid accidental contact.

The potential risks to nurses, physicians, and pharmacists from repeated contact with parenteral antineoplastic drugs can be effectively controlled by a combination of specific containment equipment and certain work techniques which are described in the following recommendations. For the most part, the techniques are merely an extension of good work practices by medical personnel and may be supplemented as deemed appropriate for the work being performed.

Recommended Practices for Personnel Preparing Parenteral Antineoplastic Drugs



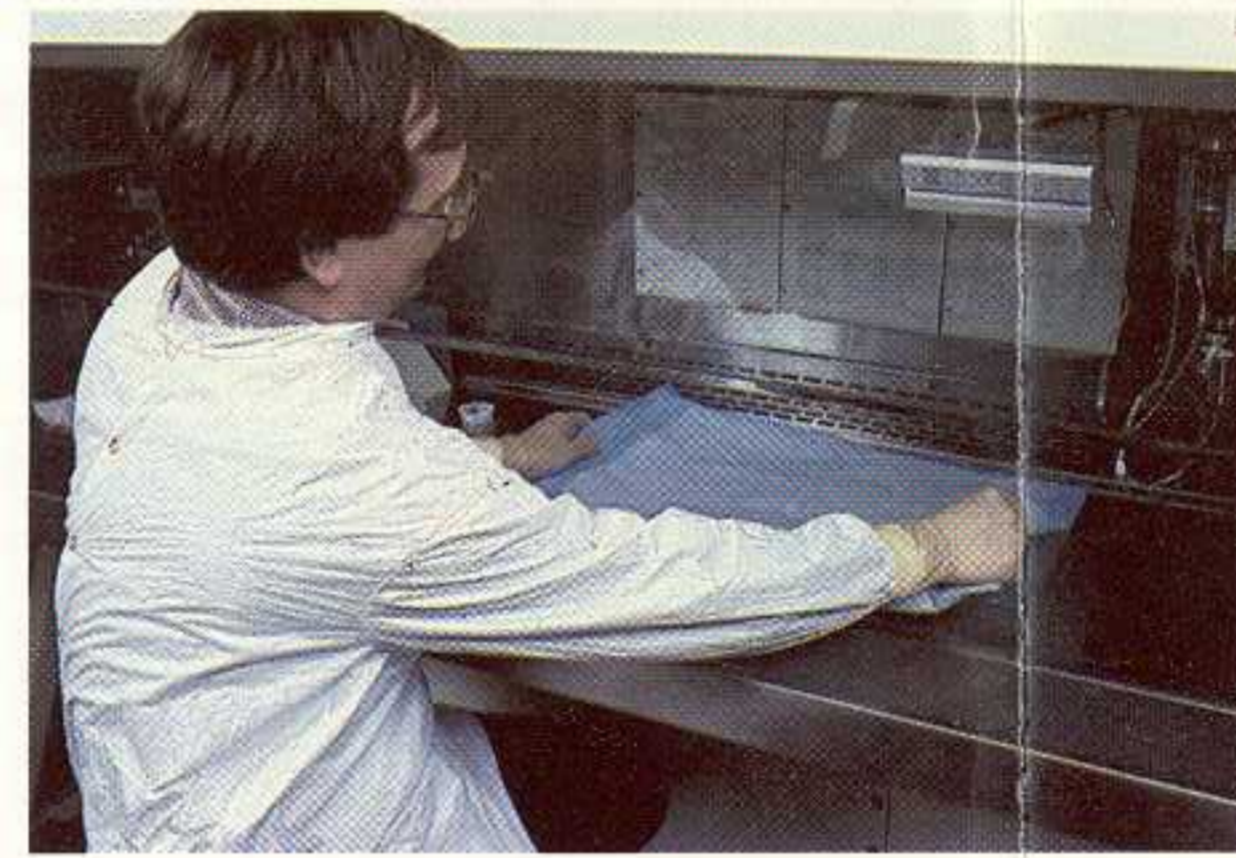
A All procedures involved in the preparation of parenteral antineoplastic drugs should be performed in a Class II laminar flow biological safety cabinet. Careful consideration should be given to selecting a cabinet size that will accommodate the preparation unit's work load.



Class II, Type A with canopy

B Personnel should be familiar with the capabilities, limitations, and proper utilization of the biological safety cabinet selected. A Class II, Type A cabinet will provide product protection and prevent exposure of the operator to aerosols. The filtered exhaust from this type of cabinet is normally discharged into the room environment. Where possible, however, it is desirable to discharge the filtered exhaust air to the outdoors. This can be accomplished by installing an exhaust canopy over the Class II, Type A cabinet or by the use of a Class II, Type B biological safety cabinet which discharges exhaust air to the outdoors.

Professionally accepted standards concerning the aseptic preparation of parenteral products should be followed.

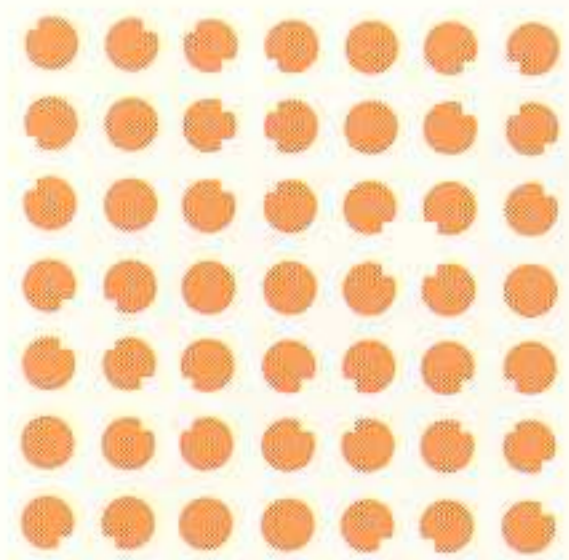


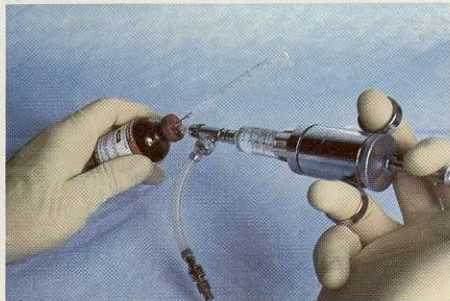
C The safety cabinet work surface should be covered with plastic-backed absorbent paper. This will reduce the potential for dispersion of droplets and spills and facilitate clean-up. The paper should be changed after any overt spills and after each work shift.

Only properly trained personnel should handle antineoplastic drugs. Training sessions should be offered to new professionals as well as technical and housekeeping personnel who may come in contact with these agents. Safe handling should be the focus of such training.



D Personnel preparing the drugs should wear surgical gloves and a closed front surgical-type gown with knit cuffs. Gowns may be of washable or disposable variety. Overtly contaminated gloves or outer garments should be removed and replaced. In case of skin contact with the drug, thoroughly wash the affected area with soap and water. Flush affected eye(s) with copious amounts of water for at least 15 minutes while holding the eyelid(s) open; then seek evaluation by a physician.





E Vials containing reconstituted drugs should be vented to reduce internal pressure. This will help to reduce the possibility of spraying and spillage when a needle is withdrawn from the septum.



F A sterile alcohol dampened cotton pledget should be carefully wrapped around the needle and vial top during withdrawal from the vial septum. Similarly, an alcohol dampened cotton pledget should be carefully placed at the needle or syringe tip when ejecting



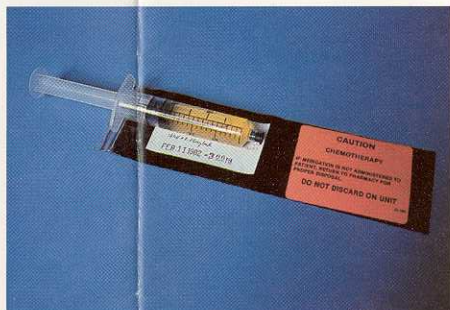
air bubbles from a filled syringe. This practice will control the dripping and aerosol production which may occur during these procedures. *Avoid self-inoculation.* Take care when conducting any procedure that involves the use of needles.



G The external surfaces of syringes and I.V. bottles should be wiped clean of any drug contamination.



H When breaking the top off a glass ampule, wrap the ampule neck at the anticipated break point with a sterile alcohol dampened cotton pledget to contain the aerosol produced and also to protect fingers from being lacerated by the broken glass.



I Syringes and I.V. bottles containing antineoplastic drugs should be properly identified and dated. When these items are delivered to a nursing ward, an additional label such as "Caution—Cancer Chemotherapy, Dispose of Properly" is recommended.



J Wipe down the interior of the safety cabinet with 70% alcohol using a disposable towel after completing all drug preparation operations.



K Contaminated needles and syringes should be disposed of intact, to prevent aerosol generation created by clipping needles. Place them in a leakproof and puncture resistant container. This container, as well as contaminated bottles, vials, gloves, absorbent paper, disposable gowns, gauze, etc., should be placed in an appropriately labeled plastic bag-lined box, sealed and incinerated. Washable gowns may be laundered in a normal fashion.



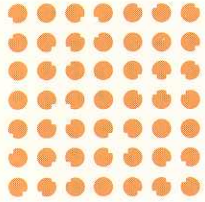
L Wash hands after removing gloves. Gloves are not a substitute for handwashing.



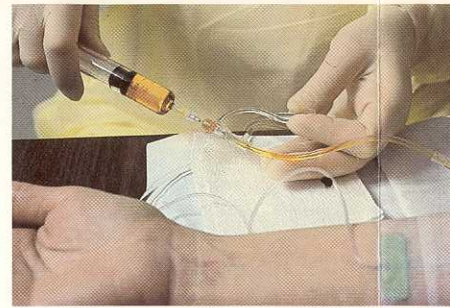
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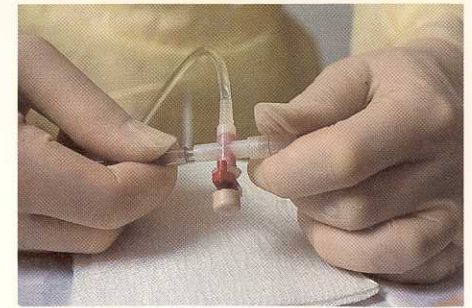
Recommended Practices for Personnel Administering Parenteral Antineoplastic Drugs



A A protective outer garment such as a closed front surgical-type gown with knit cuffs should be worn. Gowns may be of washable or disposable variety.



B Disposable surgical gloves should be worn during those procedures where leakage of the drugs may result, i.e., removing air bubbles from syringes and I.V. tubing, injecting of drugs, disconnect-



ing I.V. tubing, and fixing leaking tubing or syringe connections. Discard gloves after each use.



C When bubbles are removed from syringes or I.V. tubing, a sterile alcohol dampened cotton pledget should be carefully placed over the tips of needles, syringes, or



I.V. tubing in order to collect any of the antineoplastic drugs that may be inadvertently discharged.



D Contaminated needles and syringes should be disposed of intact, to prevent aerosol generation created by clipping needles. Place them in a leakproof and puncture resistant container. This container, as well as contaminated bottles, vials, gloves, absorbent paper, disposable gowns, gauze, etc., should be placed in an appropriately labeled plastic bag-lined box, sealed and incinerated. Washable gowns may be laundered in a normal fashion.



E In case of skin contact with an antineoplastic drug, thoroughly wash the affected area with soap and water. Flush affected eye(s) with copious amounts of water for at least 15 minutes while holding the eyelid(s) open; then seek evaluation by a physician. Wash hands after administering any antineoplastic drug and as dictated by good medical practice.

Personnel should be knowledgeable of those antineoplastic drugs that are excreted in high concentrations from patients following administration. Care should be taken to avoid skin contact and

minimize aerosol generation during disposal of the excreta. Gloves should always be worn by personnel disposing of excreta from patients treated with these types of drugs.