
HIV Safety Guidelines and Laboratory Training

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Synopsis

At the Centers for Disease Control (CDC), educational activities concerning acquired immunodeficiency syndrome (AIDS) are directed to many target audiences; important among these are health care and public safety workers. Several CDC programs are designed to address the specific education and training needs of these groups.

The National Institute for Occupational Safety and Health (NIOSH) has developed a set of occu-

pational safety guidelines directed to fire service personnel, emergency medical technicians, paramedics, and law enforcement and correctional facility personnel. These guidelines provide information on modes of transmission of human immunodeficiency virus (HIV) in the workplace, the risk of transmission, the control of risk, and specific risk-control recommendations. NIOSH also has developed a model curriculum, based on the principles and practices discussed in the guidelines, for use in training workers.

The Hospital Infections Program (HIP) at CDC's National Center for Infectious Diseases is responsible for assessing the risk of HIV infection for both health care workers and patients. As part of this effort, HIP has developed guidelines to prevent transmission of HIV and other bloodborne pathogens in health care settings, as well as statements regarding management of occupational exposure to HIV.

The Public Health Practice Program Office provides laboratory training to health care workers who are performing HIV- and AIDS-related testing. This training is delivered through the National Laboratory Training Network and through courses given at CDC headquarters in Atlanta. The delivery of laboratory training is supported by the development of training materials and by performance evaluation programs.

AT THE CENTERS FOR DISEASE CONTROL (CDC), educational activities concerning acquired immunodeficiency syndrome (AIDS) encompass a wide range of formats and address many target audiences. Two important target audiences are health care and public safety workers, persons whose work may expose them to the virus that causes AIDS. Several programs at CDC are directed to the diverse training and educational needs of this group. Examples of such programs are found in the occupational safety guidelines and curriculum guide developed by the National Institute for Occupational Safety and Health (NIOSH), guidelines to prevent nosocomial transmission of human immunodeficiency virus (HIV) developed by the Hospital Infections Program in the National Center for Infectious Diseases (NCID), and laboratory train-

ing for HIV testing that is conducted by the Public Health Practice Program Office.

AIDS-Related Safety Guidelines

Occupational safety guidelines. Public Law 100-607, the Health Omnibus Programs Extension Act of 1988, specified that

... the Secretary of Health and Human Services, acting through the Director of the Centers for Disease Control, shall develop, issue, and disseminate guidelines to all health care workers, public safety workers (including emergency response employees) in the United States concerning: (1) methods to reduce the risk in the workplace of becoming infected

'Recently, CDC published recommendations to prevent transmission of HIV and HBV to patients during exposure-prone invasive procedures.'

with the etiologic agent for acquired immunodeficiency syndrome; and (2) circumstances under which exposure to such etiologic agent may occur.

The law further noted that

. . . the Secretary, acting through the Director of the Centers for Disease Control, shall develop a model curriculum for emergency response employees with respect to the prevention of exposure to the etiologic agent for acquired immunodeficiency syndrome during the process of responding to emergencies.

In response to this law, NIOSH developed two documents: "Guidelines for Prevention of Transmission of Human Immunodeficiency Virus and Hepatitis B Virus to Health-Care and Public-Safety Workers" (1) and "A Curriculum Guide for Public-Safety and Emergency-Response Workers: Prevention of Transmission of Human Immunodeficiency Virus and Hepatitis B Virus" (2). The guidelines and curriculum were transmitted to State public health officers to be disseminated throughout the United States and made available to the public.

These documents were developed primarily to provide guidelines for fire service personnel, emergency medical technicians, paramedics, and law enforcement and correctional facility personnel. The guidelines provide an overview of the modes of transmission of HIV in the workplace, an assessment of the risk of transmission under various assumptions, principles underlying the control of risk, and specific risk-control recommendations for employers and workers. Information is included on medical management of persons who have sustained an occupational exposure to these viruses (for example, an emergency medical technician who incurs a needle-stick injury while performing professional duties). These guidelines are intended for use by a technically informed audience.

The curriculum, a separate model curriculum

based on the principles and practices discussed in the guidelines, was developed for use in training workers. It contains less technical wording than the guidelines. Information is presented concerning the protection of workers against acquisition of HIV while performing job duties; information on exposure to hepatitis B virus (HBV) is also included. Since publication, approximately 30,000 copies of the guidelines and 22,000 copies of the curriculum have been distributed. They have been incorporated into many training programs for public safety and emergency-response workers, including training programs conducted by the American Red Cross, which has published an additional 50,000 copies of the guidelines. Most recently, they have served as the basis for a training course produced by the National Fire Academy and the United States Fire Administration entitled "Infection Control for Emergency-Response Personnel: The Supervisor's Role and Responsibilities" (3). This course will be used for training 5 to 8 million emergency-response workers during the next several years. These publications are available from NIOSH Publications, telephone (513) 533-8287.

Guidelines for health care settings. The Hospital Infections Program (HIP) is responsible for assessing the risk of HIV infection for both health care workers and patients and for providing information to prevent nosocomial transmission of infection. As part of these efforts, HIP began a national study in 1983 of health care workers who had occupational exposures to blood of patients who were infected with HIV. HIP also conducts seroprevalence studies among selected populations of both health care workers and patients to better determine the risk of transmission of HIV infection from patient to health care worker, health care worker to patient, and patient to patient. Other studies have been undertaken to determine the rate at which health care workers sustain percutaneous injuries during invasive procedures.

Early in the epidemic, guidelines to prevent transmission of HIV infection in health care settings were developed on an emergency basis, with little data available. The first set of guidelines was published in 1982, before surveillance for exposed health care workers had begun and before the discovery of HIV as the causative agent of AIDS (4). These early guidelines formed the basis for all subsequent recommendations, including the guidelines referred to as "universal precautions" (5). Based on the premise that blood and certain other body fluids are potentially infectious, these guide-

lines recommend that barrier precautions, such as gloves, be appropriately used with all patients.

During 1990, HIP staff assisted many medical and health organizations in developing guidelines or position papers regarding HIV infection and AIDS in the health care setting. Recently, CDC published recommendations to prevent transmission of HIV and HBV to patients during exposure-prone invasive procedures (6).

HIP has also been instrumental in providing information to health care workers on managing occupational exposures to HIV. In 1990, CDC, the National Institutes of Health, the Food and Drug Administration, and the Health Resources and Services Administration developed and published a Public Health Service statement on managing occupational exposure to HIV, including postexposure use of the antiviral drug zidovudine (AZT) (7). (Copies of these publications can be obtained from the National AIDS Clearinghouse, P.O. Box 6003, Rockville, MD 20850 (telephone 1-800-458-5231).)

HIP staff will continue to evaluate the efficacy and toxicity of administration of AZT and other treatments following occupational exposure to HIV.

AIDS-Related Training for Laboratorians

The epidemiologic evaluation, medical diagnosis, and management of HIV infection, AIDS, and AIDS-related diseases are dependent upon the availability of accurate and reliable laboratory services. As knowledge about AIDS has increased, new diagnostic techniques have required laboratorians to update their skills. The panoply of opportunistic infections associated with AIDS has made it necessary for laboratorians to become more proficient in diagnosing diseases once considered rare. The need to ensure accurate laboratory support services for HIV prevention and early medical intervention programs means that those concerned with laboratory training must plan for transferring new information about testing to laboratorians and must direct efforts toward improvement of laboratory performance.

The Public Health Practice Program Office (PHPPO) has several programs directed toward laboratory-related AIDS training and education. Assessment of training needs, essential for the planning and development of training interventions, has been carried out both regionally and nationally. Delivery of laboratory training has taken place regionally and at CDC headquarters. Self-study tools have been developed for workers in

About 1,200 of the nation's HIV-1 antibody testing laboratories voluntarily participate in CDC's Model Performance Evaluation Program (MPEP). The MPEP estimates that this represents 60 percent to 75 percent of the laboratories offering HIV-1 testing services and that the participant laboratories perform 80 percent to 90 percent of the nation's HIV-1 antibody testing.

remote locations. In addition, performance evaluation studies for HIV testing and for CD4+ cell testing have been implemented, allowing for self-study and evaluation in the laboratory and providing additional information useful in assessing training needs.

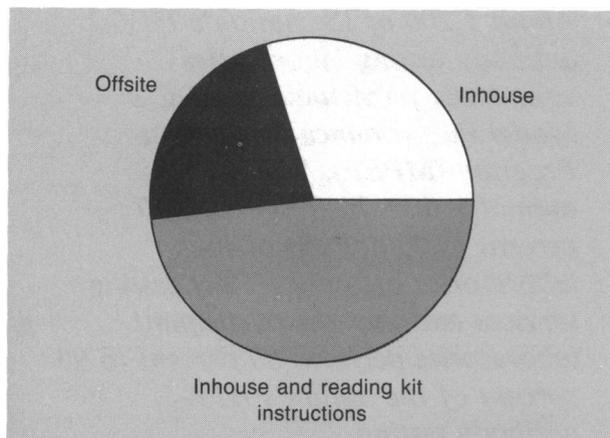
Training delivery

The National Laboratory Training Network. A new model for the direct delivery of laboratory training has recently been implemented to achieve training goals more effectively. Through a cooperative agreement, the Association of State and Territorial Public Health Laboratory Directors (ASTPHLD) and CDC have established the National Laboratory Training Network (NLTN). Its purpose is to promote laboratory training activities in support of public health goals and objectives by facilitating the use of regional and national training resources. A major goal of the NLTN is to build laboratory training capacity at the local level.

The NLTN is partitioned into seven Area Laboratory Training Alliances, and each alliance has a central office, which coordinates daily operations. Berkeley, CA, has the central office for the Pacific area; Denver, CO, for the western area; New Orleans, LA, for the south central area; Nashville, TN, for the southeastern area; Exton, PA, for the eastern area; Jamaica Plain, MA, for the New England area; and Chicago for the midwestern area.

Major functional responsibilities assigned to the offices of the Area Laboratory Training Alliances include facilitating and conducting laboratory training activities and providing information about on-

Figure 1. Site of laboratory training for HIV-1 testing



SOURCE: CDC Model Performance Evaluation Program Survey conducted August 1989. (Multiple laboratory responses and data from foreign laboratories are excluded.)

going laboratory training opportunities. The target audience is health workers who are involved in laboratory practice that supports public health objectives. The activities are carried out by bringing into the training process national and State public health organizations, professional groups, academic institutions, and private industry. All such groups having an interest in laboratory training are invited to participate.

To guide development of training interventions, both the NLTN and ASTPHLD have conducted assessments of training needs. In 1989, with the cooperation of CDC, ASTPHLD performed a survey of 54 State public health laboratory directors (response rate 70 percent) and 48 State training coordinators (response rate 92 percent) to determine perceived laboratory training needs related to the year 2000 public health objectives.

Assessments of regional training needs have been conducted by the NLTN, with each area office conducting telephone or written surveys, using focus groups, and talking directly with laboratorians to determine needs. Using information obtained by these methods, the NLTN has developed and delivered targeted training interventions.

Through the NLTN, AIDS training and education for laboratorians have been presented using a variety of techniques and covering a wide range of topics. A number of courses have specifically addressed HIV testing and have included enzyme immunoassay techniques, performance and interpretation of the HIV Western blot test, and polymerase chain reaction testing for HIV. Several courses that focused on laboratory safety and universal precautions have also been delivered.

Other subjects of importance have included testing related to the opportunistic infections that occur in persons with AIDS.

The advantages of the NLTN training delivery model are (a) assessment of training needs can be conducted at the local level, which improves training specificity, (b) delivery of training regionally improves the availability to laboratorians when funding and time limitations do not allow for long-distance travel, and (c) the involvement of all groups interested in laboratory training makes available to the NLTN a wide range of training resources and helps to ensure that training efforts are not duplicated.

Training at CDC headquarters. Training for laboratorians has been a traditional role for CDC. Laboratory training continues to be developed and delivered at CDC headquarters in Atlanta and is supported by several of the centers. The Division of Laboratory Systems (DLS), PHPPO, develops and delivers courses primarily for the transfer of new technology (and new applications of existing technology) to laboratorians whose work supports public health objectives. Much of this training in recent years has been directed toward HIV testing and testing for AIDS-related diseases.

Courses at headquarters include lectures and laboratory "hands-on" sessions. Planning for course content is based on informed perceptions regarding training needs, input from other centers, and information provided by State public health laboratory directors. For example, a recognition of the importance of CD4+ cell testing in the medical management of HIV infection and *Pneumocystis* prophylaxis resulted in the development of a course for CD4+ cell measurement by flow cytometry. Another example: the delivery of courses on HIV testing using dried blood spots collected routinely from newborns for metabolic screening has allowed public health and other laboratories to conduct blinded seroprevalence studies, contributing important information to epidemiologic studies of HIV infection in childbearing women.

Laboratory training at CDC headquarters is a cooperative effort and brings into play knowledge and expertise from many parts of CDC. Courses described previously have been jointly supported by PHPPO and by NCID.

Activities in support of laboratory training

Training materials development. Many laboratory training materials developed by PHPPO are

designed for use through the NLTN, and consist of complete packages for course presentation. Subjects for packages in use or under development include serologic HIV testing, CD4+ cell testing by flow cytometry, polymerase chain reaction techniques, and the laboratory diagnosis of various sexually transmitted diseases.

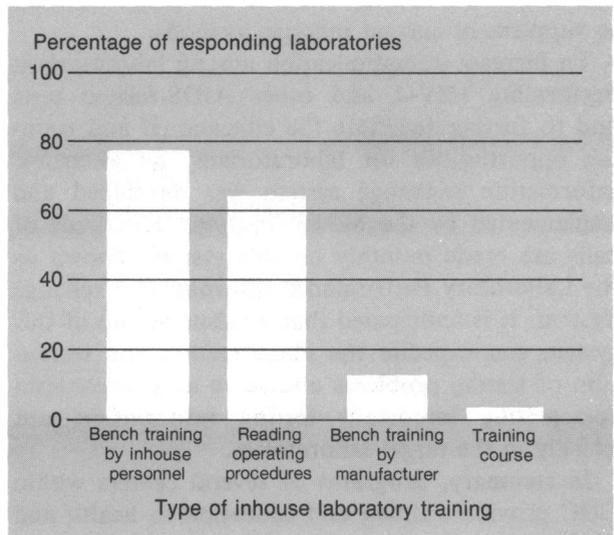
Other types of laboratory training materials are also produced by PHPPPO. An important contribution to AIDS education and training for health care workers is a recently published self-study course (8) on interpretation of the HIV Western blot test. This course is designed to help all health professionals who need to understand the complexities of this diagnostic tool and the interpretation of test results.

Performance evaluation. Performance evaluation programs such as CDC's Model Performance Evaluation Program (MPEP) support and complement the laboratory training and education activities. Through this program, which is conducted by PHPPPO, data are obtained that assist in identifying areas where laboratory training and education efforts are most needed. The program evaluates performance by assessing laboratories' ability to correctly analyze performance evaluation specimens provided by the MPEP. Data describing laboratory practices, such as methods used for testing, level of education and training of technologists, and testing workload, are obtained by compiling laboratorians' responses to questionnaires. The results from testing performance evaluation samples are compared by cross-correlation analyses with information provided by survey questionnaires to identify those variables, which may have an effect on testing quality.

To date, laboratory performance and practice data have mostly been obtained for HIV-1 antibody testing; however, the program has been expanded to include HTLV-I/II antibody testing and CD4+ cell testing. About 1,200 of the nation's HIV-1 antibody testing laboratories voluntarily participate in the MPEP. The MPEP estimates that this represents 60 percent to 75 percent of the laboratories offering HIV-1 testing services and that the participant laboratories perform 80 percent to 90 percent of the nation's HIV-1 antibody testing. The value of performance evaluation data to laboratory training and education program activities is illustrated by considering the data provided in figures 1 and 2.

In a questionnaire mailed to MPEP participants in August 1989, they were asked to indicate the

Figure 2. Inhouse laboratory training for HIV-1 testing



SOURCE: CDC Model Performance Evaluation Program Survey conducted August 1989. (Data from foreign laboratories are excluded.)

number of different personnel performing various HIV-1 tests. Following is the response.

Type of test	Number of employees
Enzyme immunoassay	5,508
Western blot	778
HIV-1 antigen.....	360
Indirect immunofluorescence	186
Viral culture	85
Polymerase chain reaction	53
Other.....	68

Data such as these are useful indicators of the magnitude of the laboratory training audience; these data also indicate the wide variety of tests being performed.

Delving further into laboratory training issues, respondents to the MPEP's August 1989 questionnaire indicated the kinds of training that their laboratorians were required to have before being allowed to perform testing (fig. 1). The majority (77.8 percent) of laboratories indicated that only some form of "in-house" training was required; that is, no other more formal off-site training was necessary.

Of the 761 laboratories that indicated that only inhouse training was required, 470 (61.8 percent) noted that "reading of kit instructions" was a component of the training. Additional data on the types of inhouse training provided (fig. 2) indicate that only 34 (3.0 percent) of the responding laboratories used a formal training course. These data suggest that training and education opportunities

may need to be amplified. An effective method for education and training may be self-study manuals to supplement current inhouse methods.

To increase communication among laboratorians performing HIV-1 and other AIDS-related tests and to further facilitate the educational and training opportunities for laboratorians, an electronic information exchange system was developed and implemented by the MPEP in 1990. Hundreds of calls are made monthly on this system, known as the Laboratory Performance Information Exchange System. It is anticipated that widespread use of this system can expedite the identification and resolution of testing problems and serve as a mechanism for getting important testing information out quickly to the target laboratories.

In summary, programs of several centers within CDC provide training and education to health and public safety workers, and comprise one facet of CDC's activities that pertain to education about AIDS. By helping to protect health and public safety workers, the occupational safety guidelines and the HIV prevention and exposure management guidelines are important in the AIDS prevention process. Training for laboratorians in HIV- and AIDS-related testing helps to provide reliable and accurate laboratory data for the study, diagnosis, and clinical management of AIDS. These activities make a significant contribution to the AIDS education program of CDC.

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