FROM THE CENTERS FOR DISEASE CONTROL AND PREVENTION

CDC MMWR MORBIDITY AND MORTALITY WEEKLY REPORT

Nosocomial Poisoning Associated With Emergency Department Treatment of Organophosphate Toxicity—Georgia, 2000

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EMERGENCY DEPARTMENT (ED) STAFF caring for patients contaminated with toxic chemicals are at risk for developing toxicity from secondary contamination. This report describes three cases of occupational illnesses associated with organophosphate toxicity caused by exposure to a contaminated patient and underscores the importance of using personal protection equipment (PPE) and establishing and following decontamination procedures in EDs and other areas of acute care hospitals.

Patient 1

On April 11, a 40-year-old man intentionally ingested approximately 110 g of a veterinary insecticide concentrate. The insecticide contained 73% naphthalene, xylene, and surfactant, and 11.6% phosmet. On clinical examination at a local hospital ED approximately 20 minutes after the ingestion, the patient had profuse oral and bronchial secretions, vomiting, bronchospasm, and respiratory distress. He was intubated for airway management and ventilation. To control secretions, he received 4 g pralidoxime and 22 mg atropine during the next 24 hours. The patient improved over a 9-day period and was transferred to a psychiatric facility.

The patient was brought to the ED by a friend, not by emergency medical services, and the friend developed symptoms that required treatment. ED personnel exposed to the patient had symptoms within an hour of his arrival. The staff noted a chemical odor in the ED and contacted the regional poison center, which recommended decontaminating the patient's skin and placing gastric contents in a sealed container to minimize evaporation; however, no decontamination was performed.

Health-Care Worker 1

A 45-year-old ED nursing assistant providing care to patient 1 developed respiratory distress, profuse secretions, emesis, diaphoresis, and weakness. She had contact with the patient's skin, respiratory secretions, and emesis. She was admitted to the hospital and required intubation for 24 hours to support respiration. After medical management and serial doses of atropine and pralidoxime for 7 days, her respiratory function improved, and she was discharged after 9 days of hospitalization.

Health-Care Worker 2

A 32-year-old ED nurse had diaphoresis, confusion, hypersalivation, nausea, and abdominal cramps while caring for patient 1. Although she did not have skin contact with his secretions or emesis, she had shared his breathing space. After treatment with 10 mg of atropine and pralidoxime over the next 12 hours, her symptoms resolved.

Health-Care Worker 3

A 56-year-old nurse providing care for patient 1 was admitted to the hospital with dyspnea, confusion, and headache. Although she did not have skin contact with secretions or emesis from patient 1, she had shared his breathing space. She was given 6 mg of atropine without relief of the dyspnea. As a possible result of excessive atropine, she experienced hallucinations. On recommendation of the regional poison center, she received intravenous lorazepam and was observed until the episode resolved. She improved overnight and was discharged.

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CDC Editorial Note: During the incident in this report, health-care workers were exposed to a patient contaminated with an organophosphate insecticide. These health-care workers were not wearing appropriate respiratory or skin protective equipment while caring for the patient. As a result, three health-care workers developed symptoms consistent with organophosphate intoxication and required treatment. This was the third episode reported during 2000 to the Georgia Poison Center of nosocomial poisoning of ED staff involved in the care of patients who had intentionally ingested a concentrated organophosphate mixed with xylene and other hydrocarbon solvents. Similar incidents have occurred elsewhere.[1] During 1987-1998, the National Institute for Occupational Safety and Health identified 46 health-care workers who had acute pesticide-related illness after providing care to a pesticide-contaminated patient (G. Calvert, CDC, personal communication, 2000).

The Joint Commission on Accreditation of Healthcare Organizations requires hospitals to have a plan to manage contaminated patients[2]; however, these recommendations do not include a plan to protect health-care workers caring for contaminated patients. During 1996-1998, surveys of hospitals in Georgia and at level 1 trauma centers nationally indicated that few acute care hospitals had trained staff, equipment, and procedures to safely care for contaminated patients.[3-5]

Depending on the extent of the contamination, health-care workers caring for chemically contaminated patients should use level C protection (i.e., full face mask and powered/nonpowered canister/cartridge filtration respirator) or level B protection (i.e., supplied air respirator or self-contained breathing apparatus).[6] The type of canister/cartridge should be appropriate to the agent; if the agent cannot be identified, an organic vapor/HEPA filter is recommended.[6] To prevent dermal absorption, chemical barrier protection appropriate to the contaminant is needed; latex medical gloves are of little protection against many chemicals. In addition to the need for surface decontamination of patients, body fluids also must be contained to prevent dermal and inhalational exposure. To limit distant spread of the contaminant, the EDs ventilation exhaust should be directed away from the hospital's main ventilation system.

EDs may have to care for persons contaminated with chemicals resulting from self-inflicted contamination, industrial incidents, and terrorist events.[7] To protect health-care workers caring for these patients, EDs should adhere to existing guidelines[6,8,9] and decontamination protocols, train staff in the use of PPE, and maintain adequate quantities of antidotes.[10] If sufficient quantities of antidote are not available, the National Pharmaceutical Stockpile at CDC maintains a mechanism to procure and deliver large quantities of pharmaceuticals to state health departments within 12 hours. Coordination among health-care facilities, poison centers, and state and local health departments could provide surveillance of a chemical agent release, facilitate the expeditious procurement of supplies from outside sources, protect health-care workers, and inform the public about contaminants.

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Certification of Poliomyelitis Eradication—Western Pacific Region, October 2000

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1 figure omitted

ON OCTOBER 29, 2000, THE REGIONAL Commission for the Certification of Poliomyelitis Eradication certified that the Western Pacific Region (WPR) of the World Health Organization (WHO) is free of indigenous wild poliovirus transmission. The last known case of indigenous poliovirus transmission occurred in Cambodia in March 1997 in a 15-month-old girl. WPR is the second of the six WHO regions to be certified as poliomyelitis-free; the first was the Region of the Americas in 1994.[1] WPR comprises 37 countries and territories* with an estimated 1.6 billion persons (27% of the world's population).[2]

The commission completed a 5-year review of programmatic data compiled by national certification committees to ensure that the absence of reported wild poliovirus isolation reflected interruption of indigenous transmission. The prerequisite for regional certification is the absence of indigenous wild poliovirus isolation for at least 3 years.[3] Other criteria used to certify that countries and regions are polio-free include (1) high vaccination coverage rates in all countries and within all areas of a country; (2) sensitive surveillance for detecting all cases of acute flaccid paralysis (AFP) meeting standard performance indicators (e.g., the processing of all stool samples from AFP case-patients in WHO-accredited laboratories); (3) a plan of action to respond to imported cases of polio and poliovirus; and (4) political commitment by national governments to maintain polio eradication activities at current levels of intensity until at least 2005.

WPR is the first region to include the biocontainment of wild polioviruses in laboratories as part of the certification process. In its initial phase, this process entails conducting inventories of all stocks of wild poliovirus infectious materials and potentially infectious materials. Completion of this phase in WPR is expected in December 2001.

In 1988, the Global Poliomyelitis Eradication Initiative was established by the World Health Assembly and was coordinated by WHO, the United Nations Children's Fund (UNICEF), Rotary International, and CDC; it is the largest public health effort for disease eradication. National governments, private foundations, nongovernmental organizations, corporations, and volunteers have collaborated to achieve eradication. In the European Region, no new indigenous polio cases have been detected since November 1998. Twenty countries in the three other WHO regions (Africa, Eastern Mediterranean, and South-East Asia) anticipate continued poliovirus transmission; global circulation of poliovirus may be interrupted by 2002.[4]

The occurrence of an imported case of polio in China in October 1999[5] and the documented transmission of wild poliovirus in areas bordering WPR dur-

ing 2000[4] underscore that the continued circulation of poliovirus in the three WHO regions pose a risk for reintroduction to all polio-free countries. Polio-free countries should maintain high levels of polio vaccination coverage and sensitive surveillance for the prompt detection of any circulating poliovirus. To minimize the risk for poliovirus importation, supplementary vaccination campaigns will be required in high-risk areas, especially those bordering countries where polio is endemic. During 2000, an outbreak of vaccine-associated polio was documented among populations with low poliovirus vaccine coverage in the Dominican Republic and Haiti.[6] Global certification of polio eradication will be required before consideration of discontinuing polio vaccination.

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Progress in Development of Immunization Registries—United States, 2000

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1 table, 2 figures omitted

IMMUNIZATION REGISTRIES ARE CONFIdential, population-based, computerized information systems that attempt to collect vaccination data about all children within a geographic area.[1] Registries are an important tool to increase and sustain high vaccination coverage by consolidating vaccination records of children from multiple providers, generating reminder and recall vaccination notices for each child, and providing official vaccination forms and vaccination coverage assessments. One of the national health objectives for 2010 is to increase to 95% the proportion of children aged <6 years who participate in fully operational population-based immunization registries (objective 14.26).[2] To assess the status of immunization registry development, CDC analyzed self-reported data from 62 immunization grantees on the basis of data from the 2000 Immunization Registry Annual Report (IRAR). This report summarizes the results of this analysis, which indicate that approximately half of the grantees are operating population-based immunization registries that target their entire catchment areas; however, approximately 75% of children aged <6 years still need to be included in an immunization registry to reach the national health objective.

The 2000 IRAR was a self-administered questionnaire distributed to immunization program managers or immunization registry managers that requested information on the enrollment status of a registry's target population and the implementation of 13 functional standards considered essential for immunization registry operation.[3] Key elements for each of the 13 standards were defined by the Immunization Registry Technical Working Group (IRTWG) and are used to measure registry development. The 2000 IRAR also collected data on provider participation and other electronic information systems that shared data with the registry.

In April 2000, CDC's 64 immunization grantees (50 states; the District of Columbia; Chicago, Illinois; Houston, Texas; New York, New York; Philadelphia, Pennsylvania; San Antonio, Texas; American Samoa; Guam; Marshall Islands; Micronesia; Northern Mariana Islands; Puerto Rico; Republic of Palau; and the U.S. Virgin Islands) were asked to complete the 2000 IRAR; 62 (97%) responded. Thirty-two (52%) of the 62 grantees (26 states, four cities, and two territories/commonwealths) reported operating population-based immunization registries that targeted their entire catchment areas. Of the remaining 30 (48%) grantees, seven operated population-based registries in regions or counties as demonstrations or pilot projects, and 23 were planning to develop population-based registries.

Data from 31 of the 32 grantees operating population-based registries indicated that approximately 46% of the estimated 10.4 million target children aged <6 years in these catchment areas had received at least two doses of vaccine. The two doses typically included one vaccine dose in addition to the dose of hepatitis B vaccine given at birth and recorded in a population-based registry's database. The 32 grantees also reported that an average of 74% of public vaccination provider sites and 44% of private provider sites participated in a population-based registry during the 6 months preceding completion of the 2000 IRAR. All 32 grantees implemented at least one key element on nine of the 13 functional standards. Six (19%) of the 32 grantees reported implementing at least one key element in each standard. However, none had implemented fully all key elements of the 13 functional standards.

Thirty-one of the 32 grantees reported electronic linkages (sending and/or receiving electronic data) between immunization registries and at least one other information system. Of these, 28 were linked electronically to their vital records department.

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CDC Editorial Note: The findings in this report indicate that an estimated 21% of children aged <6 years have their immunization histories included in a population-based immunization registry. Four major issues may limit registry participation and development: pro-

tecting the privacy of persons and the confidentiality of registry information, ensuring provider participation, overcoming technical and operational challenges, and determining resources needed to develop and maintain immunization registries.[1] To protect the privacy of patients, providers, and other participants of these systems, CDC developed privacy specifications and implementation guidelines in 2000.[4]

Ensuring provider participation in registries is critical to attaining complete and accurate electronic immunization records. By age 2 years, approximately 23% of children have seen more than one immunization provider.[5] When most or all immunization providers in a registry's catchment area participate in a registry, scattered records can be consolidated and appropriate vaccination decisions can be made based on accurate and complete information. Data from San Bernardino, California, indicate that in 1999, approximately 2000 children received at least one unneeded dose of vaccine because of incomplete immunization records (San Bernardino Department of Public Health, unpublished data, 2000). A national survey in 1997 indicated that an estimated $26.5 million could have been saved by avoiding unneeded doses.[6]

Because registry development initially was targeted at the public sector, the proportion of public vaccination provider sites participating in registries is considerably higher than that of private provider sites. Increasing private provider recruitment efforts will be critical as immunization services continue to shift to the private sector.[7]

CDC and IRTWG are finalizing criteria to measure the progress being made toward achieving the national health objective for 2010.[2] Progress toward reaching these criteria will be evaluated through annual National Immunization Program on-site visits, and recommendations and feedback will be provided.

Although developing and operating immunization registries can be expensive (CDC, unpublished data, 2000), a fully operational population-based registry offsets many other costs by avoiding duplicate immunizations, limiting the cost of missed appointments through the use of reminder/recall notices, reducing vaccine waste, and reducing the staff time required to find and/or produce immunization records or certificates. Registries also can play an important role in assisting vaccine safety efforts and can be used for vaccine ordering, inventory control, and vaccine use monitoring.

The findings in this report are subject to at least two limitations. First, because IRAR 2000 relied on self-reported information, some bias is expected. On-site verifications of these data are being conducted. Second, because only immunization grantees were surveyed, these data underestimate the degree of registry activity in the United States. Survey respondents reported an additional 22 population-based registries operating in local communities.

Additional information on immunization registries is available from CDC's immunization registry World-Wide Web site, http://www.cdc.gov/nip/registry; by telephone, (800) 799-7062; or e-mail, siisclear@cdc.gov.

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Houseboat-Associated Carbon Monoxide Poisonings on Lake Powell—Arizona and Utah, 2000

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1 figure omitted

DURING AUGUST 2000 AT LAKE POWELL in the Glen Canyon National Recreation Area on the Arizona-Utah border, two brothers died of carbon monoxide (CO) poisoning as they swam near the stern of a houseboat while the onboard gasoline-powered generator was operating. As a result of these deaths, an investigation was initiated by the U.S. National Park Service (NPS) with assistance from the U.S. Department of the Interior, CDC's National Institute for Occupational Safety and Health, and the U.S. Coast Guard. In addition to investigating the deaths of the two brothers, the multiagency team evaluated visitor and worker boat-related CO exposures at Lake Powell. The study identified nine boat-related fatal CO poisonings since 1994 and approximately 100 nonfatal poisonings since 1990. This report describes the preliminary results of an ongoing investigation of watercraft-related CO poisonings on Lake Powell.

Incident Reports

Incident 1. On August 2, 2000, two families vacationing on a houseboat on Lake Powell started the boat generator to cool the boat interior and operate the television. About 15 minutes later, two brothers (aged 8 and 11 years) swam into the airspace beneath the swim deck enclosed by the swim platform that was near water level into which the exhaust of the generator was directed. Within an estimated 1-2 minutes, one boy lost consciousness and the other began to convulse before sinking underwater. The brothers' bodies were retrieved the next day. Autopsy results showed that the boys had been overcome by CO and subsequently drowned;

autopsy carboxyhemoglobin (COHb) levels were 59% and 52.%

Incident 2. On August 18, 1994, three teenaged boys were swimming off the stern of a houseboat similar in design to that in incident one. The houseboat generator was operating. The boys were climbing up the back of the houseboat and sliding down a rear-mounted slide into the water. After several minutes, one of the boys developed a headache and went inside the boat cabin. While in the water, another boy commented that his legs felt numb and that he was dizzy. He climbed back onto the boat and is believed to have collapsed and fallen back into the water. Approximately 1 hour later, his body was recovered from the bottom of the lake. An autopsy revealed a COHb level of 53.9.%

Incidents 3, 4, and 5. During August 1998, three CO poisonings occurred on Lake Powell within the span of 12 days. All involved entry of the airspace beneath the swim deck for engine maintenance or clearing ropes from propellers, and all boats had de signs similar to those in incidents one and two. Two of the incidents resulted in fatal CO poisonings (COHb levels of 55% and 49%); the third incident involved a concessionaire employee who lost consciousness while in the water but who was retrieved and resuscitated.

Review of Medical Records

To further examine risk factors for such incidents, the team reviewed NPS emergency medical service (EMS) transport records for 1990-2000 to characterize the circumstances and number of boat-related CO poisonings. A total of 181 records was selected based on the notation of "CO poisoning" or symptoms consistent with CO poisoning and was reviewed for case classification. Of these, 111 definite cases of boat-related CO poisonings were identified.* COHb levels have been obtained for 25 cases.

Nine (8%) of the 111 CO poisonings were fatal, and five deaths occurred after the victim entered the cavity beneath the swim platform of the houseboat during operation of or immediately after deactivation of the generator or boat engines; two additional deaths occurred when the victims were overcome while standing on or swimming near a houseboat swim platform. The remaining two deaths occurred on pleasure crafts. Ages of the persons who died ranged from 8 to 66 years. Of the 111 CO poisonings, 74 (67%) occurred on houseboats and 30 (27%) occurred on pleasure crafts; seven records did not specify a boat type. Of the 74 CO-related poisonings on houseboats, 37 (50%) occurred outdoors, and half of those resulted in loss of conciousness.

Environmental Sampling

Maximum CO concentrations measured in the cavity beneath the stern deck on houseboats on Lake Powell ranged from 6,000-30,000 parts of CO per million parts of air (ppm) while the generators were in operation. Oxygen concentrations as low as 12% also were measured. This oxygen deficient, CO-rich environment in a confined space is lethal within seconds to minutes. In addition, environmental measurements and case reports indicated that CO concentrations on and near the swim platform can reach life-threatening concentrations (measured as high as 7200 ppm). CO tends to accumulate above the water near the platform, and CO concentrations as high as 200 ppm were measured at water level 10 feet away from the platform.

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CDC Editorial Note: CO poisoning associated with indoor exposure has long been recognized. However, the events described in this report illustrate a more rarely reported phenomenon—severe CO poisoning occurring outdoors.

The outdoor poisonings at Lake Powell and those reported elsewhere ([1,2]; D. Lucas, Ohio Division of Watercraft, personal communication, 2000) probably represent a larger number of deaths not recognized as CO poisoning. Because symptoms of CO poisoning resemble those of other common conditions (e.g., alcohol consumption, motion sickness, heat stress, and nonspecific viral illness), poisonings often go unrecognized. In addition, associating illness with this exposure requires awareness of the problem among EMS staff, hospital emergency department personnel, and coroners.

The preliminary findings of this investigation indicate that houseboats with a rear swim deck and a water-level swim platform are an imminent danger to persons who enter the air space beneath the deck or spend time near the rear deck. The presence of features (e.g., engine propellers, water slides, and swim platform) that attract occupancy of that airspace enhances the risk for severe injury and death. To prevent CO poisonings and deaths, boat manufacturers should immediately devise engineering changes to new and existing boats to prevent the collection of CO in airspaces around the stern deck. Boat manufacturers should evaluate the effectiveness of such controls. Boat owners should contact the manufacturer of their boats to determine whether effective corrective measures have been identified. State and federal agencies that issue boat registrations or that regulate lakes and/or boats in their jurisdictions should assess their legal authority to determine what actions might be taken to prevent these deaths.

Workers also may be exposed to very high CO concentrations. According to the Occupational Safety and Health Administration, the area beneath the swim deck should be designated as a confined space, and confined space entry procedures† must be implemented before an employee enters the water to service engine components beneath the deck.

CO poisonings also occur inside houseboats[3]; 36 of the nonfatal CO poisonings at Lake Powell occurred inside boat cabins, and eight of these were in boats on which CO detectors had been disabled because of repeated alarms. Federal, state, and local agen cies and boat manufacturers should improve public awareness of the hazards of CO on houseboats to ensure that boat oc-

cupants heed such alarms and act accordingly. All boats should be equipped with CO detectors, and boat occupants should never disable alarms.

The team has initiated an extensive effort to increase awareness of the problem by enlisting the help of state health departments, boat safety organizations, and other public health groups. The team also is developing plans to educate EMS and hospital emergency department staff to improve patient care through more rapid identification of CO poisoning symptoms. In August 2000, Lake Powell NPS officials initiated a public awareness program aimed at boat owners, renters, and occupants that included widespread posting and distribution of warning flyers, issuance of press releases, and contacting houseboat owners. However, the occurrence of another CO poisoning at Lake Powell underscores the need for rapid intervention through modification of boat designs.

Finally, surveillance of CO poisonings must be improved. Definition of the hazard depends on improved recognition of boat-related CO poisonings and drownings by EMS personnel, emergency departments, and coroners and on more extensive environmental data collection. To assist with these efforts, the team is expanding the scope of this investigation to include other U.S. lakes. Lake Powell is one of many locations where similar conditions may exist.

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*Signs and symptoms consistent with CO poisoning (i.e., death, loss of consciousness, seizures, headache, nausea, confusion, weakness, and altered state of consciousness) with a laboratory-confirmed elevated carboxyhemoglobin level (>2% in children or nonsmoking adults and >9% in smoking adults or adults for whom smoking status is unknown) or known exposure to engine or generator exhaust and one of the following: (1) loss of consciousness with no other cause; (2) symptoms of CO poisoning (other than loss of consciousness) and association with a person who also experienced symptoms of CO poisoning; or (3) symptoms of CO poisoning that improved on removal from exposure.
†29 CFR 1910-146.

Public Health Service Recommendations for the Use of Vaccines Manufactured With Bovine-Derived Materials

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THE CENTER FOR BIOLOGICS EVALUATION and Research (CBER), U.S. Food and Drug Administration (FDA) learned earlier this year that some vaccines were manufactured with bovine-derived materials obtained from countries in which bovine spongiform encephalopathy (BSE) or a substantial risk for BSE exists. A list of these countries is published by the U.S. Department of Agriculture (USDA).* This information was of concern because cases of variant Creutzfeldt-Jakob disease (vCJD) have been attributed to, among other possibilities, eating beef products from cattle infected with the agent of BSE. No evidence exists that cases of vCJD are related to the use of vaccines, and no cases of vCJD have been reported in the United States.

CBER assessed the risk for vCJD from vaccines manufactured with processes that use bovine materials potentially contaminated with the BSE agent. On July 27, 2000, CBER convened a joint meeting of the Transmissible Spongiform Encephalopathy Advisory Committee and the Vaccines and Related Biological Products Advisory Committee to review the results of these assessments and make recommendations about the use and manufacture of these vaccines. The committees concluded that the risk for vCJD posed by vaccines in the scenarios presented was theoretical and remote. This conclusion was based on the inherent low risk of the bovine materials involved (e.g., type and amount of tissue[s] used, specific time and country, or herd of origin) and/or the dilutions of materials during manufacture. The committees concluded that the benefits of vaccination outweigh any remote risks for vCJD.

As a precautionary measure, the committees recommended that vaccines manufactured with bovine-derived materials from countries on the USDA list be replaced with bovine-derived materials from other countries. This recommendation, which is consistent with existing FDA guidance first issued in 1993 on the sourcing of bovine-derived materials, is intended to reduce even the remote risk for vCJD from vaccines. The committees also recommended that FDA provide information to the public about the safety of vaccines made with materials from countries in which BSE or BSE risk exists.

FDA has requested that manufacturers replace bovine-derived materials obtained from countries on the USDA list with materials obtained from countries not on the USDA list. All of the affected manufacturers have agreed to implement these changes or have already done so. FDA anticipates that most of these changes will be completed in 2001.

The Public Health Service (PHS) recommends that all persons continue to be vaccinated according to current schedules. PHS has no preference for using one licensed vaccine product over another based on the source of bovine-derived materials used in vaccine production. Failure to obtain the recommended vaccinations with licensed vaccines poses a risk for serious disease.

Additional information about BSE or vaccines manufactured with bovine-derived materials from countries on the USDA list can be obtained from the FDA World-Wide Web site, http://www.fda.gov/cber/BSE/BSE.htm,† or from CBER's Office of Communications, Training and Manufacturers Assistance, telephone (800) 835-4709.

*9 CFR, part 94.
†References to sites of non-CDC organizations on the World-Wide Web are provided as a service to MMWR readers and do not constitute or imply endorsement of these organizations or their programs by CDC or the U.S. Department of Health and Human Services. CDC is not responsible for the content of pages found at these sites.