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Aviation Personnel Not Immune To Infectious Disease Exposure

Infectious diseases are gaining ground and are becoming a serious health problem around the world. Cabin crews and other aviation professionals should be aware of these risks and protective strategies should be implemented against biohazards.

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The last 50 years have seen the eradication or near-eradication of some transmissible diseases, and vaccines against the commonest diseases of childhood greatly reduce the numbers of children afflicted by acute infectious disease. But despite the success of medical research in combating killer diseases of the young, transmissible disease has returned as a public health problem of increasing seriousness.

Transmissible diseases of particular concern to the aviation community include tuberculosis (TB), hepatitis B (HBV) and acquired immunodeficiency syndrome (AIDS). TB, a chronic or acute infectious disease, may attack almost any organ or tissue but the commonest site is the lungs. Hepatitis — an inflammation of the liver with destruction of liver cells — comes in several forms, but hepatitis B (formerly called serum hepatitis) is the most common type in adults; if the liver is extensively damaged the result may be jaundice, a yellowing of the skin and eyes.

AIDS is caused by the human immunodeficiency virus (HIV), and leads to a progressive degeneration of the immune system and central nervous system.

The World Health Organization reported in August 1994 that an estimated 17 million people worldwide are infected with the virus, with end-of-the-decade figures projected to be 20 million to 40 million.

TB has returned in antibiotic-resistant form, and epidemiologists warn that each person infected with active tuberculosis usually infects three to four more people. HBV is epidemic in certain vulnerable populations, and differentiated strains of hepatitis A, C, D and E are seen in increasing numbers. Although the potential for HBV transmission in the workplace is greater than for HIV, the modes of transmission of these two viruses are similar. Most cases of HIV and HBV are contracted through sexual activity and through the sharing of needles among intravenous drug users; however, both have

been transmitted in occupational settings. Blood is the single most significant source of HIV and HBV in the workplace.

Aviation personnel are routinely exposed to bloodborne pathogens through the following activities:

- International travel to areas where certain transmissible diseases are epidemic;
- Physical proximity to a traveling public that includes immigrants (immigration is a known conduit of infectious illness); and,
- Work practice that requires occasional hands-on exposure to the traveling public and possible exposure to saliva, blood and vomit (as in cardiopulmonary resuscitation [CPR], other medical assistance and housekeeping).

A glance at the list of reportable diseases, published by the U.S. Bureau of the Census,[1] is disquieting to those who hope for a broadly effective, single-standard approach to the prevention of transmissible disease in the workplace. These diseases originate in a bewildering complexity of causes. Possible agents of transmissible disease (some diseases are transmissible by two or more agents) include:

- **Insect bite**
  Encephalitis and malaria (mosquitoes)
  Plague (fleas)
  Typhus fever (fleas and ticks)
  Rocky Mountain spotted fever (ticks)
- **Animal bite**
  Rabies
  Tetanus
- **Exposure to animal waste or animal parasite**
  Trichinosis (pork)
  Psittacosis (birds)
- **Exposure by inhalation**
  Tuberculosis (passed through coughing or sneezing)
  Chickenpox *
  Diphtheria *
  Legionellosis *
  Poliomyelltis *
  Rheumatic fever *

  * Spread by airborne bacteria or viruses
- **Exposure to contaminated food or water**
  Amebiasis
  Botulism
  Hepatitis A
  Hepatitis E
  Brucellosis (undulant fever)
  Salmonellosis
  Shigellosis
  Cholera
  Trichinosis
  Tularemia
  Typhoid fever
- **Exposure to contaminated soil or puncture wound**
  Tetanus
- **Exposure to contaminated blood or body fluids through a skin lesion, break in the skin or needle puncture**
  HIV
  HBV
  Hepatitis C
  Hepatitis E
  Gonorrhea
  Syphilis

Certain occupational groups are exposed to infection by the nature of their work, and for these groups, precautions are in place. Police, firefighters, emergency response personnel, physicians, nurses, dentists and dental workers, laboratory technicians, blood bank technicians, morticians, paramedics, respiratory therapists, housekeeping personnel and laundry workers in hospitals and nursing homes — these groups routinely come in contact with blood and bodily fluids or contaminated implements.

The major threats are HIV and HBV. Recognizing the need to protect these occupational groups from exposure to blood and other potentially infectious materials, the major agents of HIV and HBV in the workplace, the U.S. Occupational Safety and Health Administration (OSHA) published the Bloodborne Pathogens Standard (BPS), Part 1910.1030 (1991). The BPS mandates work practices intended to minimize or prevent contact of workers with blood or with contaminated instruments. Although it was devised to protect health care workers, its provisions are easily adaptable to work practice in other industries, such as aviation.

The BPS differs from traditional procedures that isolate infectious persons and materials. It assumes that all human blood and certain body fluids and tissues are potentially infectious for HIV, HBV and other bloodborne pathogens. The rationale for this position is that carriers of these diseases are not always identifiable, and so they cannot be quarantined, and that contaminated materials are not always properly labeled. The standard specifies that all precautions (universal precautions) should be taken to prevent contact with human blood or body fluids.

According to OSHA, “an ‘exposure incident’ is the specific eye, mouth or other mucous membrane, non-intact skin,

parenteral [nonintestinal] contact with blood or other potentially infectious materials that results from the performance of an employee's duties." Universal precautions prevent these exposure incidents by use of the following devices and procedures:

- A biohazard label and a biohazard sign must identify items, containers or work areas that contain blood or body fluids and for which special precautions must be taken. Labels, which must be fluorescent orange or orange-red, are to be firmly attached to the container.

- Employers must provide gloves when there is a chance that an employee might be exposed to blood or body fluids. Disposable gloves must not be reused but must be replaced after each use or if they become contaminated or damaged.

- Employers must provide protective eye wear and a mask or face shield when there is a chance that an employee might be exposed to blood or body fluids. Protective eye wear and masks can protect against splashes or splatters of biohazardous fluids. Safety glasses with side shields protect the eyes from exposure; safety goggles provide the most complete protection to the eye. Face shields protect the entire face and eye area from exposure to splashes of blood and body fluids.

- Employers must provide protective clothing, such as fluid-resistant aprons, lab coats and gowns that protect against splashes, sprays, splatters or droplets of potentially infectious materials.

- Employers must provide personal protective equipment, including mouthpieces, resuscitation bags and other ventilation devices. Artificial ventilation may be provided in a variety of ways that protect both the rescuer and the victim. For example, the bag-valve-mask (manual resuscitator) device is self-inflating and disposable. A pocket mask with one-way flow valve allows for mouth-to-mask ventilation and prevents passage of vomit from victim to rescuer during CPR.

- Employers must devise a procedure for handling personal protective equipment after it has been used. Employers must specify locations for collection and disposal of personal protective equipment.

- Work-practice controls include hand washing with germicidal agents after exposure to blood or body fluids and flushing the eyes, nose or other mucous membranes with water if they have been exposed. Germicidal agents are available in powders, liquids and individual disposable cloths.

- Engineering controls to reduce risk of exposure include puncture-resistant containers to hold used sharp objects, such as needles and scalpels, self-sheathing needles to protect against needle-puncture injury and tongs to pick up broken glass that may be contaminated.

- Procedural controls include minimizing of splashing, spraying or splattering of blood and body fluids; disposal of contaminated items in a special container tagged with the biohazard label and symbol; use of leakproof containers, correctly labeled, for handling or storage of specimens; use of a secondary container if the primary container is contaminated; labeling and disinfection of contaminated equipment before equipment is serviced or shipped.

- Special controls concerning personal activities must be in place in work areas where exposure is possible. Employees should not eat, drink or smoke in an area where exposure to blood or other infectious material is possible, nor should they apply cosmetics or lip balm or handle contact lenses in such an area, for any of these activities could expose the employee to bloodborne pathogens.

- Employers must offer a series of three HBV vaccine injections to all employees who may be at risk of exposure. (There is no chance of developing HBV from the vaccine.) Employees who decide not to be vaccinated must sign a waiver. Anyone who has decided against HBV vaccination may change his or her mind at any time and be vaccinated. Vaccination is the best defense against HBV. In fact, so dangerous is HBV to the public health that newborns are routinely vaccinated against it.

Biohazards Can Pose Risks in Aircraft Cabins

The more routine occasions of exposure are physical proximity, especially for a prolonged period in an enclosed space such as an aircraft cabin, and work practice, which might require cleanup of bathrooms, contaminated surfaces and instruments, and disposal of contaminated clothing, instruments and paper products. Physical proximity poses danger of airborne contagion; work practice poses danger of exposure to blood spills, vomit, feces and other body fluids.

Immigration is a vector of transmissible disease (see Table 1, page 5), and the aviation industry employee who meets immigrants in the traveling public may be exposed to disease whose threat is less than obvious.

Aviation employees are also exposed to infection through physical proximity to passengers returning from areas where they may have contracted disease. In a study of infections

imported to Great Britain from the Middle East for example, it was found that large numbers of people return each year (an estimated 2 million in 1990) carrying latent communicable disease from which they later become ill.[2] A study of new immigrants entering Switzerland between 1987 and 1990 found a high prevalence of tuberculosis among them, 174.3 cases per 100,000 among non-Swiss workers.[3] A study of HBV carriers in Sweden indicated that 76 percent of the chronic carriers were immigrants from high- or medium-prevalence regions, mainly the Middle East and Southeast Asia.[4] An Australian investigation of children admitted to the hospital with tuberculosis found that immigration accounted for most cases of tuberculosis.[5]

Physical proximity, such as in the aircraft cabin, exposes aviation workers to airborne biohazards, most notably tuberculosis, but also diphtheria, legionellosis and poliomyelitis. So critical is this matter — particularly as it relates to the transmission of tuberculosis — that OSHA has accelerated work on a proposed tuberculosis standard, similar to the BPS, establishing work practices and mandating protective equipment. The proposed standard will specify use of high-efficiency particulate air (HEPA) respirators that filter 99.97 percent of mycobacterium tuberculosis carried through the air in infectious droplets emitted in coughing or sneezing. It will also recommend the use of a portable air-filtration system of cylindrical HEPA filters to solve ventilation problems in an enclosed space.[6]

The broadest benefit of a successful complete respiratory protection program is that it might protect against a range of airborne diseases. Nevertheless, if it protected against tuberculosis alone, it would be worth the cost and effort, because the public health hazards and economic costs of tuberculosis are great. Tuberculosis will require a protective strategy very different from the protective strategy against HIV and HBV, which are primarily bloodborne biohazards.

Aviation industry personnel may incur even greater occupational exposure to airborne biohazards, blood and other infectious materials than do health care workers. Health care workers expect exposure to infectious materials and they routinely guard against it. U.S. health care workers also closely observe the BPS or a similar non-U.S. standard and follow a program of universal precautions. Thus, whatever exposure they sustain in their hands-on, public service role, protective procedures are in place to minimize infection. Aviation industry personnel, who encounter hundreds more people daily than do health workers, do not expect exposure. Without observance of the BPS and a program of universal precautions, they may be at greater risk of infection.

For example, when cabin crews treat injury, perform CPR and dispose of bandages, facial tissue and tongue depressors, contact with contaminated surfaces and contaminated instruments exposes them to infectious materials. Even in the routine performance of their duties — serving food, shaking passengers' hands, touching armrests and other surfaces in the aircraft cabin, and cleaning countertops, floors and toilets in bathrooms — they are exposed to blood spills, vomit, urine, feces, mucous and saliva.

Initial aviation industry interpretations of OSHA's BPS excluded several worker categories from the new standards. Concerning the applicability of the standard to airlines generally, the Air Transport Association of America (ATA) in 1992 advised that the OSHA BPS "is intended to apply only to those employees directly involved on a routine basis with first aid and other health care functions. Cargo handlers, flight attendants and cabin service personnel are among those not intended to be covered, although any airline may of course elect to apply these standards voluntarily to any employee."[7]

The ATA opinion added: "The common feature of all these exposures seems to be the routine nature of them … None of the examples cited by OSHA include jobs such as the serving of food, cleaning of bathrooms or eating facilities in public buildings, escorting people to seats in movie theaters, or handlers of normal household or commercial wastes. Nor do they cite jobs which occasionally require emergency handling of people in public places such as grocery stores, buses, trains and shopping malls."

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Although there is disagreement over the potential for exposure for certain workers, one can argue that observance of the BPS is indicated for aviation industry employees — cargo handlers, flight attendants and cabin service personnel included. Arguably it is reasonable and prudent to associate the urgency of the standard with *any* exposure to blood.

Six months after publishing the BPS, OSHA expanded its ruling, adding what it called a "de minimis" classification. It said that it would allow employers to offer HBV vaccinations to certain employees *after* the potential exposure rather than offering pre-exposure vaccinations.

OSHA said that employees falling under the de minimis classification were those who rendered first aid only as a collateral duty, responding solely to injuries resulting from workplace incidents, generally at the location where the incident occurred.

The de minimis ruling suggests that while an employer would technically be in violation of the BPS if an

Table 1
Diseases Known to Have Been Transmitted Through Immigration

AIDS	Plague
Amebiasis	Poliomyelitis, acute
Aseptic meningitis	Psittacosis
Botulism	Rabies, animal
Brucellosis (undulant fever)	Rabies, human
Chicken pox	Rheumatic fever, acute
Diphtheria	Salmonellosis
Encephalitis	Shigellosis
Hepatitis A	Tetanus
Hepatitis B	Toxic-shock syndrome
Unspecified hepititis	Trichinosis
Non-A, Non-B hepatitis	Tuberculosis
Legionellosis	Tularemia
Leprosy	Typhoid fever • Flea-borne • Tick-borne
Leptospirosis	
Malaria	
Measles	
Meningococcal infections	Venereal diseases • Gonorrhea • Syphilis
Mumps	
Pertussis	

Source: *Statistical Abstract of the United States,* U.S. Bureau of the Census

employee faced a potential exposure without having received a pre-exposure vaccination, if all guidelines were followed, no citations would be issued nor would penalties be assessed.[8]

OSHA stated that postexposure responses, including HBV vaccination, within 24 hours of possible exposure, minimizes the risk to employees and lessens demands on the limited supplies of the vaccine. Postexposure vaccination may be more cost-effective in the aviation industry, because each vaccination costs between US$160 and $340.

A draft U.S. Federal Aviation Administration (FAA) Advisory Circular (AC 120-44A), "Air Carrier First Aid Programs," under review, proposes a program for crew member awareness and control of incidental exposure to bloodborne pathogens.[9]

The draft AC recommends that air carrier first aid programs and manuals "provide information about protection from bloodborne pathogens" and provide information "about protection of crew members from contamination (including use of latex gloves)." The draft AC says that awareness programs should also explain the air carrier's infection control programs, "practices that will prevent or reduce exposure," and what procedures to follow if an exposure occurs.

The draft AC adds: "Even though crew members would only be incidentally exposed, it is still important to provide them with information about the nature of bloodborne pathogens …"

International travel of aircraft crews or relocation of airline employees to different countries are special cases that require special precautions. For example, encephalitis, cholera and typhoid fever are locally common in Eastern Europe, Asia and the Pacific Rim. The prudent manager will enact special precautions related to geographic area, type of disease, and likelihood and extent of exposure; will require appropriate vaccinations; and will devise preventive strategies.

As in the health care environment, special conditions in the aviation industry prompt the adoption of universal

precautions. If managers and medical officers respond swiftly and productively to the infectious threat that is presented on many fronts and adopt universal precautions, such a program can be a model of disease prevention. ♦

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