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Material in this volume is reviewed annually for technical accuracy, adequacy, and currency. For SKT purposes the examinee should check the *Weighted Airman Promotion System Catalog* to determine the correct references to study.

THIS SECOND VOLUME of Career Development Course (CDC) 4E051B—Public Health Journeyman is created to increase your knowledge and understanding of Force Health Management (FHM).

Unit 1 will discuss conducting deployment health risk assissments, and preparing and conducting pre/post deployment health screenings. This unit will also discuss preventive health assessments to include the PHA cell, individual medical readiness, patient interviews and Aeromedical Services Information Management Systems (ASIMS) components.

Unit 2 explains hazards and control measures to include types of hazrds, toxicology and hazardous workplaces. The control measures will be discussed in this unit as well along with Air Force Occupational and Environmental Safety, Fire Protection, and Health (AFOSH) program.

Unit 3 covers clinical occupational health surveillance and medical surveillance. This unit also addresses shop visits, health education and training, trend analysis, fetal protection and the hospital employee heatlh program along with bloodborne pathogens and how the information is documented.

Unit 4 covers the hearing conservation program to include physical properties of sound, structure and function of the ear, roles and responsibilities of the hearing program and hearing conservation program management. This unit will also cover the Defense Occupational and Environmental Health Readiness System-Hearing Conservation (DOEHRS-HC). This unit will address performing the test and recording the results, audiometer calibration check, conducting occupational audiometric testing, fitness and risk evaluations and how to select, fit, and educate on protective devices. Standard threshold shift identification and follow-up will be the last area discussed in this unit.A glossary is included for your use.

Code numbers on figures are for preparing agency identification only.

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To get a response to your questions concerning subject matter in this course, or to point out technical errors in the text, unit review exercises, or course examination, call or write the author using the contact information on the inside front cover of this volume.

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This volume is valued at 12 hours and 4 points.

NOTE:

In this volume, the subject matter is divided into self-contained units. A unit menu begins each unit, identifying the lesson headings and numbers. After reading the unit menu page and unit introduction, study the section, answer the self-test questions, and compare your answers with those given at the end of the unit. Then complete the unit review exercises.

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Unit 1. Force Health Management

THE DUTIES IN PUBLIC HEALTH are continually evolving to meet the needs of the Air Force. Force Health Management (FHM) is an element within Public Health (PH). While working FHM, it will become obvious that you play an intricate part in the overall success of the Air Force Medical Service (AFMS).

The unit begins with introducing some general responsibilities within FHM. These duties include providing administrative oversight of the Aeromedical Services Information Management Systems (ASIMS) program. In support of the ASIMS program you will gather data and provide reports to primary care management (PCM) teams, unit personnel, nonmedical (hereafter referred to as line) and medical leadership. This will provide line commanders with real-time information on the medical readiness status of their forces and will give PCMs specific information on the health of their enrolled active duty members. You will also provide policy input to both medical readiness and population health functions.

In addition to the previous duties, FHM will provide administrative oversight of the Occupational Health Exam (OHE) program. You must ensure PCM teams know what occupational exams to perform and provide quality control of the finished examination. You will assist the Hearing Conservation Program (HCP) manager with program effectiveness, perform occupational health-related audiograms, and provide input (such as epidemiological and compliance data) to the Occupational and Environmental Health Working Group (OEHWG).

The lessons will conclude with an overview of your role as an immunizations consultant and how FHM assists with the medical administrative processing for deploying troops. This includes reviewing medical records to identify possible disqualifying conditions.

1–1. Medical Intelligence Functions and Responsibilities

Public Health has many different missions. One of these missions that have a direct impact on the Air Force's ability to fight and win wars is our work on medical intelligence and medical threat assessments. The Force Health Management section within PH works diligently in conjunction with the Chief of Aerospace Medicine (SGP) to ensure that our fighting forces are aware of any and all medical dangers they may encounter during their deployment.

201. Conduct deployment health risk assessments

Health Risk Assessments are a medical health risk estimate to provide deploying members a clear picture of the entire spectrum of medical issues our force may encounter during contingency operations. Every deployed location offers a new set of health threats that, if left unaccounted for, can be detrimental to the Air Force's ability to maintain a fighting force and accomplish our mission

objectives. Health threat briefings are provided to deploying members at all stages of the contingency (pre, during and post).

Health risk assessment topics

When conducting health threat assessments, the following topics should be considered:

- Endemic diseases, which encompass all local diseases to include acute gastroenteritis, respiratory, skin, food, waterborne and sexually transmitted infections.
- Environmental factors include climate, humidity, altitude, topography, heat, cold, and industrial health hazards.
- Hazardous insects and vector-borne diseases include hazardous and venomous arthropods.
- Hazardous plants, animals, and zoonotic disease include local flora, poisonous, and contact hazards.
- Occupational health to include noise, blood-borne pathogens, chemical, biological, radiological, nuclear and high-yield explosive (CBRNE) threat capabilities.
- Disease incidence and prevalence, which is needed to give accurate data on disease threats.
- Morbidity and mortality are needed to know what is harming the population and how it is affecting the population.
- Countermeasures help to ensure that any threats identified will have preventive measures implemented to reduce the risk to our population.

Developing countermeasures

For any threats that we identify during our research, we need to develop countermeasures to reduce the risk. For example, if we identify that malaria is present in a specific region, we will then implement the use of chemoprophylaxis as a countermeasure to reduce the risk of any of our members contracting this disease. Not all countermeasures are as easy as taking a prescription medication to counter a disease or giving individuals an immunization before they deploy to protect them. Some of the disease and risks we uncover do not have a simple answer. If we identify that there is a poisonous snake present in the area, our countermeasures may be tougher. With these types of issues, our primary countermeasure is to focus on educating the deploying members. If we can clearly express the danger this snake may pose, we may be able to convince personnel to enact better sanitary practices. By keeping their living quarters clean and free of food, they will be less likely to attract the rodents that in turn attract the poisonous snake we are trying to keep personnel safe from. Developing countermeasures is not a one size fits all practice; they will need to be developed with the mindset that every situation is different, and keeping your people safe will only be successful if you implement countermeasures that work for your specific scenario without impeding our members' abilities to perform their mission.

Gathering medical threat intelligence

There are many different sources of medical intelligence that can be used to develop your threat assessment. Some sources are more up to date than others and certain sites are better for specific topics than others. The key is to do thorough research from many different sites so that you get the full picture of what your members will be exposed to while deployed. Only with that full picture will you be able to implement the countermeasures needed to fully protect your personnel. You can use the following list of organizations that provide Internet sites in order to allow you to gather medical intelligence information:

- National Center for Medical Intelligence (NCMI).
- Centers for Disease Control and Prevention (CDC).
- Travax.
- Armed Forces Pest Management Board (AFPMB) Disease/Vector Ecology Profiles (DVEP).

- Central Intelligence Agency (CIA).
- State Department.
- World Health Organization (WHO).

Additionally, there are intelligence sources other than the Internet. One of the best sources of information is through after-action reports or by talking to people who have experienced or been involved in threat contingencies or "been there before." Depending on the type of contingency (disaster response versus wartime operations), you may also be able to get information from the local public health officials in the country you are sending your personnel.

Delivering deployment health briefing

Once the Health Risk Assessment is completed, the next step is to educate the member. PH's goal is to educate all deploying personnel on risks they will encounter. We want to prevent exposure, adverse human effects, and diminished quality of life. Without our guidance, many will fall victim to preventable diseases that will in turn take them out of the fight and reduce our ability to accomplish our mission. PH should identify every health threat possible and in turn provide the deploying member with information on how to keep safe. This briefing will be delivered to all deploying members, either as part of a deployment outprocessing line or when they come to the FHM section to complete their Deployment Related Health Assessment (DRHA) prior to deployment.

202. Prepare and conduct pre/postdeployment health screening

FHM works closely with the SGP to provide administrative support in the DRHA program. Each deploying member of the Armed Forces who deploys in connection with a contingency operation must complete three DRHAs: Department of Defense (DD) Forms 2795, 2796, and 2900. Additionally, Department of Defense instruction (DODI) 6490.12, *Mental Health Assessments for Service Members in Connection with a Contingency Operation*, 26 February 2013, mandates personnel complete two additional deployment mental health assessments (MHA) as part of Department of Defense (DOD) DRHA requirements. FHM will ensure electronic deployment health records are created for all deploying military service members and civilian employees, report DRHA completion, and ensure unit leadership and Unit Deployment Managers are trained on the DRHA program process. Let's take a closer look at each of the DRHA Forms.

DRHA forms

DRHA #1—Pre-Deployment Health Assessment (DD Form 2795)—This form is accomplished within 120 days before the estimated date of deployment outside the United States. All personnel must report to FHM section to accomplish predeployment medical out-processing in accordance with (IAW) DOD, AF, and Combatant Command Reporting Instructions.

DRHA #2—Post-Deployment Health Assessment (PDHA) (DD Form 2796)—This form is accomplished within 30 days prior to departure from theater; all personnel will report to the deployed military treatment facility (MTF) to accomplish medical outprocessing activities.

DRHA #3—Post-Deployment Health Re-assessment (PDHRA) (DD Form 2900)—Conducted between 90 and 180 days after return from deployment. Accomplished with home station reintegration, recover, and reconstitution.

DRHA #4—Mental Health Assessment (Excerpt of DD Form 2978)—Between 181 days and 545 days after return from deployment. Accomplished with annual preventive health assessment (PHA).

DRHA #5—Mental Health Assessment (Excerpt of DD Form 2978)—Between 546 days and 910 days after return from deployment. Accomplished with Annual PHA.

Findings

Upon completion of each DRHA, information is reviewed by a credentialed, trained provider within specified times and evaluated for critical, priority, and routine findings. Critical findings must be addressed with the service member within one duty day to assess the need for immediate intervention or urgent care and face-to-face encounter within three duty days. Priority findings must be addressed face-to-face with provider within seven calendar days. Routine findings must be addressed face-to-face within thirty calendar days. The purpose of DRHA forms is to gather information from the service member to assess the state of the individual's health before and after deployment outside the United States.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

201. Conduct deployment health risk assessments

1. At what stages during the contingency are Health Threat briefings provided?

2. Why do we develop countermeasures for deployment threats?

202. Prepare and conduct pre/postdeployment health screening

1. Which DRHA needs to be assessed 120 days prior to the estimated date of deployment outside of the United States?

2. Within how much time must critical findings be addressed with service members to assess the need for immediate intervention?

3. What is the purpose of DRHA Forms?

1–2. Preventive Health Assessment

The intent of the PHA program is to provide evidence-based, cost-effective preventive health services to Airmen to maximize their health and readiness postures. Unless otherwise stated, Air Force Instruction (AFI) 44–170, *Preventive Health Assessment,* applies to all Airmen, including guard and reserve. The PHA is an annual assessment intended to provide preventive health services to Airmen to maximize their well-being and to ensure mobility readiness.

203. Preventive health assessment cell roles

The PHA process involves several components. First, the member is notified that he or she is due for a PHA. The member then completes an AF Web Health Assessment (AF WEB HA). A review of the member's health record is conducted to identify medical issues, and all necessary clinical preventive services (CPS) are provided, such as lab work, immunizations, tests, specialty services, and so forth. Finally, the member has a one-on-one encounter with the primary care manager (PCM), if necessary.

Patient care team (led by the provider)

- Addresses/documents critical and priority AF WEB HA findings within mandated time frames.
- Reviews Armed Forces Health Longitudinal Technology Application (AHLTA) PHA notes and assesses if further evaluation is needed.
- Determines occupational and worldwide qualification.
- Signs AHLTA PHA note and updates ASIMS.

PHA Cell

- Reviews the Multiple Patient Report in ASIMS daily for critical and priority findings.
- Sends high priority telephone consults based from multiple patient reports.
- Reviews AF Web HA's, individual medical readiness (IMR), & CPS.
- Completes thorough electronic health record (EHR) review (include paper record as needed).
- Generates AHLTA PHA note.
- Re-verifies IMR requirements are met and ASIMS is updated.
- Sends AHLTA PHA note to Patient-Centered Medical Home (PCMH) team for review and signature.
- Performs administrative EHR update and verifies member has completed all CPS & IMR requirements.
- Reviews each member's AF Form 469, Duty Limiting Condition Report, and AF Form 422, Notification of Air Force Member's Qualification Status, if applicable and forwards records requiring further evaluation to Medical Standards Management Element (MSME).
- Schedules member for PCMH appointment if indicated or requested.
- Maintain a liaison with Unit Health Monitors (UHM) for members who are due/overdue for their PHA.

204. Individual medical readiness

The primary purpose of IMR is to provide a "real-time" medical readiness assessment of IMR requirements to commanders, individuals, and patient care teams, so they can manage and optimize the readiness status of their assigned or enrolled Air Force personnel. The assessment of an individual's medical readiness must be a continuous process. It is independent of the recurring PHA cycle or assessment. For example, if an individual completes the required PHA in January and becomes due for a required immunization in March or becomes pregnant in June, the individual's IMR status will be reflected in ASIMS immediately. For IMR status to be kept current in ASIMS, these items must be updated continuously throughout the year since as you know medical conditions do change. The vast majority of information for the IMR portion of ASIMS will be imported into the software from other computer systems or a central server. The rest will be manually entered into the ASIMS system as needed. The AF goal for IMR is 80 percent, which reflects those service members who are considered "Fully Medically Ready." All IMR factors include immunizations, dental readiness, individual medical equipment, deployment limiting conditions, and medical readiness lab tests. Each of these are explained in the following paragraphs.

Immunizations

Immunization requirements are noted elsewhere but are reflected in ASIMS Web, which should generally be the source for determining what immunizations are due and when they should be given. Some immunizations are specific to a deployment, permanent change of station (PCS) or temporary duty (TDY) location, or an occupation and must be loaded as requirements by major command (MAJCOM) personnel in coordination with the Defense Health Agency/Health Information

Technology (DHA/HIT) Solution Delivery Division when these requirements are identified. Once the requirement is loaded, the vaccine(s) will reflect as "Due" in ASIMS Web. Vaccines are considered overdue if more than 30 days has elapsed since their due date. Influenza is considered "Overdue" if not administered by 1 January of each year. The influenza requirement is valid from 1 October (or slightly earlier if vaccine is available) until 30 June of each fiscal year based on DODI 6025.19, *Individual Medical Readiness (IMR).*

Dental readiness

Dental Readiness is managed through the Dental Classification Management System (DCMS) and passed on to ASIMS automatically. A dental classification of one or two will be reflected as IMR GREEN (individual meets all readiness requirements for deployment), while three or four will be reflected as RED.

Individual medical equipment

Some members require special equipment for deployments. The only item required for IMR is one pair of gas mask inserts and only for those who meet certain visual acuity deficiencies. All members must have either a recorded distant visual acuity to determine if they need gas mask inserts or a record in ASIMS Web that they were shipped gas mask inserts from the DOD Spectacle Request Transmission System (SRTS). Each of these requirements is only required once and, once documented, will not change unless a new visual acuity measurement is added to ASIMS Web that drives the requirement for a gas mask insert.

Deployment-limiting conditions

Members must have no deployment-limiting condition to be determined "medically ready." Members on a AF Form 469 duty limiting condition, code 31, 37, 81 recommending "not worldwide qualified" or "not deployable" or having a personnel system designator, either an Assignment Limitation Code (ALC)–C (1, 2 or 3) or an Assignment Availability Code (AAC) 81, 37 or 31, signifying a deployment limiting condition, are determined to be "not medically ready."

Medical readiness lab test

The following table provides lab tests that are required for IMR at the indicated frequency and must be recorded in ASIMS:

Lab Test	Frequency
Glucose-6-phosphate dehydrogenase (G6PD)	Once
Deoxyribonucleic acid (DNA)	
Blood Type/Rhesus (Rh) factor	
Sickledex	
Human immunodeficiency virus (HIV)	Every two years

If these lab tests have not been accomplished and are not in the ASIMS, this area will show as RED until the requirements are met. The data must be entered manually into ASIMS Web to change the RED (required item) to GREEN (accomplished item).

205. Health records review date

The health record review (HRR) is accomplished annually with the PHA. The date entered into ASIMS for the HRR is used to calculate the next due date. In rare cases (e.g., deployment, unexpected TDY, emergency leave, etc.), individuals may exceed 12 months since their last PHA. If a member's PHA is due around a deployment, the PHA does not need to be accomplished if the PHA is current within the last 365 days.

Other specific data

Special populations of active duty members may have additional requirements, such as flying and special-duty personnel. Additional requirements for those personnel are programmed into ASIMS. This information, such as gas masks inserts and quantitative fit training (QNFT), will be entered into ASIMS. This includes the date gas mask inserts were issued, for those with defective visual acuity, and the date quantitative fit testing of the gas mask was last accomplished. If members have other required medical equipment, such as hearing aids or orthotic support devices, the date of their issue should also be listed.

206. Completing a preventive health assessment

The PHA process involves four main PHA partners: the Air Force member, the PHA Cell, the patient care team, and the UHM. When it comes to completing a PHA, there is a lot of work behind the scenes that determine what the member will need to accomplish the PHA with minimal time in the MTF and out of the member's duty section.

Review/update all IMR requirements

All IMR requirements must be reviewed, accomplished, scheduled, and ordered if needed, as part of the PHA process. All IMR requirements must be evaluated and those issues that can be "turned green" (all medical readiness requirements met/current) should be accomplished. However, the completion of a review does not necessarily affect the IMR status. For example, an individual may have a deployment-limiting profile, may be deferred for an immunization, or may not be in dental class one or two. Thus, they will be complete for the review but will remain IMR "red."

Record review

As a minimum, an individual's medical record must be reviewed by FHM annually to identify any medical conditions or behavioral risks that require further evaluation or counseling. Historical evidence tells you that a good record review is essential to identifying issues which may need further evaluation, especially in terms of a member's qualification for deployments and/or continued military service IAW AFI 48–123, *Medical Examinations and Standards*. Technicians will conduct a thorough health record review using the medical record (AHLTA and paper record if AHLTA is not available) for interval medical and surgical history, family history, and currency of clinical preventive services since the members last PHA. Completing the record review in advance helps minimize the time the member must spend away from his or her duty section.

Electronic adult preventive and chronic care flowsheet

When completing the ASIMS update, the technician will also update the members electronic DD Form 2766, Adult Preventive and Chronic Care Flowsheet, and the DD Form 2766C, Adult Preventive and Chronic Care Flowsheet (Continuation Sheet), as necessary, by going through the following tabs: Allergies, Illness/Meds, Hospitalization, Counseling, and Family History. This update to the DD Form 2766 should include previously undocumented significant medical events, allergies, and surgeries, in addition to the current PHA activities. Once the form has been completed with up-to-date information, the technician will print out the 2766 and place it in the member's medical record. The printed DD Form 2766 will include the following areas: Immunizations, PHA, Dental, Labs, Profile, Medical Equipment (gas mask inserts), Other (Not IMR) Allergies, Illness/Meds, Hospitalization, Counseling, and Family History.

207. Patient interview

The PHA process has many pieces to it. We have already looked at the administrative side, now it's time to explore the clinical aspects of the PHA. The first step in a patient interview is to verify the patient's identity by checking his or her ID card and reviewing the patient's standard form (SF) 600, Chronological Record of Medical Care.

Using all of the information from your record reviews, it's now time to conduct the patient interview. Before the one-on-one PCM visit, a member of the PHA Cell team will sit with the patient and review the AF Web HA. Medications will also be reviewed. Information can be found in AHLTA, CHCS, and the patient's hard-copy medical record. It is important to review all the ASIMS tabs while the patient is in front of you to ensure you updated everything during your initial review to make sure they are current and any outstanding issues are resolved before the patient leaves the facility. The PHA Cell will educate, counsel, and refer the member as needed.

Clinical preventive services

The CPS reflected within ASIMS is the minimum recommended studies that an individual needs. These studies are based on recommendations from the US Preventive Health Services Task Force (USPHSTF) and can be found in the Preventive Base Screening Grid, which is part of the algorithm used in the ASIMS. This chart identifies what examinations/studies are needed during the annual PHA. This computer-generated list includes the following elements of the PHA:

- Test needed.
- Frequency of test required.
- Male versus female test required.

Tests and procedures for nonflyers are based on age and family history. Tests and procedures for flight personnel are based on the same criteria with the addition of visual and hearing exams.

The ASIMS software uses this matrix to determine when individuals are due for these examinations. Providers may change the recommended frequency for individual patients based on his/her risk factors. However, if the provider does change the frequency, his/her rationale for doing so should be clearly explained in the medical records. A manual record review can also identify tests and procedures that may be required during a PHA.

CPS studies must be addressed as part of a member's routine health care. At the time of the annual PHA, all of these requirements and recommendations should be reviewed, and any that have not been accomplished should be scheduled and completed.

Clinical administration

As part of our duties in the PHA Cell, we need to administer height, weight, blood pressure, and distant visual acuity screenings.

Height (standing)

The back-to-hard surface and height-rod method are the two methods that can be used to administer standing height. The back-to-hard surface is the most accurate and usually the required method. Examinees must remove their shoes and stand at the position of attention with head facing directly forward. The height-rod method comes attached to a standard manual scale. Examinees stand directly on the scale facing away from the rod while the spoon is carefully lowered to rest on top of the examinees' head. Height is recorded to the nearest quarter of an inch with both methods.

Weight

Before recording any weight measurements, scales must be calibrated for accuracy. Body weight is also administered by either a manual or automatic scale. For manual weight, shoes may or may not be worn depending on local protocol.

Blood pressure

Before taking blood-pressure readings, there are some basic tools needed to complete the task. A stethoscope and sphygmomanometer will be used to get an accurate blood-pressure reading. When taking blood-pressure readings, the two methods include manual (which uses a manual sphygmomanometer) and electronic (which uses an electronic sphygmomanometer).

Components

Along with the manual sphygmomanometer for reading blood pressure manually, additional components include the following:

- Cuff—Contains bladder.
- Gauge—Small line represents 2 millimeters of mercury (mm Hg), and large line represents 10 mm Hg.
- Tubing—Two tubes connected to a gauge with one tube going to the bulb to be manually squeezed to inflate the cuff, and the other tube going to the cuff for inflation.
- Bulb—Used to inflate the bladder.
- Needle valve screw—Regulated by the examiner to inflate the bladder (valve closed) or allow air (valve opened) to escape while pressure is being measured.

Along with the electronic sphygmomanometer for reading blood pressure electronically, additional components include the following:

- Electronic pump with digital display.
- Cuff and bladder.
- Tubing.

Performing blood-pressure procedures

After the appropriate method is determined, the following steps need to be applied to perform blood-pressure procedures:

1. Clean equipment.
2. Select appropriate cuff size.
3. Place cuff midway on the upper arm over the brachial artery. The lower edge of the cuff is placed about 1–2 inches above the inner aspect of the elbow. The forearm should be supported at the level of the heart with palm placing upward.
4. The cuff should be deflated and the gauge should register zero. Ensure tubing is not kinked.
5. Find pulse site with two or three fingers.
6. Place the stethoscope ear pieces in the ears with the tips facing forward. With firm, gentle pressure, place the stethoscope diaphragm directly over the brachial artery where the pulse was located. (Don’t allow stethoscope to touch clothing or cuff.)
7. Close the needle valve screw on the blood-pressure cuff. Pump the bulb slowly to inflate the cuff. While the cuff inflates, pulse sounds will be auscultated. Watching the gauge, the pulsations will no longer be auscultated at a certain point. Inflate the cuff until the gauge reads 30 mm Hg higher than the point where the pulse is no longer auscultated.
8. Loosen the needle valve screw, which releases the pressure and allows the needle to drop slowly.
9. The first distinct sound heard is the systolic blood pressure.
10. As pressure is released, the point at which the last sound disappears is the diastolic pressure.
11. Indicate the blood pressure in medical records.

Any unusual readings should be referred to a provider for further evaluation. The following chart displays results and categories.

For Adults Age 18 and Older			
Category	**Systolic (mm Hg)**		**Diastolic (mm Hg)**
Optimal	<120	and	<80

For Adults Age 18 and Older			
Category	Systolic (mm Hg)		Diastolic (mm Hg)
Normal	<130	and	<85
High-normal	130-139	or	85-89
Hypertension			
• Stage 1	140-159	or	90-99
• Stage 2	160-179	or	100-109
• Stage 3	≥180	or	≥110

Distant visual acuity

Distant visual acuity is tested to gain an understanding of the degree of vision loss. It does not indicate how well a person uses his or her vision but is a standard measurement. A Snellen eye chart is used to measure visual acuity.

208. Aeromedical services information management systems components

FHM is responsible for several components of the ASIMS. In this lesson, you will learn the four components, which include data management, occupational examination oversight, immunizations consultant, and deployment support. You will begin this lesson with an overview of the various responsibilities associated with managing ASIMS data.

Data management

The daily management of the ASIMS software system is the responsibility of FHM with the assistance of the local systems personnel, as required. ASIMS data provided by FHM should be reviewed and analyzed by the Population Health Working Group (PHWG) on a routine basis as part of their outcome management function. This group should work as a team to resolve issues with process completion, staff interactions, scheduling problems, and so forth, and to ensure line commanders are receiving adequate support.

Occupational health oversight

FHM will oversee the Occupational and Environmental Health Program (OEHP) by reviewing and analyzing the outcomes of the OHEs. They should work with PCM teams to ensure that they are aware of the occupational health requirements and keep them updated on any changes to the requirements made by the OEHWG. Additionally, identification of trends and tracking compliance rates will be performed by FHM. As FHM conducts quality control of the MTF PHA program, they should ensure that any high-risk occupational examinations are included.

Immunizations consultant

As consultants to the immunization section, FHM plays a critical role in protecting the health of all enrolled patients. In addition to making recommendations to the PHWG regarding which immunizations various segments of the population should receive, FHM also plays a part in keeping the PCM teams and line commanders informed. Periodic review of the immunizations database, with reports to the PCM teams and line commanders or unit health monitors, helps ensure the patient population is properly immunized.

Deployment support

FHM personnel may be tasked to participate in support of mass deployments. This critical support consists of reviewing medical records to identify personnel who may not be qualified to deploy. Most medical groups in the Air Force will at some point be tasked to help prepare deploying personnel. Managing pre- and postdeployment checklists, conducting medical intelligence briefings, and assisting PCM team members with medical records reviews are all areas involving PH technicians.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

203. Preventive health assessment cell roles

1. Who reviews AHLTA PHA notes and assesses if further evaluation is needed?

2. Where does the PHA Cell forward AF Form 469 and AF Form 422 records requiring further evaluation?

204. Individual medical readiness

1. List all IMR requirements.

2. When is the Influenza requirement valid?

3. List the five IMR medical lab tests and their frequency.

205. Health records review date

1. How often should a PHA be accomplished, and when would an individual be allowed to exceed this requirement?

2. List two special populations of active duty members that may have additional requirements?

206. Completing a preventive health assessment

1. List examples of why someone would remain “IMR Red” after a review.

2. What tabs of the DD Form 2766 must be updated when completing a PHA?

207. Patient interview

1. What are the two methods used to administer standing height?

2. What are the basic tools needed to complete a manual blood-pressure check?

208. Aeromedical services information management systems components

1. Who reviews and analyzes ASIMS data as a part of their management function?

2. How does FHM oversee the OEHP?

3. What critical role does FHM play as consultants to the immunization section?

Answers to Self-Test Questions

201

1. At all stages of the contingency (pre, during and post).
2. To reduce the risk.

202

1. DRHA #1 Pre-Deployment Health Assessment (DD Form 2795).
2. One duty day.
3. To gather information from the service member in order to assess the state of the individual's health before and after deployment outside the United States.

203

1. The Patient Care Team.
2. MSME.

204

1. Immunizations, dental readiness, individual medical equipment, deployment limiting conditions, and medical readiness lab test.
2. From 1 October (or slightly earlier if vaccine is available) until 30 June of each fiscal year.
3. G6PD (Once), DNA (Once), Blood Type/Rh factor (Once), Sickledex (Once), HIV (Every two years).

205

1. Annually. Instances that would allow an individual to exceed the 12-month requirement include deployment, unexpected TDY, emergency leave, and so forth.
2. Flying and Special Duty personnel.

206

1. An individual may have a deployment limiting profile, may be deferred for an immunization, or may not be in dental class one or two.
2. Allergies, Illness/Meds, Hospitalization, Counseling, and Family History.

207

1. Back to hard surface and height rod.
2. Manual Sphygmomanometer, Cuff, Gauge, Tubing, Bulb, Needle valve screw.

208

1. PHWG.
2. By reviewing and analyzing the outcomes of the OHEs.
3. Protecting the health of all enrolled patients.

Complete the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to the Field-Scoring Answer Sheet.

Do not return your answer sheet to the Air Force Career Development Academy (AFCDA).

1. (201) During which stages of the contingency are health threat briefings provided?
   a. Pre, during and post.
   b. Predeployment only.
   c. Postdeployment only.
   d. When member in-processes to the base.

2. (201) When conducting health threat assessments, what Environmental Factors should be considered?
   a. Cold, Climate and local flora.
   b. Noise, topography and altitude.
   c. Climate, topography, and industrial health hazards.
   d. Hazardous and venomous arthropods, humidity and heat.

3. (201) What is the next step once the Health Risk Assessment has been completed?
   a. Educate the member.
   b. Out-process the member for deployment.
   c. Evaluate the member's knowledge of risks.
   d. Coordinate with the member's Unit Health Monitor.

4. (202) How many person-to-person mental health assessments are mandated for service members in connection with a contingency operation?
   a. 1.
   b. 3.
   c. 4.
   d. 5.

5. (202) Which Deployment Related Health Assessment (DRHA) form must be completed between 90 days and 180 days after return from deployment?
   a. DRHA #1.
   b. DRHA #2
   c. DRHA #3.
   d. DRHA #4.

6. (202) Which DRHA Form(s) are accomplished with the annual PHA?
   a. DRHA #2.
   b. DRHA #3.
   c. DRHA #2 and #4.
   d. DRHA #4 and #5.

7. (203) What does the Preventive health assessment (PHA) Cell review daily in the Aeromedical Service Information Management System (ASIMS) for critical and priority findings?
   a. Individual medical readiness (IMR) Report.
   b. Clinical and Preventive Service.
   c. Multiple Patient Report.
   d. Daily Profile Report.

8. (204) The human immunodeficiency virus (HIV) test is required every
   a. year.
   b. 2 years.
   c. 3 years.
   d. 5 years.

9. (205) At a *minimum*, how often must the preventive health assessment (PHA) be accomplished?
   a. Monthly.
   b. Quarterly.
   c. Annually.
   d. Every two years.

10. (206) Who is not one of the four main partners involved in the preventive health assessment (PHA) process?
   a. PHA Cell.
   b. Optometrist.
   c. Patient Care Team.
   d. Air Force member.

11. (206) As a minimum, how often must the medical records of active duty personnel be reviewed?
   a. Monthly.
   b. Quarterly.
   c. Annually.
   d. Semiannually.

12. (207) Which is not a Clinical Administration screening requirement?
   a. Pulse.
   b. Height.
   c. Weight.
   d. Blood Pressure.

13. (207) Height is recorded to the nearest
   a. inch.
   b. meter.
   c. half inch.
   d. quarter inch.

14. (207) What is considered hypertension?
   a. 140–90.
   b. 130–85.
   c. 120–80.
   d. 125–75.

15. (208) What *is not* considered a component of Aeromedical Services Information Management System (ASIMS)?
   a. Data management.
   b. Readiness postures.
   c. Deployment support.
   d. Immunization consult.

16. (208) Force Health Management (FHM) provides critical support for mass deployments by identifying
    a. shop rosters.
    b. deployment trends.
    c. possible deployment outcomes.
    d. personnel who are not qualified to deploy.

Student Notes

Unit 2. Hazards and Control Measures

THE WORKSHOP can be a hazardous place for employees to perform their jobs. With all the technological advances in today's society, you would think the work environment would always be safe. However, with these advances in technology come new hazards. Once a hazard is identified, it must be controlled or the worker must be protected. If the Air Force requires workers to perform a mission, by law, it must provide a safe and healthy environment for the worker. This is where you, the PH journeyman, come into the picture. PH supports the Air Force OEHP. This unit discusses occupational hazards commonly found in the Air Force and lists workplaces that contain these hazards as well as control measures to prevent exposure.

2–1. Industrial Hazards

You must be knowledgeable about industrial hazards in a variety of fields before you can educate workers about the hazards they work with in their own shops. There are many hazards in the industrial environment and this section will explain some of them. It also discusses the toxicity of certain hazards to include the factors affecting the toxicity of a substance. You will read about the operational hazards found within specific shops on a base. Although this information is essential, you have to begin with the basic types of hazards that are included in an industrial environment.

209. Types of hazards

Some of the types of hazards that you will encounter are biological, chemical, and physical hazards such as noise, radiation, thermal extremes, and vibration.

Biological

Biological hazards include molds, bacteria, viruses, yeasts, parasites, and insects. An exposure to biological hazards can result from unhealthy working conditions or performing a job where biological hazards exist. Health care workers and those in related occupations are at risk of exposure to bloodborne pathogens, such as the HIV and hepatitis B (HBV) viruses, and other potentially infectious materials. Workers may carry bacteria or viruses on their hands or clothes to a break area and could contaminate food items, making someone ill. Another example of a biological hazard might be a security forces individual bitten by a rabid animal on base while trying to catch the stray animal.

Chemical

Chemicals in the industrial setting pose a physiological hazard to workers primarily through inhalation or skin contact. Examples of chemical hazards include acids, solvents, lubricating oils, and carbons. One of the major problems associated with chemical hazards is contact dermatitis or skin problems.

Physical

The effects of physical hazards on the worker may be twofold. Certain physical hazards, such as thermal extremes, may reduce the effectiveness of the worker's immune system. This exposure to

temperature extremes might also increase the effects of a chemical exposure. Pressure and vibration place a repetitive strain on joints and body parts and may cause inflammation and/or trauma. Also, the worker may receive traumatic injury as a result of exposure to a physical hazard. Noise, vibration, ionizing and nonionizing radiation, and thermal extremes are examples of physical hazards.

Noise

Workers exposed to high levels of noise can be affected in many ways. The worker exposed to high noise levels for a short time can exhibit a temporary hearing loss or threshold shift. This loss of hearing can be recovered shortly after by removing the noise source or by removing the worker from the source. Noise hazards are discussed in more detail in unit 5.

Radiation

Ionizing and nonionizing radiation are increasingly prevalent in the industrial work environment. Ionizing radiation is electromagnetic radiation with energy sufficient to cause the loss of an electron from the matter with which it interacts. Alpha, beta, and neutron particles, gamma radiation, and x-rays are examples of ionizing radiation. Ionizing radiation can cause skin burns, deep tissue burns, and chronic genetic defects of affected individuals and their offspring.

Nonionizing radiation is electromagnetic radiation that does *not* have the energy to cause the loss of an electron. Examples of nonionizing radiation are ultraviolet, infrared, laser, and microwaves. Nonionizing radiation can cause damage to the eyes and reproductive system and produce minor burns to the skin.

Thermal extremes

Workers exposed to extremes of hot and cold temperatures, as well as rapid changes in temperatures, can suffer from thermal stress. Thermal stress may be prevented by allowing workers to adjust to temperature extremes over 1–2 weeks for acclimatization. Acclimatized individuals are more effective at accomplishing their tasks and less prone to thermal stress. One important factor is the amount of physical activity required while subjected to the thermal stress. Heavy physical activity, performed in extremely high temperatures, can cause thermal injuries. As activity increases, the body's ability to tolerate high temperature decreases.

Vibration/pressure

Initial research indicates that whole-body vibration increases respiration and the physiological activity of the heart. The results have also shown that there is an inhibition of tendon reflexes as a result of vibration. Additionally, there seems to be reduced ability of the worker to perform complex tasks, and there are indications of potential damage to other systems, such as the reproductive. Prolonged vibration of the forearm and hand can damage the tendons and nerves causing Raynaud's phenomenon or *dead hand*.

Bioenvironmental Engineering (BE) usually recommends that the process is changed or substituted, if possible, to protect the worker. You need to know that vibration is a hazard and, in some circumstances, not much can be done about it.

210. Toxicology

The human body exists in a delicate balance, constantly assaulted with foreign substances and physical phenomena. The work environment contains many of these substances in highly concentrated forms. Some present a potential danger while others are harmless. There are still a large number of substances for which the danger to humans are not known.

You have already studied some of the major defense mechanisms that protect the human system. These defense mechanisms are useful when the concentration of potentially hazardous materials is relatively low. However, in the industrial environment where high concentrations may exist, these mechanisms may fail to provide adequate protection. Thus, a hazard exists for the worker.

Toxicity factors

Toxicity is defined as the capacity of a substance to produce injury or illness. There are certain factors that are considered when determining the toxicity of a particular substance. The National Institute for Occupational Safety and Health (NIOSH) uses these factors when determining the toxic levels of specific industrial hazards. These factors are divided into three groups which include factors affecting the agent, the individual, and the environment. None of these factors can be considered by themselves to determine the toxicity of a substance; they must be used together.

Factors affecting the agent

Factors affecting the agent's toxicity include the type of substance, formulation of the substance, and its volume or concentration. Examples are provided in the following table:

Factors Affecting the Agent's Toxicity	
Type of substance	The type of substance is a key factor in determining the toxicity of a material. Some materials are inherently more toxic than others, while others are not toxic at all or have not been proven to be toxic.
Formulation	The formulation of a substance is also a factor in determining the toxicity of a substance. Chemical composition such as pH, physical characteristics such as particle size, and the presence of impurities or contaminants are part of the formulation factor. Ingredients such as preservatives or lubricants can be added to the formulation, or the pH can be adjusted to help lower the toxicity of the agent. Other ingredients, including suspending agents, surfactants, binding agents, coating agents, diluents, and solvents, can be added to adjust the toxicity of a particular substance. Some substances are contaminated with impurities that increase the toxicity.
Volume or concentration	The volume of a toxic agent, as well as its concentration, are two closely related and important factors affecting its toxicity. The greater the concentration of a toxic substance, the greater the chances of it causing harm. The greater the volume of a toxic substance, the greater the chance for exposure. Volume and concentration are also closely related to the factors affecting the individual.

Factors affecting the individual

Factors affecting the individual include the route of entry, frequency of exposure, duration of the exposure, and individual differences, such as age and weight.

Route of entry

The major routes of entry include the gastrointestinal tract (ingestion), the lungs (inhalation), and the skin (absorption). The most hazardous route of entry is inhalation, while ingestion and absorption are considered less hazardous.

Inhalation through the respiratory tract is important because the human lung has an enormous gas-tissue interface, or surface area, where oxygen and carbon dioxide are exchanged. The continuous blood flow, along with the constant oxygen and carbon dioxide exchange, enhances the rapid rate of absorption of many substances from the air by the alveoli into the blood stream.

The amount of respirable toxic substances absorbed into the blood stream is difficult to determine. The respiratory rate and depth of respirations vary among individuals. Some individuals are sedentary and others are more physically active; the latter increase the rate and depth of respirations. In addition, the concentrations of pollutants may vary at different locations in the work environment. Concentrations can increase and peak based upon production cycles in the work environment.

The respiratory system has protective mechanisms that provide the first line of defense against toxic materials that are inspired. Soluble gases are absorbed in the moist mucous membrane of the upper respiratory tract, thus limiting their effect on the lungs.

Particulate matter is filtered out of the respiratory system at various stages. The nasal structure and turbulent air flow cause the settling of large particles that are then captured by the mucous membranes of the nose. Cilia, or small hair-like filaments in the nose and upper respiratory tract, serve to help the mucous filter particulate matter from inspired air. The bronchial branches also filter out large particles. Usually, only particles less than three micrometers reach the alveoli of the lungs. Once these particles reach the alveoli, phagocytic cells or macrophages entrap the particles and slow their action in the body. Some particles are also filtered out of the body through the lymphatic system.

Absorption through skin contact is the most common route of exposure in the industrial environment. When a substance comes into contact with the skin, the following four actions are possible:

1. Skin and its associated film of lipids acts as an effective barrier against penetration, injury, or other forms of disturbance.
2. The substance can react with the skin's surface and cause primary irritation or dermatitis.
3. The substance can penetrate the skin and conjugate with tissue protein, resulting in skin sensitization.
4. The substance can penetrate the skin, enter the blood stream, and act as a potential systemic poison.

The skin has certain protective mechanisms that act to inhibit exposure to the toxic materials. Three of the skin's protective mechanisms include the following:

- Its multiple layers provide a less permeable surface.
- Sweat glands produce perspiration that dilutes the toxic substance when it comes into contact with the skin.
- Sebaceous glands produce the lipid film on the skin's surface, which provides a protective layer that helps prevent penetration.

A breakdown of any of these protective mechanisms causes a more serious exposure. Thus, if the oily film produced by the sebaceous glands is removed by soaps, or if a break in the skin occurs through a wound such as an abrasion or laceration, the danger of exposure to the worker increases. Even with all of its protective mechanisms, some toxic materials are readily absorbed into the skin. Serious and even fatal poisonings can occur from brief skin exposures to highly toxic substances, such as parathion and related organophosphates, the organometallics, the alkyl leads and tins, aniline, phenol, and hydrocyanic acid.

Health hazards from ingestion are less significant in the industrial environment and warrant only limited discussion. First, the number of substances that can be ingested are fewer since it is virtually impossible to ingest a vapor or gas. Second, the frequency and degree of contact are very limited. Oral contact with substances on hands, in food and drink, and on cigarettes is less frequent, of shorter duration, and lesser in amount during the work shift than exposure by other routes of entry. However, it is worth noting that portions of inhaled particles that lodge in upper parts of the respiratory tract during inhalation are swept up the tract by ciliary action and are subsequently swallowed.

Third, and most important, ingestion is a less hazardous route of entry than inhalation. Reasons for this include the following:

1. Poor absorption from the digestive tract into the bloodstream.
2. Exposure to acid as the substance passes through the stomach.
3. Exposure to an alkaline medium in the pancreatic juice as the substance passes through the small intestine.

The acid and alkaline fluids may reduce toxic organic substances, through hydrolysis, to less toxic substances. Moreover, the pancreatic enzymes convert or metabolize some substances to less toxic subunits well before the original substance is absorbed.

There are exceptions to the preceding statements concerning reduced toxicity through ingestion. Exceptions are those highly toxic elements with slow, cumulative action such as arsenic, cadmium, lead, and mercury. The potential increased body burden of these elements through ingestion has led to prohibiting food, drink, and tobacco products in areas where such substances are used.

Number of exposures

The number of exposures must be considered along with the other factors to determine the toxicity of a substance. The toxic effects can be either acute (rapid onset) or chronic (slow onset) depending upon the number of exposures to the substance. Generally, an increase in the number of exposures increases the toxic effects of a substance.

Duration of exposure

The period of time an individual is exposed to hazardous agents can lead to a varying degree of effects. A short exposure to a high concentration might cause more damage than a long-term exposure to a low concentration. However, a short exposure to a certain concentration may produce less damage than a long exposure to the same concentration. This factor is not as easily controlled because the job may require a worker to be exposed for a long period of time.

Individual differences

The individual worker is a major factor in determining the toxic effects of a substance since different agents affect people in different ways. Workers in poor health are more susceptible to toxic agents than workers in good health; consequently, the age and weight of individuals need to be taken into account in determining their health status.

1. Age has an impact on how a toxic substance affects a specific worker because older employees do not handle toxic exposures as well as younger employees. However, a healthy, older worker may be able to handle toxic agents better than a younger, unhealthy worker.
2. Heavier individuals with a higher percent of body fat may absorb and store more toxic substances than thinner employees.
3. Apart from age and weight, other influencing factors include general absorption, body storage, metabolism, and the ability to eliminate toxic substances. These factors are being studied to determine how strong their influences are on the toxic properties of substances.

Factors affecting the environment

There are two environmental factors that can affect human responses to toxic materials. These, in turn, influence the toxicity of a substance. The external environmental factors include temperature and environmental chemicals.

Temperature

Extreme cold environmental temperatures generally decrease the biological response or sometimes depress the immune system to an agent; however, a cold environmental temperature that is considered normal prolongs the response. For example, sarin increases in toxicity as the temperature decreases. Other substances such as organophosphate pesticides increase in toxicity as the temperature increases.

Environmental chemicals

Chemicals in the environment affect the body's response but do not directly affect toxic agents. There may be a synergistic effect when a worker is exposed to two chemicals. This means the effects of two chemicals together is greater than the sum of the individual toxic effects of each chemical separately. The same might be true with a toxic agent in the presence of radiation.

Toxicity of specific materials

Many personnel on base use toxic materials daily. One such workplace is the pest management/entomology shop. Entomology personnel use pesticides to control many different pests. If these pesticides are incorrectly used or if personnel are exposed to unsafe levels of these substances, serious illness may result.

Pesticide toxicity

The toxicity of a pesticide is largely dependent on its chemical makeup. From your standpoint, one of the most important aspects of insect and rodent control would be the effects the various chemicals can have on the human body. Improper handling of pesticides during mixing and application can result in serious injury, even death. Most chemical pesticides are extremely toxic if ingested and vary in their effects when inhaled or absorbed through the skin. Some also cause dermatitis from repeated skin exposures. The Air Force is currently limiting the use of hazardous pesticides; however, there may be several different types of pesticides used on a base.

Inorganic pesticides

Most inorganic pesticides are formulated from heavy metals and are extremely toxic to warm-blooded animals. Because of their toxicity, these pesticides are rarely used.

Synthetic organic pesticides

This group includes chlorinated hydrocarbons, organophosphates, and the carbamates. Some are quite hazardous as concentrates, and a single exposure is capable of causing illness or death. There is a wide range of toxicity and hazards, and even repeated exposure to diluted solutions can be hazardous. Applicators must use protective measures when handling the agents. Pesticides in this group usually affect the nervous system, resulting in spasticity (the inability to coordinate muscular activity). Severe cases often progress to convulsions, respiratory failure, and ultimately death.

Organophosphates display a wide range of toxic effects in mammals. Malathion is slightly toxic, diazinon is moderately toxic, and parathion is highly toxic. This category of pesticide inhibits cholinesterase, an enzyme essential to the proper functioning of the body’s nervous system. Symptoms of poisoning include gastrointestinal discomfort, salivation, profuse sweating, and difficulty in breathing. The immediate cause of death is usually respiratory failure, as is the case with poisoning due to chlorinated hydrocarbons.

The carbamates are a relatively new group of pesticides. This group of compounds also inhibits cholinesterase and has a wide range of toxicity and hazards.

Solvents

Liquid pesticides are rarely applied in undiluted form. Water is sometimes used as a solvent, but kerosene and fuel oil are also widely used. Kerosene is dangerous to humans if not properly handled. Ingestion often causes gagging and coughing, and aspiration into the lungs may be followed by bronchopneumonia. Using kerosene sprays in enclosed, poorly ventilated areas may cause nausea, dizziness, coma, and other symptoms of poisoning. Kerosene dermatitis can also occur from continuous exposure to the skin.

Rodenticides

Materials in this group include inorganic and organic chemicals. The uses and modes of action are sufficient to justify consideration of rodenticides as a separate group. Inorganic and organic chemical rodenticides have been the cause of most human poisonings associated with rodenticides.

Anticoagulants

Another group of chemicals used widely in rodent-control programs is the anticoagulants. One of the first anticoagulants used was Warfarin. This has been supplemented in the military supply system by other anticoagulants in water-soluble formulations. In addition to causing capillary damage,

anticoagulants interfere with formation of prothrombin, which is necessary for blood clotting. The result is extensive internal hemorrhages.

Anticoagulants have the advantage of low acute toxicity. Consequently, in the concentrations recommended, repeated ingestion over a period of several days is required to produce lethal poisoning in mammals, including humans. However, accidental or deliberate ingestion of these anticoagulants, particularly the concentrates, may lead to death.

Fumigants

These chemicals are used for specialized problems in rodent control and for insect control in selected situations. One type of fumigant is hydrogen cyanide (HCN). This chemical and any of the cyanides that produce HCN gas are extremely toxic to humans. They cause death very quickly by interfering with cellular respiration. The skin readily absorbs the gas; therefore, a gas mask is not enough to protect an individual at high concentrations for prolonged periods of time. Fumigation in closed spaces requires elaborate precautions in addition to the gas mask. Those applying HCN must know how to escape quickly, even in the dark.

Phosphine is another fumigant that is "state of the art" for food product fumigation because there are no toxic residues. It is commonly used today as a fumigant for stored grains throughout the United States and the world. An odor cannot be relied upon as a warning of dangerous concentrations; thus, hazardous quantities can be inhaled before an odor is detected. The exposed individual may not be aware of an exposure because of its delayed toxic action in humans. Onset of symptoms, including shortness of breath, thirst, nausea, vomiting, stomach pain, diarrhea, back pain, fainting, a feeling of coldness, and possibly death, may occur as long as 48 hours after an exposure. At high enough concentrations, death can occur in a matter of minutes rather than hours. Phosphine must be applied only by specially trained and certified pest controllers who have special application equipment.

Physiological classification of airborne toxic materials

Airborne toxic materials produce many physiological responses in the body. The following discussion presents a system for classifying toxic materials in terms of the physiological response obtained. This system, though generally accepted, is somewhat arbitrary since the type of physiological response depends on the dose/concentration of the toxic material. Each toxic classification affects a specific organ or organ systems within the body; these organs are known as *target organs*. The following table discusses some of the common airborne toxic materials.

Airborne Toxic Material	Physiological Response
Irritants	Cause inflammation of the mucous membrane of the respiratory tract. Toxic materials can be either primary or secondary irritants. • Primary irritants cause inflammation, conjunctivitis, or pulmonary edema. • Secondary irritants result in the same reactions, but irritation is secondary or minor compared to other effects, such as hepatotoxicity or asphyxiation. Secondary irritants include hydrogen sulfide and many of the aromatic hydrocarbons.
	Carbon monoxide and cyanides. Carbon monoxide attaches itself to the hemoglobin of the red blood cell, thus disabling the transport of oxygen.
	Can cause respiratory paralysis and affect the central nervous system (CNS), causing excitement, dizziness, and even coma and death with either higher concentrations or with longer exposure periods to a moderate concentration.

Airborne Toxic Material	Physiological Response
Asphyxiants	Deprive cells of the body of oxygen and are of two types—simple and chemical. • Simple asphyxiants are inert elements that, in sufficient quantity, exclude oxygen from the body. Examples of simple asphyxiants include nitrogen, carbon dioxide, and helium. • Chemical asphyxiants act in the body by limiting the use or availability of adequate oxygen to the cells.
Anesthetics	Act by depressing the CNS. The most common example of an anesthetic is alcohol. Other anesthetics include acetylene hydrocarbons, ethyl ether, paraffin hydrocarbons, and aliphatic ketones.
Hepatotoxic agents	Damage the normal functioning of the liver. Examples of hepatotoxic agents include carbon tetrachloride, tetrachloroethane, and nitrosamines.
Nephrotoxic agents	Result in damage to the functioning of the kidney. Examples of nephrotoxic agents include some halogenated hydrocarbons and uranium.
Neurotoxic agents	Produce damage to the CNS. Symptoms include anxiety; trembling; spasms, leading to violent convulsions; unconsciousness; and possibly death. Examples of neurotoxic agents include organometallic compounds, such as methyl mercury and tetraethyl lead; and solvents, such as carbon disulfide.
Blood-damaging agents	Break down the red blood cells or chemically induce cyanosis by converting hemoglobin to methemoglobin in the blood. Benzene, arsine, and aniline are examples of such agents.
Lung-damaging agents	Produce their effect by scarring the pulmonary tissue. This effect is beyond the irritant action of certain acids. Examples would be silica, asbestos, coal dust, and organic dusts. Symptoms can include a cough and shortness of breath.

Physical classification of toxic materials

The four physical classes of toxic materials are gases/vapors, particulate matter, liquids, and solids. The latter two, liquids and solids, though a concern of BE, do not pose nearly the problems posed by gases/vapors and particulate matter.

Gases and vapors

A gas is defined as a material different from a solid or liquid with low density and viscosity. It has great expansion and contraction abilities, depending upon the temperature and pressure, and will distribute evenly throughout any container. A gas exists at 25°C and 760 millimeters (mm) hectogram (HG); that is standard temperature and pressure. On the other hand, a vapor is the gaseous stage of a material that is a liquid or solid in its natural state at standard temperature and pressure.

Particulate matter

Particulate matter is generally in aerosol form, such as a dispersion of solid or liquid particles in a gas. The five major types of aerosols include smoke, fog, mists, fumes, and dusts.

1. Smoke—Consists of particles that result from incomplete combustion of materials. Wood or coal can burn without flame-causing smoke.
2. Fog—A visible aerosol consisting of condensed liquids. A cloud-like formation of water vapor that lies close to the ground is a fog.
3. Mist—A dispersion of liquid particles, many of which are individually visible, such as spraying perfume from an atomizer.

4. Fumes—Solid particles generated by condensation from a gaseous state, generally as a result of the volatilization of molten metal. Welding metal causes fumes that resemble a smoke.
5. Dust—Consists of particles that result from a mechanical action on a solid. Dust consists of fine, dry, solid particles of matter as in a cloud of dust.

The physical classification of toxic materials is important, both in the methods used to evaluate the level of contaminants in the atmosphere and the control methods available to remove the contaminants. The removal of gases and vapors presents a different problem than removing particulate matter from the air.

211. Potential operational hazards

There are many AF operations and jobs hazardous to humans. This section covers some of the most common hazards found in workplaces. It is not all-encompassing, nor is it designed to make you an expert in occupational health; however, it is intended to familiarize you with the more common operational hazards.

Halogenated hydrocarbons

The halogenated hydrocarbons are among the most widely used industrial chemicals. These compounds, containing chlorine, bromine, and fluorine or combinations of the three, are used as cleaning solvents. This group of chemicals offers a wide variety of solvents that are well suited to any particular process requirement. They are also used as refrigerants and fumigants. Other halogenated hydrocarbons include fluorocarbons, methyl chloride, methylene chloride, tetrachloroethane, trichloroethane, and trichloroethylene.

The toxicologic effects of halogenated hydrocarbons vary from one compound to another, but generally most cause CNS depression, such as light-headedness, dizziness, unconsciousness, and possibly death. Another common problem is skin defatting, which leads to dermatitis. Inhalation of high concentrations of vapor may cause liver or kidney damage. Some compounds have no effect; others affect only one organ, and still others may affect both liver and kidney.

Aliphatic hydrocarbons

Aliphatic hydrocarbons are derived from petroleum by cracking, distillation, or fractionation of crude oil. These products are used principally as fuels, refrigerants, propellants, dry-cleaning agents, lubricants, solvents, and chemical intermediates. Some aliphatic hydrocarbons used in the Air Force include acetylene, ethane, gasoline, kerosene in jet fuel, naptha, and mineral spirits known as stoddard solvent. Aliphatic hydrocarbons are asphyxiants and CNS depressants. Some cause displacement of oxygen, and others cause unconsciousness. Some can cause fires and explosions. Another common effect is irritation of the skin and mucous membranes of the upper respiratory tract. Repeated and prolonged skin contact may result in dermatitis, due to skin defatting. Direct contact of liquid hydrocarbons with lung tissue, through aspiration, results in chemical pneumonitis or inflammation of the lungs, pulmonary edema, and hemorrhage.

Aromatic hydrocarbons

Aromatic hydrocarbons cause CNS depression, and depending on the compound, hepatic, renal, or blood-forming cell problems that cause anemia and leukopenia. Vapors are absorbed through the lungs, and liquid is absorbed through the skin. Repeated and prolonged skin contact causes skin defatting, which leads to dermatitis. Some of the aromatic hydrocarbons used in the Air Force include benzene (a jet fuel contaminant), styrene, toluene, and xylene.

Phenols and phenolic compounds

Phenolic compounds are widely distributed in industry and used in pharmaceuticals because of their disinfectant properties. Examples of phenols and phenolic compounds used in the Air Force are creosote, hydroquinone, and phenols. These materials generally enter the body through the respiratory

tract and the skin. The toxicity varies, but some are extremely irritating to the skin, mucous membranes of the upper respiratory tract, and eyes. Some are corrosive to all tissues. Creosote, a complex mixture of phenolic and aromatic compounds, can cause skin cancer. Systemic effects usually involve the CNS and cardiovascular system; in addition, there may be renal and hepatic damage.

Acids and alkalies

This group covers a wide range of substances used in industry. These compounds have a primary irritant effect, the degree of which is determined by the specific substance. In addition to burns, bronchopneumonia, pulmonary edema or fluid in the lungs, and kidney damage have accompanied exposures to these compounds. Examples of acids include acetic and sulfuric acids. Potassium hydroxide is an alkali-electrolyte for nickel cadmium batteries, and sodium hydroxide is an alkali used in paint strippers and aircraft-cleaning compounds, both of which are in common use on AF installations.

Organophosphates

The organophosphate pesticides are characterized and grouped by the similarity of their mechanism of toxic action to each other. However, they differ widely in inherent toxicity and, to some extent, in the rate of absorption and excretion.

Organophosphates act as irreversible inhibitors of the enzyme cholinesterase, allowing the accumulation of acetylcholine at the nerve endings. This can cause headache symptoms, fatigue, dizziness, blurred vision, excessive sweating, nausea and vomiting, stomach cramps, diarrhea, and salivation. Organophosphates are rapidly absorbed into the body by ingestion, inhalation, through the intact skin, the eye, and even more efficiently through cuts, abrasions, and areas with dermatitis. Additionally, workers can continue to be exposed long after they apply pesticides, as a result of contaminated hair, shoes, and clothing.

Ketones

Ketones are used in many ways in industrial operations. They are used most often as solvents and are found in other items, such as varnishes, coatings, and adhesives. Ketone compounds commonly used in the Air Force include acetone, methyl ethyl ketone, and methyl isobutyl ketone.

Industrial exposure to ketones is usually through inhalation of vapors or contact with liquids. Prolonged exposure is usually precluded by intense eye and respiratory tract irritation.

There are many other industrial hazards besides the chemicals listed here. Additionally, there are other forms of hazards in many industrial shops located on base. The following lesson will focus on these workplaces.

212. Hazardous workplaces

Your job requires you to visit, talk with, and educate workers in many shops on base. These range from metal cleaning and degreasing operations and fuels handling to welding and corrosion control shops. In addition, you will also have a responsibility toward the MTF because there are many hazards found there. In this lesson we'll look at some of the important hazards you'll be dealing with as you visit the many workplaces found on a typical AF base.

Metal degreasing

The AF uses thousands of gallons of solvent each year. The three basic types of metal degreasing operations include the following:

- Cleaning small pieces of equipment or surfaces with a rag soaked with a solvent.
- Spraying solvents on a large piece of equipment, such as those found on aircrafts.
- Dipping pieces of equipment into a tank filled with solvent.

The hazards produced by these operations depend on the type of chemical being used. Health hazards associated with these operations include dermatitis, mucous membrane irritation, CNS depression, liver and kidney damage, and eye irritation.

Fuel handling and tank cleaning

In these operations, personnel accomplish hazardous tasks involving refueling and defueling (unloading fuel from an aircraft), fuel cell repair/cleaning, and tank cleaning. The related hazards and health effects are discussed below as they apply to each operation.

Refueling and defueling

The most common hazards associated with this operation include splashing of fuel that can cause fire and explosion and exposure to tetraethyl lead, which in severe intoxications causes symptoms of restlessness, violent behavior, seizures, and death. Other health effects associated with this operation include hearing loss, dermatitis, and burns.

Fuel cell repairing/cleaning and tank cleaning

The hazards associated with these operations include fire and explosion due to the vapors that might be present. The health effects associated with this operation include anoxia, dermatitis, and burns.

Welding

The welding shop is a part of fabricating much of the equipment used by the Air Force. There are several types of welding, such as oxyacetylene, electric arc, heli-arc, plasma torch, and metalizer. Each type produces a slightly different hazard and health effect. Some of the hazards associated with welding are the production of metal fumes; sparks and burns, which may cause eye and skin irritation; fire and explosive hazards associated with the gases used; and exposure to ultraviolet, laser, and infrared radiation, causing burns. Additionally, laser welding can damage the rods and the cones in the eyes.

Battery shops

The battery shop operation involves checking discharge rates and repairing batteries. The two basic types of batteries used in AF workplaces are acid base and caustic base. Acid-base batteries use sulfuric acid as the electrolyte, and caustic-base batteries use potassium hydroxide. Explosion is the primary hazard when using acid-base batteries. The acid mist released when these batteries are charging may also be a hazard. For example, think of the effect of acid on the skin and imagine the effect of breathing in an acid mist. Chemical burns can be a hazard, as well as electrical shock produced when the batteries are charging.

Corrosion control

Paint pigments, solvent carriers, isocyanates, and polyurethane paints are the primary toxic materials found in corrosion control shops. Inhalation of these substances can cause CNS depression associated with solvents, liver and kidney damage, and asthmatic reaction due to isocyanate sensitization. Also, these substances are irritating to the eyes and respiratory tract and can cause dermatitis.

Structural repair

Structural repair includes electroplating operations, fiberglass work, machine shops, and sheet metal shops. In fiberglass shops, resins, adhesives, vapors from curing fiberglass, and asbestos cause inhalation hazards. Dust results from sanding fiberglass, as well as sanding the other materials. Contact dermatitis can result from the hazards when working with these materials. During electroplating operations, the hazard is primarily inhalation of metal fumes. Machine and sheet metal operations produce hazardous noise. In addition, lubricating oils can cause dermatitis, while grinding operations can cause metal chips to fly off and injure a worker’s eye.

Aerospace ground equipment

Powered aerospace ground equipment (AGE) consists of an internal combustion engine used to provide heat, supplemental lighting, and to simulate aircraft power on the flight line in many maintenance areas. The primary hazards associated with this equipment are noise, exhaust emissions, the production of carbons, and use of solvents that may cause dermatitis.

Nondestructive inspection

The nondestructive inspection (NDI) shop inspects aircraft and metal parts using several processes. For example, small parts are cleaned, often with a solvent, then dipped into a series of tanks containing a penetrant dye, emulsifier, and a water rinse before the inspection process. Parts are heated and machine dried before inspecting them using an ultraviolet (UV) light source to detect cracks or hair-line fractures that cannot be seen otherwise.

In some cases large parts or an entire aircraft can be examined using industrial x-ray exposures. The primary hazards include ionizing radiation, nonionizing radiation, and solvents. In addition, workers also are exposed to film developer chemicals just like medical x-ray technicians in MTFs.

Medical treatment facilities

MTFs have many potential health hazards. The job-related injuries and illnesses are higher for health care workers than other workers as reported by NIOSH. In this publication, the major sections are listed along with the associated hazards. The following table describes some of the hazardous areas you'll find in MTFs:

Hazardous Areas in Medical Facilities	
Area	**Hazards to Which Workers are Exposed**
Laboratory	Acids, xylene, formaldehyde, bloodborne pathogens and other infectious materials. Other hazards include benzene, ethylene oxide, solvents, flammable and explosive agents, cryogenic hazards, and body fluids. Some of the chemicals and biological hazards they work with can cause cancer, fetal malformations, and biological mutations.
Dental and dental laboratories	Acids, ammonia, mercury, metal powder, ionizing radiation, and x-ray film developer.
Medical maintenance	Degreasing solvents, mercury, acids, ionizing radiation, epoxy and resins, noise and soldering hazards.
Medical x-ray	Exposure to ionizing radiation as well as film developer chemicals.
Surgical suite	Anesthetic waste gases, ionizing radiation, disinfectants, antiseptics, methyl methacrylate, compressed gases, ethylene oxide, formaldehyde, glutaraldehyde, sharp instruments, bloodborne pathogens, and other infectious materials.
MTF, civil engineering, or plant management	Electrical hazards, noise, welding fumes, asbestos, flammable liquids, solvents, mercury, pesticides, cleaners, ammonia, carbon monoxide, ethylene oxide, Freon, paints and adhesives, water treatment chemicals, and thermal stress.
Housekeeping	Soaps, cleaners, solvents, disinfectants, sharp instruments, electrical hazards, bloodborne pathogens, and other infectious materials.
Central supply	Ethylene oxide, infectious materials, soaps, steam, flammable gases, noise, sharp instruments, asbestos insulation, and mercury.
Patient treatment areas	Bloodborne pathogens and other infectious diseases, sharp instruments, chemotherapeutic agents, radiation, and electrical hazards.
Pharmacy	Chemotherapeutic agents.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

209. Types of hazards

1. What are the three main types of hazards found in a hazardous work environment?

2. What is ionizing radiation?

3. What are some examples of ionizing radiation?

4. What are some examples of nonionizing radiation?

210. Toxicology

1. What are the three groups of factors for determining the toxic levels of specific industrial hazards?

2. What factors affect an agent's toxicity?

3. What are the three major routes of entry for hazardous substances?

4. What is the most common route of exposure in the industrial environment?

5. Give some examples of individual differences that would affect the toxic reaction of a substance on a worker.

6. What two environmental factors can affect human responses to toxic materials?

7. What are the symptoms of organophosphate poisoning?

8. How does HCN cause death?

9. What is a target organ?

10. What is an asphyxiant?

11. What are the four physical classes of toxic materials?

12. What are the five major types of aerosols?

211. Potential operational hazards

1. To which specific group of hazards do chlorine, bromine, and fluorine belong?

2. List at least five uses for aliphatic hydrocarbons.

3. What types of bodily damage may creosote possibly cause?

4. What are some uses for potassium hydroxide and sodium hydroxide commonly found on AF bases?

212. Hazardous workplaces

1. Oxyacetylene, electric arc, heli-arc, plasma torch, and metalizer are forms of what operation that causes hazards in the workplace?

2. What are the two basic types of batteries used in AF workplaces?

3. What is the *primary* hazard during electroplating operations?

4. What are the *primary* hazards associated with AGE?

5. What are the exposure hazards of a medical maintenance worker?

2–2. Control Measures

The role of the Air Force Occupational Safety and Health (AFOSH) program is to prevent work-related illnesses, injuries, and premature death in AF personnel. When you visit a workplace, the supervisor may ask you questions about controlling hazards or protecting workers. Thus, you need to know about the proper control measures for hazards in the workplace before you can answer the questions. In this section we'll discuss the control measures that make up a large part of your job.

213. Control measures

In the Air Force, we use many measures to control hazardous situations:

- Engineering controls, including substitution, isolation, and ventilation.
- Administrative controls.
- PPE.

In this lesson we'll discuss these measures and also look at some of the problems involved when people are required to wear protective equipment.

Engineering controls

The purpose of engineering controls is to control the hazard at the source. The three types of engineering controls just mentioned are generally effective because they do not rely on human factors as much as administrative controls and PPE.

Substitution

The first recommended control measure for a hazard in AF workshops is substitution. Materials, the process itself, or the equipment can be substituted to reduce the hazard to workers. Any one, or a combination of these forms of substitution, can provide a method of control for a given hazard.

Materials

When considering substitution as a control, there are certain questions that must be answered. The first question should be, "Is there a material that is less toxic or flammable and does the job?" Given the abundance of materials available in the industrial world, a substitute may be available. Substitutes may do the job equally as well, or they may provide better or worse results but provide a less hazardous work environment. In some cases, it may be necessary to give up some production efficiency to protect the workers.

Examples of substituting safer materials for more hazardous ones include the use of a citrus-based cleaning agent instead of trichloroethylene and substituting aliphatic chlorinated hydrocarbons for benzene. In these cases, the substituted material exhibits less toxic properties. In other cases, substituting alkali and water-detergent solutions for solvents may yield equal results with an even greater margin of safety for the worker. Thus, given a particular situation, substitution may decrease or eliminate the hazard.

Process

The second question is, "Is there a better and safer way to do the job?" It may be possible to change the overall process or procedures within the process, thus eliminating or reducing the worker's exposure. For example, as an alternative to spray painting, a part could be dipped into a paint bath or the part may be brush painted. Each of the substituted processes presents less exposure. Another example is the substitution of automated material-handling devices for manual or mechanical methods. For instance, consider a pumping process in situations where toxic materials need to be opened and dumped into a system. This automated process prevents any exposure because the hazardous product is pumped from a closed container into a closed system, such as a degreasing machine. This substitution would also eliminate costly manual labor.

Equipment

The final consideration is substitution of equipment. “Is there a better and safer piece of equipment to perform the job?” “Can engineering changes be made on existing equipment to make it less hazardous?” Examples include using machine guards on existing mechanical equipment and substituting automated equipment for manual methods. Another example would be adding catalytic converters to gasoline engines to reduce the emission of pollutants that would make the existing equipment less hazardous. Using electrically powered fork lifts instead of gasoline-powered lifts is also substituting equipment to make the workplace less hazardous.

Isolation

Separating the source from the worker’s environment is another method to control hazardous exposures. Isolation is accomplished in a number of ways.

1. The source can be located away from the worker’s environment so there is no contact with the hazard.
2. Enclose or shield the source with a physical barrier, such as a grinding room (separate from other work areas) to protect workers. This keeps the source in the work area but protects the other workers.
3. Enclose the process with the hazardous materials, as we discussed in the substitution of equipment and processes section earlier in this lesson.

There are many examples of isolation used in industry. Tank farms, used to store toxic or flammable materials away from work environments, are an example of removing or isolating hazardous materials. Heat barriers and soundproof booths around hazardous equipment are other forms of isolation. Another example is to put the worker in a control room away from the hazardous environment, as can be done with any automated process.

Ventilation

Ventilation controls air contamination by removing pollutants from the breathing zone of the worker. Ventilation can also be used to control thermal extremes, hot or cold, in the work environment and condition the air for worker comfort.

Administrative controls

The supervisors and managers of an organization can use administrative controls to decrease hazardous exposures for the employees working in their shops. These controls are most effective when used along with one of the other control methods. Administrative methods include monitoring the conditions of work areas as well as the worker’s exposure time, setting up schedules for employees to reduce the amount of time exposed to hazards, and scheduling preventive maintenance to assure proper functioning controls. Continuous monitoring equipment can be used in the work area to sound a warning if the potential hazard exceeds the acceptable limits. Personal samplers or dosimeters are used to monitor the exposure of individual workers required to move in and out of hazardous areas.

Monitoring workers through the use of biological tests is also a valuable method of determining if workers have been exposed to a hazardous material. However, the results of biological monitoring, as well as sampling the environment, may come too late to actually prevent the worker from overexposure to hazardous environments.

Consequently, it is necessary to use other control measures to prevent the worker from exposure. There is a separate unit in this volume that explains the medical examination requirements for workers exposed to hazards.

Rotating workers through a hazardous environment provides another alternative for regulating exposures. Workers can be rotated in and out of hazardous areas during a shift, or rescheduled to work in different areas of the facility. These measures help to limit cumulative effects of potential

hazards. In addition, workers who are required to perform extremely physical tasks, or assigned to extremely hot or cold areas, can be given rest periods to allow their systems time to recover.

Preventive maintenance schedules are also valuable administrative controls in eliminating potential hazard exposures. To protect the worker, the system must operate as it was designed, although in some cases, normal wear can cause problems by exposing the worker to a hazard. Control or monitoring equipment also requires maintenance. Filters become clogged, fans do not always work as designed, and monitoring equipment can malfunction.

Personal protective equipment

PPE should only be used as a last resort and sometimes as a temporary measure until a more permanent control can be implemented. Several questions need to be answered before using PPE. Can ventilation help to solve the problem? Can the hazardous material be substituted with a less hazardous material? Can engineering changes be made to the process or equipment to reduce the hazard to workers? Can the worker be removed from the hazardous source either by isolating the source or the worker? If the answers to these questions are no, then sometimes there is no other alternative but to use PPE.

PPE needs to be designed to permit minimum interference with the job being performed. Otherwise, the worker is likely to discard the protective equipment and take the chance of being exposed to the occupational hazard. For example, large gloves interfere with the worker's ability to perform small manipulation of parts. In this case, substituting latex form-fitting gloves may allow for the required movements and provide the necessary protection to the hands. Now, let's turn our attention to the types of PPE you will come in contact with and also some of the problems you will encounter with this equipment.

Types

There are many different types of PPE designed to protect specific parts of the body against specific hazards. Check each piece of equipment to ensure it protects the worker against the specific hazard. For example, goggles protect the eyes but not the face; so do not use goggles alone in operations where the face must be protected. In such an instance, a face shield is more appropriate for the operation.

Personal Protection	
Protection	**Equipment Used**
Skin	Gloves made from many types of materials are used to protect the hands and arms. Also, aprons are available to offer some protection for the worker. In addition to gloves and aprons, there are specially-made protective suits that protect the whole body from exposure.
Eye	Safety glasses, goggles, face shields, safety masks, and hoods offer some protection for the eyes and face.
Ear	Many different types of ear plugs and muffs protect against hazardous noise in work areas. We will have an in-depth discussion on ear protection in a separate unit of the course.
Respiratory	Respirators are used to protect workers from gas, vapor, and particulate hazards. There are air purifying, air supplied, and self-contained breathing apparatus (SCBA) type respirators. The BE section determines the most appropriate respirator for a job, conducts fit testing, and trains the workers.
Other	Other personal protection items include safety shoes, diving suits, arm and hand guards, knee and elbow pads, and environmental control suits.

Problems

People do not like to wear PPE because it is uncomfortable. Other reasons include equipment that doesn't fit properly or is poorly maintained, workers do not know personal protection exists, or workers are not properly trained and educated on the importance of wearing or using the equipment. To overcome these problems, it is important that upper management, supervisors, and workers place more emphasis on safety equipment.

214. Air Force Occupational Safety and Health program

All workplaces on base must be evaluated for workplace hazards. This is part of a program called AFOSH and is derived from the Occupational Safety and Health Administration (OSHA) regulations. The Air Force either meets or exceeds the OSHA requirements for workplace safety and health. Another part of the AFOSH program comes from NIOSH, which is a division of the CDC. This organization provides the research and technical information for the OSHA and AFOSH programs. If anyone needs to know the effects of a particular hazard, usually NIOSH has information available upon request.

The Air Force Occupational & Environmental Health Program is a medical service program that ensures all bases are striving to make working conditions safe and healthy for all employees. To ensure this objective is met, BE gathers detailed surveillance information of base workplaces and the assigned personnel. BE will forward copies of the surveillance reports to PH so it can determine if occupational health medical examinations are required.

Surveillance of workshops

OEHP has four types of surveillance activities to include industrial hygiene, and chemical, physical, and biological surveillance programs. Each of these are described in the following paragraphs.

Industrial hygiene surveillance

To ensure that our objectives and goals of the program are met, BE begins by performing surveillance activities of the workplace. The information gathered during this phase is provided to PH. The chief goal is the preservation and, if possible, improvement of the work force's health. The industrial hygiene surveillance phase begins with the industrial hygiene survey of all AF workplaces.

The industrial hygiene surveys are required because occupational stresses or hazards must be identified and evaluated before they can be appropriately controlled. Documentation of surveillance activities is made using the applicable forms.

BE does a comprehensive baseline study of each hazardous workplace. Such studies include a detailed assessment of the operations performed, including specific risks, available control measures, and an evaluation of the effectiveness of such measures. Consideration is also given at that time to the interrelationships of chemical, physical, biological, and biomechanical stresses that may exist in the industrial environment. BE determines if the workplace should be placed on the survey list. If so, the BE performs an industrial hygiene survey of the workplace to check the continuing effectiveness of, or the need for, other control measures and to evaluate any new or changing operations. BE may also revisit the workplace sooner than a year to evaluate the adequacy of actions taken to correct potentially unhealthy conditions noted on baseline or annual surveys. Finally, BE may perform an unscheduled survey.

A health care practitioner, a supervisor, an employee, employee representative, or you can request a special survey from BE on a particular workplace if a threat to worker health is suspected or if there is reason to believe proper procedures are not being practiced. When potential or actual health risks are identified during any of these surveys, PH is notified to make sure that proper medical monitoring of affected workers is done when appropriate. When determined to be appropriate, the health of the exposed worker will be monitored by conducting occupational medical examinations to include worker histories, biological screening, and physical examinations.

Chemical agent exposure surveillance

Every industrial workplace is unique because of the wide range of tasks performed, materials/equipment used, and facilities occupied. As a result, rigid surveillance procedures cannot be specifically stated; however, a generalized survey process can be followed. This process has three phases to include recognition, evaluation, and control. BE uses these phases as a guide for its chemical agent exposure surveillance.

Recognition

BE must become familiar with the tasks being performed in the workplace through observations, interviews, and review of case files. This recognition phase also includes making a list of materials used, which is called a workplace chemical inventory. The recognition phase is completed with a decision as to which potential exposures require detailed special surveys.

Evaluation

In the evaluation phase, if it is determined that an inhalation risk is possible and a valid prediction as to exposure level cannot be made, air samples are taken. The results are documented in the current Occupational and Environmental Health Management Information System (OEH-MIS). If an absorption, ingestion, or skin contact risk is possible, an evaluation of work practices is made to include such things as the wear and maintenance of protective equipment and the sanitation of latrines and break areas.

Control

If the evaluations reveal exposures at or in excess of the permissible exposure limits, further controls must be considered. These controls can be classified as engineering, administrative, and PPE. All of the existing and recommended controls are recorded on the Industrial Hygiene Data Sheet–General. If the PPE involves respirators, BE records the fit testing and education of workers in the OEH-MIS.

Physical agent exposure surveillance

The generalized recognition process is basically the same as for chemical exposure surveillance. The appropriate forms will be used to identify the hazard.

Evaluation

Two types of evaluations are used by BE for physical agent exposure. They are mathematical predictions and actual measurements. BE may use actual measurements to verify its mathematical predictions.

Control

In the area of control, BE ensures physical agent exposures exceeding the permissible exposure limits are reduced by using engineering or administrative controls or appropriate PPE. These controls are recorded on the applicable survey form. For example, if hearing protection is required, PH records fit testing and worker education in the members' ASIMS and Armed Forces Health Longitudinal Technology Application (AHLTA) medical records.

Biological agent exposure surveillance

In the area of biological agent exposure surveillance, BE places a lot of emphasis on preventive controls because a proper evaluation of the workers' exposure is usually difficult. There are few potential exposures to biological agents found in AF industrial workplaces.

Postsurvey

A narrative postsurvey report is prepared by BE and forwarded to the shop supervisor with a copy going to PH. BE recommendations are recorded in OEH-MIS. A summary of survey findings is reported in the OEH-MIS. This is used by the OEHWG to determine any occupational health examination requirements and to summarize the worker exposures in the health record.

When there are hazards identified, PH must be notified both of the hazard and the shop where the hazard was identified. PH monitors all workers if the exposure is considered to be excessive. This leads us to the question of "what is excessive?" To answer this, we'll say that there are established levels of exposure a worker can be exposed to without any harmful effects. These levels are called occupational & environmental exposure limits (OEEL). Air Force policy is to medically monitor each individual exposed to half of the OEEL established for each hazard. This is better known as the action level (AL). Your local OEHWG will dictate which medical examination each worker will receive, based on the exposure data received from the BE and the tests required for each type of hazard.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

213. Control measures

1. Which control method is using citrus cleaners instead of trichlorethylene an example of?

2. What control measure would use a soundproof booth around a piece of equipment producing hazardous noise?

3. Rotating workers through a hazardous environment regulates hazardous exposures through which control method?

4. What should be done to PPE to ensure protection for the worker?

5. What are the types of respirators used to protect workers from gas, vapor, and particulate hazards?

214. Air Force Occupational Safety and Health program

1. What is the Air Force Occupational & Environmental Health Program?

2. What is the chief goal of industrial hygiene surveillance?

3. What is included in a comprehensive baseline study of each workplace?

4. Who may request a special survey from the BE section?

5. What are the three phases of the general survey process followed for chemical agent exposure surveillance?

6. What are the two types of evaluations used for physical agent exposure?

7. What is an AL?

Answers to Self-Test Questions

209

1. Chemical, biological and physical hazards.
2. Electromagnetic radiation with energy sufficient to cause the loss of an electron from the matter with which it interacts.
3. Alpha, beta, and neutron particles, gamma radiation, and x-rays.
4. Ultraviolet, infrared, laser, and microwaves.

210

1. Factors affecting the agent, individual, and environment.
2. Substance type, formulation, and volume or concentration.
3. The gastrointestinal tract (ingestion), the lungs (inhalation), and the skin (absorption).
4. Absorption through the skin.
5. Age and weight. Other influencing factors might include the general absorption, body storage, metabolism, and ability to eliminate toxic substances.
6. Temperature and environmental chemicals.
7. Gastrointestinal discomfort, salivation, profuse sweating, and difficulty in breathing.
8. By interfering with cellular respiration.
9. An organ or organ system that is specifically affected by a toxic material.
10. Toxic material that deprives the body’s cells of oxygen.
11. Gases and vapors, particulate matter, liquids, and solids.
12. Smoke, fog, mists, fumes, and dusts.

211

1. Halogenated hydrocarbons.
2. Fuels, refrigerants, propellants, dry-cleaning agents, lubricants, solvents, and chemical intermediates.
3. Skin cancer; systemic effects involving the CNS and cardiovascular system, or renal and hepatic damage.
4. Potassium hydroxide is an alkali-electrolyte for nickel cadmium batteries; sodium hydroxide is an alkali used in paint strippers and aircraft-cleaning compounds.

212

1. Welding.
2. Acid and caustic.
3. Inhalation of metal fumes.
4. Noise, exhaust emissions, production of carbons, and use of solvents that may cause dermatitis.
5. Degreasing solvents, mercury, acids, ionizing radiation, epoxy and resins, noise, and soldering hazards.

213

1. Substitution.
2. Isolation.
3. Administrative.
4. Check to ensure it protects the worker against the specific hazard in the workplace.
5. Air purifying, air supplied, and SCBA respirators.

214

1. A medical service program that ensures that all bases are striving to make working conditions safe and healthy for all employees.
2. The preservation and the improvement of the health of the work force.
3. A detailed assessment of the operations performed, specific risks, available control measures, an evaluation of the effectiveness of those control measures. Consideration is also given at that time to the interrelationships of chemical, physical, biological, and biomechanical stresses that may exist in the industrial environment.
4. A health care practitioner, a supervisor, an employee, employee representative, or you can request a special survey from BE on a particular workplace if a threat to worker health is suspected or if there is reason to believe proper procedures are not being practiced.
5. Recognition, evaluation, and control.
6. Mathematical predictions and actual measurements.
7. A level of measurement which is half the OEEL established for each hazard.

Complete the unit review exercise before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter.

17. (209) Exposure to which hazard often results in Raynaud's phenomenon or "dead hand"?
    a. Chemical.
    b. Radiation.
    c. Vibration.
    d. Biological.

18. (210) What size particles usually reach the alveoli of the lung?
    a. 2 micrometers.
    b. 6 micrometers.
    c. 12 micrometers.
    d. 24 micrometers.

19. (210) In an industrial environment, what is the most common route of entry or exposure for toxins to enter the body?
    a. Swallowing.
    b. Breathing it into the lungs.
    c. Absorption through skin contact.
    d. Injection by sharp objects through injury.

20. (210) To which group of pesticides do organophosphates belong?
    a. Botanical pesticides.
    b. Synthetic organic pesticides.
    c. Fumigants made from inorganic chemicals.
    d. Rodenticides made from inorganic chemicals.

21. (210) What are the two types of asphyxiants?
    a. Simple and complex.
    b. Simple and chemical.
    c. Physical and chemical.
    d. Primary and secondary.

22. (211) Which medical problem may be caused by inhalation of high concentrations of halogenated hydrocarbons?
    a. Skin cancer.
    b. Stomach cramps.
    c. Defatting of the skin.
    d. Liver and kidney damage.

23. (211) Acetylene, ethane, gasoline, and kerosene are all examples of
    a. organophosphates.
    b. phenolic compounds.
    c. aliphatic hydrocarbons.
    d. halogenated hydrocarbons.

24. (212) Which base shops have hazardous metal fumes, sparks and burns that cause eye and skin irritation, fire and explosion, and exposure to ultraviolet and infrared radiation that causes burns?
    a. Battery shops.
    b. Welding shops.
    c. Structural repair.
    d. Nondestructive inspection.

25. (213) What is the first recommended control measure used for hazards in Air Force workshops?
    a. Isolation.
    b. Ventilation.
    c. Substitution.
    d. Administration.

26. (213) Which hazard control measure would implement a soundproof booth?
    a. Isolation.
    b. Ventilation.
    c. Substitution.
    d. Administration.

27. (214) What Air Force medical service program is designed to ensure that all bases are striving to make working conditions safe and healthy for all employees?
    a. NIOSH.
    b. OSHA.
    c. IHSP.
    d. OEHP.

28. (214) During chemical agent exposure surveillance, in which phase of the survey process is a decision made as to which potential exposures require detailed special surveys?
    a. Control.
    b. Evaluation.
    c. Post-survey.
    d. Recognition.

Please read the unit menu for unit 3 and continue ➔

Unit 3. Public Health Responsibilities in AFOSH

AS YOU HAVE already learned, BE performs industrial hygiene surveys of each workplace. The purpose of these surveys is to identify all potential exposures to physical, chemical, and biological hazards. These workplace exposures are further evaluated to determine the level of worker exposure. Then BE provides PH with a summary of its findings. Using that summary, and the knowledge of the effects on the human body of the identified hazards, a recommendation for an occupational examination can be made to assess the health status of the exposed workers.

In this unit, we will discuss policy that governs how and why we accomplish occupational health surveillance and exams. In addition, we will be going over all of PH's many responsibilities within the Occupational Health (OH) program; from conducting shop visits and providing education to employees, to our role in protecting pregnant employees and their unborn fetuses, you need to understand all of the responsibilities you will be asked to fulfill to keep our workers safe.

3–1. Clinical Occupational Health Program

Most bases will have a group such as an OEHWG or an Industrial Facilities Review Board. The group, chaired by the Installation Occupational and Environmental Medicine Consultant, should include representatives from PH, BE, and Flight Medicine. This group reviews the shop folder and decides on the appropriate examinations. These occupational examinations are also called medical surveillance.

215. Clinical occupational health surveillance

Clinical occupational health surveillance is an extremely important part of the occupational health program and will help maintain a healthy industrial workplace population. As a PH technician, you will play an instrumental role in this process. Within this lesson, we will briefly introduce a few directives that apply to your role, as well as conditions in which you must accomplish medical surveillance and provide medical examinations.

Directives

In many cases, specific regulatory documents dictate occupational examinations. These requirements are often based on past histories of occupational illnesses among workers exposed to hazardous agents. In other cases, the requirements may be based on studies of the effects of hazardous agents on laboratory animals. In any event, a panel of occupational medicine experts reviews the most recent medical literature, determines safe levels of hazardous agents, and recommends specific occupational examinations if those threshold levels are exceeded. Below are some of the more important regulatory documents that may help in the development of an occupational examination for specific hazards.

AFI 48–145, Occupational and Environmental Health Program

The medical facility is responsible for medical surveillance of personnel occupationally exposed to physical, chemical, and biological hazards. AFI 48–145 lists the overall responsibilities for OEHWG and for Team Aerospace members. It also explains the clinical surveillance process.

DOD 6055.05–M, Occupational Medical Examinations and Surveillance Manual

This manual was written by a DOD panel of experts to help DOD installations design a medical surveillance program. It contains the suggested medical surveillance procedures for many chemical, physical, and biological hazards encountered by AF personnel and is a source of information for designing a local medical surveillance program. It identifies target organs affected by the occupational hazards and names the exams/labs to better determine the worker's exposure level. The manual also summarizes existing medical surveillance requirements specified in Title 29–Labor, in the *Code of Federal Regulations* (CFR). However, be aware that the CFR may not be completely up to date for your needs.

Title 29–Labor, CFR, Part 1910, Occupational Safety and Health Standards

This document contains federal laws written to protect workers. When it directs specific types of medical surveillance for a hazard, it supersedes all other DOD or AF directives on the subject. However, as with all the other titles within the CFR, Title 29 is not all-inclusive and is updated slowly.

AFOSH standards

There are several AFOSH standards (STD) and AFIs that specify medical surveillance examinations for specific hazards. For example, AFI 48–139, *Laser and Optical Radiation Protection Program*, contains a section on medical exams for personnel working with hazardous lasers. It specifies the types and frequency of examinations and identifies personnel who should receive the examinations.

Conditions

In the previously discussed directives, there is usually a threshold level of exposure to a hazard that constitutes the point where you institute medical surveillance. When there is no specific directive addressing the hazard you are concerned with, refer to OSHA guidance for more information. Medical examinations are *not required* unless at least one of the following conditions exists:

- Personnel are being protected from exposures exceeding OEEL by the use of respirators, or other PPE, such as gloves, aprons, goggles, and face shields.
- Personnel are being exposed to eight-hour occupational exposure limit time-weighted average (OEEL-TWA) concentration exceeding one-half the AL, or significant OEHWG concern exists because of potential skin absorption.
- Personnel exhibit signs or symptoms that may be reasonably attributed to the workplace exposures involved.
- Personnel are known to be exposed above the AL or have skin contact with substances having a potential for skin absorption, for example, during emergencies or accidents.

216. Medical surveillance

In this lesson, we will discuss medical surveillance, which will assist health care providers in determining if industrial workers have been occupationally exposed to potential hazards in the workplace. Your duties and responsibilities will require you to assist the health care providers in determining the appropriate occupational examinations for industrial workers.

Types of medical surveillance

The occupational health medical examination may consist of a single examination such as a pulmonary function test or a combination of examinations. The exam may range from a medical

history to a hands-on physical given by a health care provider. These exams are target-organ specific and not head-to-toe physicals.

Exposure data

Workplace exposure data is completed by BE and contains a summary of exposures to physical, chemical, or biological hazards. This data is filed in the outpatient medical records of all personnel in that shop. The workplace exposure data gives the physician a summary of what the worker is exposed to in the workplace.

Medical history

Completing thorough medical and work history documentation is often required by workers at the time of their examination. It gives the health care provider a written record of the worker's current and past health. In response to certain answers, the health care provider may require specific clinical tests or a more in-depth physical to make a thorough evaluation of the worker's health status.

Biological screening tests

Biological screening tests target specific organs of the body to determine possible overexposure to workplace hazards. The tests can either measure the specific chemical or its metabolite to evaluate the amount absorbed by the worker. For example, to determine lead exposure, the provider may measure the amount of lead in the blood. The results of the blood-lead test are compared with the normal range established by the laboratory. These tests measure a worker's exposure but cannot differentiate between occupational and environmental exposures.

In some cases, a preplacement exam is useful in establishing a baseline for the patient. For example, personnel working at a firing range are exposed daily to varying airborne concentrations of lead. However, their hobbies may also include hunting and loading their own ammunition; hence, it may be difficult to determine the actual work exposure. In addition, they may also absorb lead from the environment; as a result, an accumulation of all these exposures may result in an overexposure.

Not all hazardous exposures can be adequately evaluated with tests for a variety of reasons.

1. In some cases, there is no test to measure the effect on a target organ.
2. In other cases, tests may be too expensive to use routinely.
3. Routine biological screening is inappropriate because of the body's ability to detoxify and/or rapidly excrete chemicals.
4. If testing is performed, peak exposures to chemicals would not be identified.

Clinical screening tests

Clinical screening tests measure the actual effects of a physical, chemical, or biological hazard on the body by evaluating the target organ affected by the specific hazard. For example, if the hazard is toxic to the liver, the appropriate screening test is an aspartate aminotransferase (AST) to measure liver damage. A problem with laboratory tests is that other things, such as infectious hepatitis or alcohol abuse, could be causing the organ to malfunction, as in the case of the liver. When recommending an occupational examination, PH must remember to recommend only tests that evaluate the target organ and try to evaluate for occupational exposures.

Physical examinations

In some cases, a complete head-to-toe physical may be necessary to evaluate a worker's overall health. This may be done as part of the required occupational examination or may be in response to "yes" answers on the medical history.

Quality control of occupational health exams

After the surveillance exams are complete, they will be reviewed to identify a possible exposure. In many cases, workers may be unaware of the changes in health; however, lab results will provide a better picture as to what is really going on with each individual worker.

Frequency of medical surveillance

Whenever occupational health medical examinations are required, the frequency of examinations must also be determined. The following paragraphs discuss the normal frequencies.

Preplacement or baseline

This examination is designed to evaluate the worker's health status before encountering exposures to hazards the worker may experience upon entering the workplace. The data obtained from this examination is then used as baseline data for future examinations. The baseline examination is given to all workers entering the OEHP and it identifies any physical limitations that may adversely impact the worker's ability to perform the job.

Periodic

Periodic examinations evaluate and document the health effects of occupational exposures on the worker. While most periodic examinations are conducted annually, they may also be accomplished twice a year, every three years, or whatever the exposure situation dictates. Sometimes a directive mandates the frequency; however, the frequency normally depends on the exposure levels identified by BE and the results of previous examinations. PH recommends the frequency to the OEHWG for approval. In many cases, periodic examinations are not required; for example, X-ray technicians do not usually receive an annual or periodic examination.

Termination

Termination examinations are usually performed at termination of employment, separation, or retirement but may be accomplished when individuals cross-train into a career field not requiring an examination. Termination examinations are designed to assess pertinent aspects of the worker's health that were previously measured in preplacement or periodic examinations. Documentation of results may help to assess the relationship of any future medical problems to past hazardous exposures in the workplace. This examination is of limited value since many conditions may take 20–30 years before symptoms develop. In these cases, the periodic exam is a more accurate indication of problems. There are only a few hazards that require termination examinations. In all other cases, it is up to the working group to determine the value of a termination examination.

Out-of-cycle

Out-of-cycle examinations are given when workers are exposed to above-recommended exposure limits or have skin contact with chemicals that are known to be rapidly absorbed through the skin (i.e., during accidents or emergencies). Again, the OEHWG approves the type, frequency, and extent of examinations required.

Role of Public Health

The directives cited earlier often mandate medical surveillance examinations. These directives are periodically revised, and PH and BE should make sure they keep current copies of all directives relating to occupational examinations. Both PH and BE work with the installation occupational health consultant to recommend occupational examinations to the OEHWG based on existing directives, references, and professional judgment. These recommendations are based on the target organ and the effects of hazards on the organ. Consequently, occupational examinations are tailored to the worker's exposures.

Occupational health medical examination requirements

Once the occupational health medical examinations are approved by the OEHWG, the installation occupational health consultant will sign the original Clinical Occupational Health Examination Requirements (COHER) form for each industrial workplace. This form lists the examination types, frequency, and scope of examinations. After this, the examination requirements are reviewed annually for each shop. If the Aerospace Medicine Council (AMC) decides medical examinations are inappropriate or have little value, the decision and rationale are documented on the computer-generated COHER form. For example, routine examinations have little value in determining the significance of occupational exposure to radio frequency (RF) radiation. AFOSH STD 48–9, *Electro-Magnetic Frequency (EMF) Radiation Occupational Health Program*, lists medical exam procedures to follow and who to notify in cases of overexposure.

Examination responsibilities

FHM will assist Flight Medicine with scheduling and processing occupational examinations. The flight surgeon, usually identified as the consultant to PH, reviews the examination results and determines the health status and any necessary duty restrictions of the patient.

Processing

The Occupational and Environmental Health Exposure Data (OEHED) and COHER forms give the health care provider a picture of the worker's occupational exposures. These forms should be filed in the member's medical record.

When the worker's examination is complete, an annotation will be made on a SF Form 600, Medical Record—Chronological Record of Medical Care, to indicate the patient reported to the appointment and to document any exams and education provided. The SF Form 600 will be filed in the worker's medical record. Any pending labs or exams will be reviewed to identify abnormal results. The test results help to identify a potential problem in a shop.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

215. Clinical occupational health surveillance

1. What document lists the responsibilities for the OEHWG?

2. What does DOD 6055.05–M, *Occupational Medical Examinations and Surveillance Manual* contain?

3. If no specific guidelines are available for a particular hazard in a shop and the personnel are being protected from exposures exceeding OEELs by the use of PPE, is a medical examination required for the workers?

216. Medical surveillance

1. Which examination is designed to evaluate a worker's health status before exposures in the workplace?

2. Who approves PH's recommendations for periodic examinations?

3. What information goes on the COHER?

3–2. Other AFOSH Public Health Responsibilities

A portion of your job at the base PH office is to become familiar with the industrial operations performed at your base. One way to do this is to perform shop visits. These shop visits serve many functions, from establishing rapport to evaluating the effectiveness of PPE. Other responsibilities you will have under AFOSH include health education and training, trend analysis, fetal protection, bloodborne pathogens, ergonomics, and case-file documentation. Let's begin this section by looking at shop visits in more detail.

217. Shop visits

There are many reasons for PH to conduct industrial shop visits. The most important reason is to become familiar with the operations of the shop as well as to see the workers' environment. From this, PH can evaluate the workplaces for compliance with occupational safety and health requirements. Other reasons to conduct shop visits include the following:

- Reaffirming the BE survey results.
- Reviewing how PPE, such as ear plugs, ear muffs, and eye goggles, are used in the shop.
- Reviewing and reemphasizing the need for occupational medical examinations for shop personnel.
- Ensuring that all personnel were trained as required and that the specific training was documented properly.
- Evaluating environmental sanitation.
- Validating shop rosters with the supervisors.

Some bases may coordinate medical examination scheduling for shop personnel at the time of the shop visit. In addition, PH can also provide technical guidance and assistance to the supervisor in training workers.

Preparation

Get prepared before you leave your office to perform a shop visit. This preparation includes reviewing the BE survey, shop rosters, the case-file information including any training conducted, and any pertinent Safety Data Sheets (SDS) for the shop. The SDSs will be maintained in each shop, and the workers will know where these documents are located and will have access to them. SDSs are documents containing important safety information about hazardous materials used in workplaces; they are used to create a central repository of data on hazardous materials that are procured by the DOD. Also, review the schedule of occupational medical exams so that you can remind the supervisor of the appointments. In addition, collect statistics for "no show" rates to inform the supervisor. After this, gather any new information that you think will help the shop supervisor, such as a new type of BE-approved hearing protection that will benefit the shop if it were used instead of the currently used type. Also, gather any equipment you might need to perform the shop visit.

Another part of the preparation process is to create a checklist for performing the shop visit, if one has not already been created. Such a checklist is used to ensure all areas of the shop are evaluated and that all requirements are met.

Performance and documentation

Frequencies for industrial shop visits are established locally by your OEHWG. Once the frequency is established, there are two philosophies of performing these visits. One philosophy is to perform the visit when BE does its shop survey. This way you can benefit from the information found while the BE technician performs the survey. This method works well when BE personnel have been through the shop and you are not familiar with the shop operations. Another philosophy is for PH to perform separate visits. Having both BE and PH perform shop visits separately allows more frequent coverage of the shop to ensure questions and problems are addressed at the earliest possible time.

When you perform shop visits, ask about the prevalence of occupational disease and injuries within the shop. Also, ask if the shop is experiencing difficulty in scheduling medical surveillance examinations. You may want to schedule a training session for occupational health education or even provide some training while you are performing the shop visit. Also, it is very important to verify both that the workers are using PPE and that it is worn properly. This may also be a good time to verify the rosters of personnel actually working within the shop. In addition, you may want to discuss the BE survey results and look at the supervisor's documented training program which might include the AF Form 55, Employee Safety and Health Record. There may be questions or concerns that arise while at the shop; if so, discuss the issues. If you have to do research to answer the questions, do your research and follow up with the shop later. In some cases, the workers may have questions that need answering or the supervisor may have some concerns that need discussing or research for answers. If time permits, outbrief the supervisor of the findings from the visit. After completing the shop visit, it is also a good idea to send a follow-up written report to the shop.

Document the findings of the shop visit on the Chronological Record of Workplace Surveillance form (computer-generated AF Form 2754) found in ASIMS. Ensure BE was notified of your findings. If there is no system to notify BE, institute a system to ensure BE reads the entry or brief them of the findings.

218. Health education and training

Training has a valuable part in controlling hazardous exposures. With thorough training, workers can be taught to identify potential hazards and report these hazards before an injury or illness occurs. Training can be used to provide workers with methods and procedures that are useful in avoiding hazards and to develop error-avoidance behaviors. As workers are made aware of the hazards in their workplace, they also need to be informed on how to protect themselves and their families. Workers may understand that they cannot eat where they work, but do they understand they need to exercise personal hygiene to ensure they are not "bringing" the workplace hazards into their home?

For example, workers who work in a building that contains asbestos will annually receive asbestos awareness training. This is to make them aware of the location and the necessary measures to protect themselves from this hazard.

Studies indicate that training and education, when properly applied, can act like experience in reducing occupational illnesses and injuries. Workers will adhere to safe work practices only when they have a good understanding of the hazards and what it takes to prevent these hazards from harming them. This goal can be reached most effectively through a well-developed and coordinated training effort that includes safety and health training for supervisory personnel, employees responsible for conducting safety and health inspections, all members of locally established safety and health committees, and other employees.

Your occupational health training programs must be designed in a manner that will instruct individual employees in the performance of their work in a safe environment and should be developed according to the responsibility level of the individual. Maintain records to indicate training provided, list of attendees, and the dates of the training. Record your training sessions on the AF Form 2767, Occupational Health Training and Protective Equipment Fit Testing, in the industrial case file. Let's now take a look at who we are going to train, beginning with supervisors.

Supervisors

Management or supervisory personnel need training to enable them to actively and effectively support occupational safety and health programs in their specific areas of responsibility. In addition to coverage of appropriate statutes, regulations, and applicable AFOSH standards, management-level training should include the following:

- An in-depth examination of management's responsibilities in relation to the occupational safety and health programs.
- Emphasis on the implementation of an aggressive and continuing AFOSH program throughout the workplace. Training topics include analysis of compliance procedures, the study of current accident and injury reporting procedures, and a thorough understanding of inspection/investigation techniques.
- A review of AF policy of all relevant aspects of the AFOSH program.

IAW AFI 90–821, *Hazard Communication Program*, supervisors shall contact PH for assistance with training programs. Supervisory training usually includes AFOSH program goals and objectives established by higher command. Typical AFOSH program goals used at all command levels throughout the AF might include:

- The reduction of personnel exposed to hazards by abatement procedures or facilities' correction.
- An increased degree of AFOSH awareness throughout the activity through an effective training program.
- The development and implementation of plans and procedures for evaluating and improving education program effectiveness.

Nonsupervisors

AFOSH training for nonsupervisory personnel includes specialized job safety and health training appropriate for the work performed by the employees. Direct this specialized training to the individual's worksite and include an examination of the relevant AFOSH standards and an analysis of the material and equipment hazards associated with the worksite. The workplace supervisor provides the training and direction for employees, which includes instructions on employee rights and responsibilities pursuant to relevant AFOSH statutes, regulations, and the AFOSH program. The supervisors can request assistance from PH for this training. Make arrangements to provide training to all new personnel as close to the time of assuming their responsibilities as possible. Include the following in the initial training requirements for new employees:

- Command and/or local policy on occupational health education.
- Work unit policy on occupational safety and health.
- Individual responsibility for safety and health.
- Employee procedures for reporting hazardous operations/conditions.
- Hazards common to the individual's worksite, trade, occupation, or task.
- First aid/cardiopulmonary resuscitation (CPR) training for personnel who will be exposed to electrical shock, hazardous materials, or operations which could result in loss of heart or lung function.
- PPE required, if any, and its proper use and care.

Sources

There are educational and promotional materials, such as posters, films, technical publications, pamphlets, and related materials, that can be beneficial in the reduction and prevention of workplace related accidents and illnesses. Obtain and incorporate these as an integral element of the AFOSH program. Maintain a suitable safety and health reference library or have one available to you that is

appropriate for the size and mission of your base. If you need an occupational health training film, visit your base audiovisual library. Many programs are already available with many more being developed. These training packages can serve as excellent tools to get your occupational health education program off and running.

219. Trend analysis

The occupational health trend analysis is really an epidemiological study of illnesses and injuries within an industrial shop. It is important for you to analyze the health trends in the workplace to determine if the controls are effective and that all hazards have truly been identified. Performing trend analysis allows you to identify adverse trends in health in the workplace that may have been caused by occupational exposure and to verify the occupational status of the workers.

Occupational illness or injury reporting

PH will investigate all reported occupational illnesses or injuries input data for investigation in Air Force Safety Automated System (AFSAS). Before you learn about investigating and reporting occupational illnesses and injuries, you need to know the definition of an occupational injury and an occupational illness.

Occupational injury

An occupational injury is any injury, such as a cut, fracture, sprain, or amputation that results from a work-related accident or from a single instantaneous exposure in the work environment. Conditions resulting from animal, insect, or snake bites, or from one-time exposure to chemicals are considered to be injuries.

Occupational illness

An occupational illness of an employee is any condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with employment. It includes acute and chronic illnesses or diseases that may be caused by inhalation, absorption, ingestion, or direct contact.

There are different categories of occupational illnesses. The following table provides some examples of each category:

Category	Examples
Occupational skin diseases and disorders	Contact dermatitis, eczema, or rash caused by primary irritants and sensitizers or poisonous plants, oil acne, chrome ulcers, chemical burns, or inflammations.
Dust diseases of the lungs (pneumoconiosis)	Silicosis, asbestosis and other asbestos-related diseases, coal workers pneumoconiosis, byssinosis, siderosis, and other pneumonconioses.
Respiratory conditions due to toxic agents	Pneumonitis, pharyngitis, rhinitis, or acute congestion due to chemicals, dusts, gases, or fumes; farmer's lung.
Poisoning (systemic effect of toxic materials)	Poisoning by lead, mercury, cadmium, arsenic, or other metals; poisoning by carbon monoxide, hydrogen sulfide, or other gases; poisoning by benzol, carbon tetrachloride, or other organic solvents; poisoning by insecticide sprays such as parathion, lead arsenate; poisoning by other chemicals such as formaldehyde, plastics, and resins.
Disorders due to physical agents (other than toxic materials)	Heatstroke, sunstroke, heat exhaustion, and other effects of the environment; caisson disease; effects of ionizing radiation; and effects of nonionizing radiation.

Category	Examples
Disorders associated with repeated trauma	Noise-induced hearing loss; synovitis, tenosynovitis, and bursitis; Raynaud's phenomena; and other conditions due to repeated motion, vibration, or pressure.
All other occupational illnesses	Anthrax, brucellosis, infectious hepatitis, malignant and benign tumors, food poisoning, histoplasmosis, and coccidioidomycosis.

Purpose of occupational illness reporting

The purpose of the occupational illness or injury program is to ensure appropriate evaluation and follow-up of each occupational illness or injury to prevent recurrence. AFSAS is the data repository for occupational illness or injuries as well as provides for standardized information gathering from the entire Air Force.

How the program works

The worker goes to a medical facility and sees an HCP. The HCP initiates a SF 513, Medical Record—Consultation Sheet, when the medical problem may be work related. Keep in mind that not all problems can be easily diagnosed as work related because some illnesses are slow to develop, while others produce symptoms or conditions similar to other diseases. Other problems may include a sketchy exposure history with patient symptoms matching symptoms caused from other toxic materials also used in that specific shop.

If an occupation-related condition is considered, the provider may use the SF 513 to refer the patient to PH for further investigation. However, the SF 513 is not the only way PH can find out about occupational illness or injury problems. Other sources are emergency room log books, primary care clinic log books, and Civilian Administration (CA) forms. Perform an interview and initiate in AFSAS the AF Form 190, Occupational Illness/Injury Report, when the patient arrives at your office. This form is used to get a complete description of the accident or exposure. As you perform your interview, you are primarily interested in the illnesses; however, be aware the Base Safety Office needs to know about the injuries. Although the Base Safety Office must be notified of all injuries and illnesses, the procedures for notification are established locally.

If the medical problem is a chemical exposure, BE may provide some input into the investigation, so send the Occupational Illness Report to BE on all suspected toxic chemical exposures or suspected occupational illnesses. In this way, BE can easily refer to the case file for any further information needed. Once the Occupational Illness/Injury Report goes to the BE, the office of primary responsibility (OPR) for corrective action within the shop becomes BE. As a corrective action, BE can assign a risk assessment code (RAC), institute some engineering controls, or require PPE for each employee within the shop to prevent workers from further illness or injury.

After BE is finished with the Occupational Illness Report, the information is sent back to PH (where the SF 513 is waiting in suspense) along with any recommendations. Then the Installation Occupational Health Physician Consultant determines whether the illness is work related or not, assigns a case status, and signs the form. Complete the SF 513 by explaining the results of the investigation and send the original SF 513 back to the HCP. Make sure that a copy of each form is filed in the industrial case file in the privacy act folder. The HCP reviews the SF 513, treats the patient as necessary, and forwards the originals to the Medical Records Section for filing in the patient's medical record.

Occupationally related illness and injuries are annotated on the Occupational Illness and Injury Log for both military and civilian personnel. The Base Safety Office and PH personnel prepare this log, which summarizes occupational illnesses and injuries reported through AF personnel and medical channels. Within seven working days after receiving information of an occupational injury or illness, enter the appropriate information concerning such injury or illness on the Occupational Illness and Injury log. Coordinate with your Base Safety Office on reporting procedures.

Other sources for trend analysis data

There are other sources you can use to obtain trend analysis information. The following are not all-inclusive but will provide you with a good beginning for trend identification.

AF Form 469, Duty Limiting Condition Report

This form provides a written medical opinion as to the health status of a worker. The attending physician completes the AF Form 469, Duty Limiting Condition Report, to convey the worker's physical limitations to the commander when a member's health, safety, and well-being prevent the member's abilities to effectively and safely accomplish the mission.

Hearing conservation forms

Trends in noise problems in an industrial shop are identified by reviewing the DD Form 2215, Reference Audiogram, and DD Form 2216, Hearing Conservation Data, for significant threshold shifts (STS). These forms are covered in the hearing conservation unit.

Occupational and environmental health exposure data

The workplace-specific Occupational and Environmental Health Exposure Data (OEHED) form is a great source for checking for unusual trends in a shop. Occasionally review this form to identify unusual happenings that might indicate an illness or injury problem within the shop. Information that is documented on the OEHED form includes key findings on baseline or special surveys conducted by BE and informal visits conducted by BE or PH. The results of these findings may include important telephone conversations with either supervisors or workers, documentation of personnel not wearing personal protection devices, and a summary of epidemiological findings from past trend analyses.

Indoor air quality

Complaints about poor indoor air quality may generate PH's involvement to provide a questionnaire to be able to get to the root of the source. The questionnaire is generated from Appendix B in AFRL–SA–WP–SR–2014–0012, *Technical Guide for Indoor Quality Surveys*.

Emergency room log book

For this source to be effectively used for trend analysis, you have to have the time each week to keep up with the listed occupational illnesses and injuries. You must always be looking for adverse trends in a workplace as well as during the annual workplace trend analysis. The emergency room log book is a good source to identify trends within a workshop. It is important for the installation occupational health consultant to remind the emergency room physicians to ask about and annotate any illnesses and injuries that are job related. This makes it easier for you to identify problems within a shop when performing trend analysis.

Medical records

A detailed review of workers' medical records is not necessary to perform the occupational health trend analysis. However, if a problem is suspected within a particular shop, consider delving into the workers' medical records to gather more information.

Documentation of trend analysis

When you have completed the trend analysis of a shop, document your findings in ASIMS on the Chronological Record of Workplace Surveillance form. Your narrative comments should include the sources used to analyze the trends in the shop. Also, include a description of problems identified and the number of persons involved. In addition, explain the plan for follow-up action in detail. Remember to sign and date each entry.

Actions for trend analysis

As mentioned earlier, the purpose of trend analysis is to identify problems within a workplace. When we have this information, we can then intervene to prevent their recurrence. This may require some sort of follow-up action. If no problems are identified within a shop, you can assume controls such as PPE or engineering controls are working properly, as long as the trend analysis was conducted thoroughly using all available resources.

If there are problems identified within a shop, there should be some questions asked and answered to help solve the problems. Some of the questions include the following:

- Is there a change in operations?
- Are there any previously unknown hazards?
- Have engineering controls been working properly?
- Have personnel been properly using personal protection devices?
- Can the problem be addressed through occupational health education?
- Is there an indication for PH or BE to perform a shop visit and act on the findings?

After you answer these questions, it is your job to ensure that adequate follow-up actions are taken to make sure that workers are provided a healthy and safe work environment.

220. Fetal protection

In 1999, before the turn of the century, the AF had 356,487 members, 65,808 of whom were women. This figure, representing 18.5 percent of the active duty force, was enlarged considerably when one adds the women who made up a large portion of civilians employed by the AF.

According to their website, http://www.afpc.af.mil/library/airforcepersonneldemographics.asp, as of June 2015, the Air Force Personnel Center indicates that demographics had changed somewhat.

- 308,016 were active duty AF personnel. Of this number, 58,680 were women, representing 19 percent of the active duty force.
- 138,060 were civilian employees, whether full or part-time. Of this number, 52,707 were women, representing 29.3 percent total civilian AF personnel.
- This made a total of 487,902 members, including both active duty and civilian personnel, with a total of 111,387 women, or 23 percent of all AF personnel, active duty and civilian.

Many of these women, working alongside their male counterparts, are exposed to hazardous materials and physical forces. How do the OEEL that provide a reference for our OEHPs apply if these women become pregnant? Do these standards, developed for healthy adults working a 40-hour work week, provide adequate protection for the developing fetus? Your job is to review the workplace information gathered and recommend appropriate duty restrictions to ensure the health of the unborn child. To understand this better, we will look at some specific hazards and PH's responsibilities in this important program. Finally, we will look at the current information pertaining to nursing workers.

Specific hazards

The potential reproductive hazards found in the workplace include biological agents, chemicals and metals, and physical agents, such as heat, radiation, or stress. All of these can affect the female reproductive system and can damage the fetus in many ways. In some cases, the genetic material, composed of DNA, can be damaged by substances known as mutagens. A few examples of mutagens used in industry include the following:

- Ethylene oxide is used for chemical sterilization of surgical instruments.
- Acrylonitrile and vinyl chloride are used in the plastics industry.

- Trichloroethylene is a cleaning solvent.
- Metals such as cadmium, manganese, arsenic, and nickel compounds.

In addition to mutagens, there are some compounds that have been found to interfere with the implantation of the egg within the uterus that can lead to early loss of pregnancy. These compounds include pesticides, inorganic lead, copper, cadmium, and zinc.

Other substances that cause birth defects are called teratogens. During the third and on through eighth week of gestation, the fetus is extremely sensitive to teratogens since the major organ systems are developing. The growth of the fetus can also be affected by teratogens later in the pregnancy. The CNS, immune system, and endocrine system develop later and can be affected by exposure to workplace teratogens. Examples of teratogens are organic mercury and lead, both of which are found in industrial workshops.

Family members of the pregnant worker might work in a hazardous environment and bring hazardous dusts home on clothing and expose the pregnant worker. Therefore, we must not only be concerned with the pregnant worker but must also with any family members that might expose the fetus to unnecessary hazards.

In addition to the items we have just discussed, there are many other hazards in the worker's environment that can harm a growing fetus. Let's look at some of these hazards and see how they affect the fetus.

Hypoxia and G-forces

Hypoxia and G-forces may be encountered in flying duties. Because the fetus is very susceptible to these influences, pilots, navigators, physicians, nurses, technicians, and physiological training instructors are grounded during all or part of the pregnancy.

Radio frequency radiation

RFR is a type of nonionizing radiation that originates from communications and radar systems as well as commercial, industrial, and certain medical devices (diathermy units used in physical therapy). Most people exposed to RFR work in avionics shops, on flight lines, or in communications facilities. The thermal effects of RFR are a potential occupational health hazard for exposed workers. However, these effects occur at exposures 10–100 times the permissible exposure limit. Additionally, there are no special RF exposure limits for pregnant females; thus, any RF environment safe for the mother is also safe for the developing embryo or fetus, with the lowest amount of potential hazard of any provided in within this list. However, the story is a little different for ionizing radiation.

Ionizing radiation

The five primary types of ionizing radiation include alpha, beta, gamma, neutron, and X-rays. By far, the most common occupational exposure is to X-rays from equipment used in hospital and dental radiography as well as on flight lines for nondestructive inspection of aircraft. Ionizing radiation can disrupt cellular DNA and thereby cause serious developmental defects in the fetus. Therefore, observe all precautions if a worker normally exposed to ionizing radiation becomes pregnant. In all cases, BE must enroll the employee in the thermoluminescent dosimeter (TLD or film badge) program, and the base must receive a monthly telephone report of her accumulated radiation dosage. These safeguards ensure the health of the fetus and allow the continued job productivity of the pregnant worker.

Biological agents

Systemic infections during pregnancy can have disastrous effects on the developing fetus. These effects can range from developmental abnormalities to abortion or stillbirth. The theoretical risk of fetal infection following live virus vaccination precludes pregnant women from routinely receiving these immunizations. Infectious agents which may cause fetal complications include rubella, rubeola, mumps, herpes zoster, herpes simplex, HBV, listeriosis, syphilis, leptospirosis, and toxoplasmosis.

Jobs requiring prolonged exposure to these agents, such as hospital work, pose special problems to pregnant workers. Duty limitations may be necessary to ensure a successful pregnancy.

Waste anesthetic gases

A number of epidemiological studies have investigated the health effects associated with work in operating rooms. These studies indicate a higher rate of spontaneous abortion among pregnant women exposed to waste anesthetic gases. To control this potential hazard, the following policy was implemented:

- Where anesthetic gases are used safely, no one will be denied the opportunity to work in the area, due solely to their fertility status.
- Each worker who suspects she is pregnant will be expeditiously tested by a serum method to verify pregnancy.
- A reassigned woman may be returned to her original duties at any time upon her written request.

The collective effects of low-leakage anesthetic techniques, installation and use of waste anesthetic gas scavenging systems, routine equipment maintenance and testing, periodic air sampling by BE, recordkeeping, and worker education will help reduce the occupational hazard in these workplaces.

Metals

Many metals, including aluminum chloride, cadmium chloride, chromium trioxide, and nickel carbonyl, have produced damaging effects in animal embryo studies. In addition, the effects of the heavy metals, lead and mercury, are well-documented in humans. Increased numbers of abortions and stillbirths among female workers exposed to excessive lead levels have long been recognized. In addition, high concentrations of lead have been demonstrated in the placenta, liver, and brain of infants stillborn to lead workers. Mercury poisoning is quite similar. Infants born to women who ingested food contaminated with methyl mercury have damaged CNSs, kidneys, and other organs. Infants were affected even when the mothers showed no evidence of clinical toxicity. In some breast-fed infants, ingestion of mercury-contaminated mother's milk adds to the intra-uterine exposure. A little later we will discuss mothers occupationally exposed to hazardous materials and nursing.

Other chemical hazards

Many of the acrylic compounds, such as styrene and vinyl chloride, used in the production of plastics have been shown to cause fetal deformities in animal studies. Likewise, the solvents benzene, methylene chloride, methyl ethyl ketone, tetrachloroethylene, trichloroethylene, toluene, and xylene are widely used in industrial environments and have shown varying toxic effects on fetuses. The sterilizing agents, ethylene oxide and formaldehyde, commonly used in AF medical facilities, and the polychlorinated biphenyls (PCB), which are among the most common environmental contaminants, may also be dangerous to the developing fetus.

Education and administration

Pregnant workers must not be forced to work in an environment that is hazardous to their unborn children. However, not every worker should be removed from her job. AFI 44–102, *Medical Care Management*, gives guidance concerning basic duty restrictions for pregnant workers. Providing accurate duty restrictions requires the cooperation of the patient's obstetrical HCP, the installation occupational health consultant physician, PH, BE, and the patient's supervisor. We will first look at the program for active duty personnel and then turn our attention to AF civilian employees.

Active duty

The program begins when the worker suspects she may be pregnant and seeks medical attention at your MTF. Inform workers of the importance of early pregnancy confirmation during educational

programs. After the pregnancy is confirmed, the HCP initiates an SF 513 requesting PH evaluate the employee's working conditions. In addition, the HCP drafts an AF Form 469 recommending duty restrictions appropriate to any pregnant worker, regardless of workplace exposures. Once PH receives the SF Form 513, a thorough evaluation is conducted of the workplace. Interview the worker to get a job description and talk with the supervisor about the work environment and the member's specific duties. In many cases, PH will consult with BE on the type and level of occupational hazard, particularly if data in the case file is not current. After reviewing all this information and researching the hazards as necessary, complete the SF 513 describing the workplace hazards and consult with the installation occupational health consultant physician who will recommend modification of the "standard" AF Form 469, if necessary.

Air Force civilian employees

With the exception of civilian employees who are either retired military members and are enrolled in Tricare Prime Retiree, civil servants who are dependents of active duty members, or dependents of retired military members who have their family enrolled in Tricare Prime Retiree, civilian employees are generally not authorized medical care on base. In these types of cases, supervisors must refer pregnant civilian employees to PH for evaluation.

PH evaluates workplace risks in conjunction with BE, advises the employee of such risks, and reports the risks with recommended techniques for avoiding them to the employee's supervisor by a letter signed by the consulting physician.

Although differences between the active duty and civilian programs arise from differences in eligibility for AF medical care and supporting paperwork, the intent and the end results of the two systems are the same—an efficient worker and a healthy pregnancy.

Education information for nursing mothers

Some toxic substances in a work environment can be passed through breast milk to the nursing infant. Active duty and civilian workers exposed to such substances will not normally be excluded from duty to permit breast-feeding. However, at present, there are no recognized health hazards to the infant if the exposure to the mother is below the OEEL. Even if the AL, one-half the OEEL, is exceeded, as long as the mother is exposed below the OEEL, breast-feeding should not be dangerous. However, when occupational exposures exceed the AL, the mother will be counseled about the advisability of breast-feeding. The decision to nurse in these situations may be based on factors such as toxicity of chemicals involved, the chemical's fat solubility and elimination rate from the body, average daily milk intake by the nursing infant, and the recommended allowable daily intake of the chemical. If the analysis reveals a known health hazard to the infant, a medical recommendation for job accommodation to allow continued breast-feeding can be made.

All in all, these programs related to pregnant and nursing workers are intended to utilize the full working potential of AF women while protecting the health of their child.

221. Hospital employee health program/bloodborne pathogens

According to the OSHA estimates, more than 5.6 million workers in health care–related occupations are at risk of exposure to bloodborne pathogens, such as HIV, hepatitis C virus (HCV), and HBV, and other potentially infectious materials.

OSHA recognizes the need for a regulation that prescribes safeguards to protect these workers against the health hazards from exposure to blood and certain body fluids, including bloodborne pathogens.

Employees covered

The OSHA bloodborne pathogens standard protects employees who may be occupationally exposed to blood and other potentially infectious materials, which include but are not limited to, physicians, operating room personnel, therapists, orderlies, laundry workers, and other health care workers.

Outside of the hospital, firefighters, security forces, life support, and mortuary affairs personnel are also included.

Infectious materials

Blood means human blood, blood products, or blood components. Other potentially infectious materials include human body fluids, such as saliva in dental procedures, semen, vaginal secretions; cerebrospinal fluids visibly contaminated with blood; unfixed human tissues or organs; HIV-containing cell or tissue cultures; and HIV- or HBV-containing culture mediums or other solutions.

Occupational exposure

Occupational exposure means a "reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of the employee's duties."

Determining occupational exposure and instituting control methods and work practices appropriate for specific job assignments are key requirements of the standard. The required written exposure control plan and methods of compliance show how employee exposure can be minimized or eliminated. PH and Infection Control work together to create a written exposure control plan.

Exposure control plan

A written exposure control plan is necessary for the safety and health of workers. At a minimum, the plan must include the following:

- Identify job classifications where there is exposure to blood or other potentially infectious materials.
- Explain the protective measures currently in effect in the acute care facility and/or a schedule and methods of compliance to be implemented, including hepatitis B vaccination and post-exposure follow-up procedures; how hazards are communicated to employees; PPE; housekeeping; and recordkeeping.
- Establish procedures for evaluating the circumstances of an exposure incident.

The written exposure control plan must be available to workers and OSHA representatives and updated at least annually or whenever changes in procedures create new occupational exposures.

Communicating hazards to employees

Training is required for new workers at the time of their initial assignment to tasks with occupational exposure or when job tasks change, causing occupational exposure, and annually thereafter.

Training sessions must be comprehensive in nature, including information on bloodborne pathogens, as well as on OSHA regulations and the employer's exposure control plan. The person conducting the training must be knowledgeable in the subject matter as it relates to acute-care facilities. Specifically, the training program must accomplish the following:

- Explain as well as make a copy of the regulatory text accessible.
- Explain the epidemiology and symptoms of bloodborne diseases.
- Explain the modes of transmission of bloodborne pathogens.
- Explain the employer's written exposure control plan.
- Describe the methods to control transmission of HBV and HIV.
- Explain how to recognize occupational exposure.
- Inform workers about the availability of free hepatitis B vaccinations, vaccine efficiency, safety, benefits, and administration.
- Explain the emergency procedures for and reporting of exposure incidents.

- Inform workers of the post-exposure evaluation and follow-up available from health care professionals.
- Describe how to select, use, remove, handle, decontaminate, and dispose of personal protective clothing and equipment.
- Explain the use and limitations of safe work practices, engineering controls, and PPE.
- Explain the use of labels, signs, and color coding required by the standard.
- Provide a question and answer session on training.

Commercial videotapes are available to meet this training requirement. In addition to communicating hazards to employees and providing training to identify and control hazards, also take other preventive measures to ensure employee protection. Preventive measures, such as hepatitis B vaccination, universal precautions, engineering controls, safe work practices, PPE, and housekeeping measures, help reduce the risks of occupational exposure. Each duty section should address specific job tasks it performs that put employees at risk for exposure and the corresponding preventive measures.

Preventive measures

Personnel can take several actions to help prevent occupational exposure to bloodborne hazards in the workplace. Following the prescribed precautions will help protect health care workers and the patients seen in health care facilities.

Hepatitis B vaccination

The hepatitis B vaccination series must be made available within 10 working days of initial assignment to every employee who has occupational exposure. Employers are not required to offer hepatitis B vaccination to employees who have previously completed the hepatitis B vaccination series, when immunity is confirmed through antibody testing, or if vaccine is contraindicated for medical reasons. Civilian employees who decline the vaccination may request and obtain it at a later date, if they continue to be exposed. Employees who decline to accept the hepatitis B vaccination must sign a declination form indicating that they were offered the vaccination but refused it. All active duty personnel are required to receive the hepatitis B series.

Standard precautions

The single most important measure to control transmission of HBV and HIV is to treat all human blood and other potentially infectious materials ***AS IF THEY WERE*** infectious for HBV and HIV. Application of this approach is referred to as “standard precautions.” Consider blood and certain body fluids from all acute-care patients as potentially infectious materials. These fluids cause contamination, defined in the standard as “the presence or the reasonably anticipated presence of blood or other potentially infectious materials on an item or surface.”

Methods of control

As a PH technician, it is your responsibility to provide occupationally exposed health care workers with the knowledge to safely use the control measures located in their duty section. Some control methods to help the occupationally exposed health care worker remain safe in the workplace include engineering and work-practice controls, PPE, and housekeeping procedures. These control methods are discussed in the following paragraphs.

Engineering and work-practice controls

Engineering and work-practice controls are the primary methods used to control the transmission of HBV and HIV in acute-care facilities. Engineering controls isolate or remove the hazard from employees and are used in conjunction with work practices. PPE also is used when occupational exposure to bloodborne pathogens remains even after instituting these controls. Engineering controls must be examined and maintained, or replaced, on a scheduled basis.

Similarly, work practice controls reduce the likelihood of exposure by altering the manner in which the task is performed. All procedures will minimize splashing, spraying, splattering, and generation of droplets.

Personal protective equipment

In addition to instituting engineering and work-practice controls, the standard requires that appropriate PPE be used to reduce worker risk of exposure. PPE is specialized clothing or equipment used by employees to protect against direct exposure to blood or other potentially infectious materials. Protective equipment must not allow blood or other potentially infectious materials to pass through to workers' clothing, skin, or mucous membranes. Such equipment includes, but is not limited to, gloves, gowns, laboratory coats, face shields or masks, and eye protection.

NOTE: Remember that the selection of appropriate PPE depends on the quantity and type of exposure expected.

Housekeeping procedures

The employer must ensure a clean and sanitary workplace. Decontaminate work surfaces with a disinfectant upon completion of procedures or when contaminated by splashes, spills, or contact with blood, other potentially infectious materials, and at the end of the work shift. Frequently inspect surfaces and equipment protected with plastic wrap, foil, or other nonabsorbent materials for contamination; change these protective coverings when they are found to be contaminated.

Inspect and decontaminate waste cans and pails on a regularly scheduled basis. Clean up broken glass with a brush or tongs; never pick up broken glass with hands, even when wearing gloves. Waste removal from the facility is regulated by local and state laws.

Laundering contaminated articles, including employee lab coats and uniforms meant to function as PPE, is the responsibility of the employer. Contaminated laundry shall be handled as little as possible with minimum agitation. This is accomplished by using a washer and dryer in a designated area on site, or the contaminated items can be sent to a commercial laundry.

Response to an exposure incident

An exposure incident involves specific eye, mouth, or other mucous membrane, non-intact skin, parenteral contact with blood, or other potentially infectious materials that results from the performance of an employee's duties. An example of an exposure incident would be a puncture from a contaminated sharp instrument.

Immediate assessment and confidentiality are critical issues when evaluating an exposure incident. Employees must immediately report exposure incidents to enable timely medical evaluation and follow-up by a health care professional as well as a prompt request by the employer for testing of the source individual's blood for HIV, HCV, and HBV. The "source individual" is any patient whose blood or body fluid is the source of an exposure incident to the employee.

At the time of the exposure incident, *the exposed employee must be directed to a health care professional*, usually in the emergency room or acute-care clinic. At that time, a baseline blood sample is drawn from the employee, if he or she consents.

The source individual also needs to have blood tests done. This is usually coordinated by PH. The provider refers the patient to PH via SF 513. PH interviews the employee to determine job duties, how the exposure occurred, route of exposure, relevant employee medical records (such as hepatitis B status) and other exposure risk factors.

Tuberculosis

Tuberculosis (TB) is also a concern for hospital workers, and the AF requires all MTFs to have a TB exposure control plan. Elements of the plan are based on that MTF's TB risk assessment. USAF

medical personnel are required to have a baseline TB skin test, unless they have previously tested positive. See CDC guidance for more detail.

Training and education

Unit managers/supervisors will ensure the completion of a unit-specific orientation, on-the-job-training, and ongoing in-service education to include the appropriate documentation per regulations on infection control for assigned personnel.

222. Ergonomics

Ergonomics is the science that relates the capacity of the workers, all aspects of the job, and the work environment. Most industrial operations rely on systems that depend on human-machine interface. When the machine component fits with the human component, work can be done efficiently; if not, work-related musculoskeletal disorders may result. This section will describe some work-related musculoskeletal disorders (WMSD) and provide information on establishing an ergonomics program.

Work-related musculoskeletal disorders

WMSD are health disorders arising from repeated biomechanical stress due to ergonomic hazards. Simply put, the symptoms of pain, tingling, numbness, and/or weakness associated with WMSDs are the result of irritation (inflammation) and swelling of nerves, tendons, ligaments, and linings of joint spaces from repeated overuse of the affected structures.

These health disorders are more specifically defined as a class of neuromuscular disorders involving damage to muscles, tendons, tendon sheaths, and nerves. The following are examples of common WMSDs:

WMSD	Explanation
Carpal tunnel syndrome	A disorder of the hand characterized by pain, weakness, and numbness in the fingers, caused by nerve compression in the wrist. Carpal tunnel syndrome occurs when the median nerve is compressed within the carpal tunnel area. The nerve can be trapped when the tendons become inflamed or swell when the sheath becomes irritated and inflamed. This may result from direct pressure on the nerve from hard, sharp edges of work surfaces or tools due to repetitive motion.
Low-back pain	Currently felt to be a WMSD where repeated bending, lifting, and twisting of the lower back results in cumulative microtrauma. An aggravating event (e.g., slip, trip, fall, awkward lift) often causes an acute episode to occur.
Tendonitis	An irritation (inflammation) of a tendon resulting from repeated tensing of that muscle/tendon group.
Lateral epicondylitis (tennis elbow)	An irritation (inflammation) of the tendons attached on the outside of the elbow from activities that have jerky throwing motions or impact (e.g., hammering).
Medial epicondylitis (golfer's elbow)	An irritation (inflammation) of the tendon attachments on the inside of the elbow resulting from activities that require repeated or forceful rotation of the forearm and bending of the wrist at the same time.
Tenosynovitis	An irritation (inflammation) of the tendon and the lining of the smooth sheath surrounding the tendon resulting from repeated movement of the tendon in the sheath.
Synovitis	An irritation (inflammation) of the inner lining of the membrane surrounding a joint.
Stenosing tenosynovitis of the finger	Results from a tendon surface becoming irritated and rough. If the tendon sheath also becomes inflamed and presses on the tendon, a progressive constriction of the tendon can occur, resulting in a loss of free movement in that joint area. For example, "trigger finger" is a

WMSD	Explanation
	condition where the tendon sheath of the affected finger is sufficiently swollen so that the tendon becomes locked in the sheath, and attempts to move the finger will result in a jerking or snapping motion in that finger.
DeQuervain's disease	A stenosing tenosynovitis affecting the tendons on the side of the wrist and base of the thumb. Constriction of these tendons tends to pull the thumb back away from the hand.

Establishing an ergonomics program

The goal of an ergonomics program is to eliminate or reduce worker exposure to conditions that do not meet their capabilities, do not consider worker limitations, and lead to WMSDs and related injuries and illnesses.

According to OSHA, the implementation of an effective ergonomics program requires commitment by top management, a written program, worker involvement, and regular program review and evaluation. The major program elements to effectively deal with ergonomic hazards are worksite analysis, hazard prevention and control, medical management, and training and education.

Worksite analysis

A worksite analysis is the first step for effectively dealing with ergonomic hazards and is done to determine those tasks that place workers at risk of developing WMSDs. An individual trained to recognize ergonomic risk factors identifies the following:

- Existing hazards and conditions.
- Operations that create hazards.
- Areas where hazards may develop.

Hazard prevention and control

Some methods that can be used to prevent and control hazards would be engineering and administrative controls.

Engineering control

Engineering control is the primary control method and includes designing workstations, work methods, and tools to prevent or control hazards. These include design workstations that are easily adjustable and designed for specific tasks. Proper work methods reduce or avoid awkward, extreme, or static postures, repetitive motion, and excessive force. Tools must fit properly and not force awkward postures.

Work practice controls includes using proper work techniques, providing new employees with a conditioning period, monitoring all levels of operations, and modifying controls when the dynamics of the workplace change.

Properly selected PPE will not increase ergonomic stressors. Incorrect or ill-fitting PPE may actually make stressors worse. Provide this equipment in a variety of sizes, accommodate the physical requirements of workers on the job, and do not contribute to extreme postures and excessive forces.

Administrative controls

Administrative controls include reducing the duration, frequency, and severity of exposure to ergonomic stressors. Reduce the number of repetitions per employee by decreasing production rates or limiting overtime. There are some other things that can be done:

- Increase cycle time.
- Maintain equipment.

- Rotate to a nonstress task.
- Increase type and variety of task.
- Increase number of employees assigned to a task.
- Provide rest periods to relieve fatigued muscle-tendon groups.
- Maintain effective housekeeping to eliminate slip and trip conditions.

Medical management

Medical management requires that health care providers be knowledgeable in preventing and treating WMSDs. A medical management program for WMSDs provides for early identification, evaluation, and treatment of signs and symptoms. It addresses the following:

- Systematic monitoring.
- Conservative treatment.
- Conservative return to work.
- Adequate staffing and facilities.
- Early recognition and reporting.
- Injury and illness recordkeeping.
- Systematic evaluation and reporting.

Training and education

The purpose of training and education is to inform employees about the ergonomic hazards to which they may be exposed so they are able to actively participate in their own protection. At a minimum, provide training for the following individuals:

- Managers.
- Supervisors.
- HCPs.
- Process engineers and maintenance personnel.
- All employees, with high-risk employees receiving prioritized training.

Proper training covers the varieties of WMSDs and the risk factors that cause or contribute to them. It also covers how to recognize and report symptoms and prevent WMSDs.

In addition, new employees need to receive an orientation and hands-on training before starting tasks with potential ergonomic stressors.

223. Documentation

To determine how workplace surveillance activities are documented at your base, you must contact BE for current guidance.

The federal government is required to keep good documentation on all workplaces where identified hazards exist. This documentation is used to protect the government against legal action and claims that are unjustified. The government must prove its case and to do this, the documentation must be available. The only way to have this documentation available is to keep copies of all the important records throughout the years of surveillance of the shop. This documentation is kept in a file known as the industrial case file.

Case files

As BE completes surveys and records the data into the OEH-MIS, it provide results to PH, where it maintain the survey in the case file pertinent to each shop. The case file is to a workplace what a medical record is to a worker. Therefore, each industrial shop in which there are significant physical,

chemical, or biological exposures has its own case file. On the other hand, those workplaces with no significant physical, chemical, or biological exposures identified are often combined into one file to cover an entire building or facility. PH may also use some form of electronic database to document industrial workplace data. Contact the noncommissioned officer in charge (NCOIC) of PH to determine the specific method of documentation used in your office.

Coding systems

Each case file must be uniquely identified with a descriptor equivalent to a worker's Social Security number. The descriptor is called the workplace identifier code (WIC) and consists of three sets of four digits. The first set of four digits designates the base where the workplace is located. The middle set of digits designates the type of organization, such as the hospital, aircraft maintenance, or civil engineering; and the work function, such as welding, painting, or carpentry. The last set of digits designates the numerically sequenced case-file number, locally assigned by the BE section. The WIC is used on all forms governed by the OEHP. When a form is used that does not have an entry space for the WIC, the code is entered in the upper left margin of the form. The major advantage of the WIC descriptor is that data can be stored, sorted, and retrieved manually, or in a future-automated repository.

Recordkeeping

Recordkeeping is one of the most important parts of the OEHP. To accurately document such things as training, industrial shop visits, medical examination findings, and other miscellaneous information, it is extremely important to document and record your findings for each industrial workplace.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

217. Shop visits

1. State the most important reason why PH performs shop visits in industrial workplaces.

2. List four more reasons why PH performs shop visits in industrial workplaces.

3. Who determines the frequencies for industrial shop visits at each base?

4. Where should you document the results of each shop visit?

218. Health education and training

219. Where do you file the form used to document occupational health education?

220. Who conducts nonsupervisory AFOSH training?

221. Where can you go to get an occupational health training film?

219. Trend analysis

1. What is the definition of an occupational illness?

2. What is the purpose of the occupational illness or injury program?

3. What form is used to report an occupational illness or injury?

4. Who assigns the RAC for a hazard within a workplace?

5. What other sources can be used for trend analysis data?

6. Where do you document the results of a trend analysis?

220. Fetal protection

1. List five examples of mutagens that are used in industry.

2. Why is ionizing radiation hazardous to a fetus?

3. What criteria must be met for a pregnant employee to continue working in an X-ray exposure environment?

4. What guidance does AFI 44–102 provide for pregnant workers?

5. What does a HCP use to request a workplace evaluation of a pregnant active duty employee?

6. Who refers pregnant civilian employees to PH for evaluation?

221. Hospital employee health program/bloodborne pathogens

1. Other than hospital personnel, who is covered by the OSHA bloodborne pathogens standard?

2. What is considered an occupational exposure to bloodborne pathogens?

3. How often is training required for employees exposed to bloodborne pathogens?

4. What is meant by “standard precautions”?

5. List three methods of control for bloodborne pathogens.

6. What should an employee do immediately if an exposure incident occurs?

222. Ergonomics

1. What is ergonomics?

2. What parts of the body experience irritation and inflammation that result in symptoms associated with WMSD?

3. What is the goal of an ergonomics program?

4. List four major program elements that effectively deal with ergonomic hazards.

223. Documentation

1. Who should you contact to determine how industrial workplace data is documented at your base?

2. What does the first set of four numbers in the WIC represent?

3. What does the last set of digits in the WIC represent?

Answers to Self-Test Questions

215

1. AFI 48–145, *Occupational and Environmental Health Program.*
2. Suggested medical surveillance procedures for many chemical, physical, or biological hazards and summarizes the existing medical surveillance requirements specified in Title 29–Labor, *Code of Federal Regulations*.
3. Yes.

216

1. Preplacement or baseline examination.
2. OEHWG.
3. Examination types, frequency, and scope of examinations.

217

1. To become familiar with the industrial operations of the shop and to evaluate compliance with occupational safety and health requirements.
2. Reaffirm the BE survey results, review how PPE such as ear plugs, ear muffs, and eye goggles are used in the shop, review and reemphasize the need for occupational medical examinations for shop personnel, ensure that all personnel were trained as required and that the specific training was documented properly, evaluate environmental sanitation, validate shop rosters with the supervisors.
3. OEHWG.
4. Chronological Record of Workplace Surveillance (ASIMS computer-generated AF Form 2754) form.

218

1. Industrial case file.
2. Workplace supervisor.
3. Your base audiovisual library.

219

1. Any condition or disorder, other than one resulting from an occupational injury, caused by exposure to environmental factors associated with the employment.
2. To ensure appropriate evaluation and follow-up of each occupational illness or injury to prevent recurrence.
3. Initiate in AFSAS the AF Form 190, Occupational Illness/Injury Report.
4. The BE.
5. AF Form 469, DD Form 2215, DD Form 2216, the workplace-specific OEHED form, poor indoor quality air questionnaire, emergency room log book, and medical records.
6. The Chronological Record of Workplace Surveillance form.

220

1. Ethylene oxide; acrylonitrile and vinyl chloride; trichloroethylene; and metals such as cadmium, manganese, arsenic, and nickel compounds.
2. It can disrupt cellular DNA, which can cause serious developmental defects in the fetus.
3. The employee must be enrolled in the TLD or Film Badge program and the base must receive a monthly telephone report of the accumulated radiation dosage.
4. Basic duty restrictions.
5. Initiate a SF 513, Medical Record—Consultation Sheet, providing the request to PH.
6. Supervisor of the pregnant employee.

221

1. Firefighters, security forces, life support, and mortuary affairs personnel.

2. A reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood, or other potentially infectious materials that may result from the performance of the employee's duties.
3. At the time of their initial assignment to tasks with occupational exposure or when job tasks change, causing occupational exposure, and annually thereafter.
4. Treating all human blood and other potentially infectious materials as if they were infectious for HBV and HIV.
5. Engineering and work practice controls, PPE, good housekeeping procedures.
6. Immediately report exposure incidents to enable timely medical evaluation and follow-up by an HCP.

222

1. The science that relates the capacity of the workers, all aspects of the job, and the work environment.
2. Nerves, tendons, ligaments, and linings of joint spaces.
3. To eliminate or reduce worker exposure to conditions that do not meet worker capabilities, do not consider worker limitations, and lead to WMSD and related injuries and illnesses.
4. Worksite analysis, hazard prevention and control, medical management, training and education.

223

1. The NCOIC of PH.
2. The base where the workplace is located.
3. The numerically sequenced case-file number.

Complete the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter.

29. (215) Which document, when it directs specific types of medical surveillance for a hazard, supersedes all other Department of Defense (DOD) or Air Force directives on the subject?
    a. AFI 90–821, *Hazard Communication (HAZCOM) Program*
    b. AFI 48–145, *Occupational and Environmental Health Program.*
    c. DOD 6055.05–M, *Occupational Medical Examinations and Surveillance Manual*.
    d. Title 29 - Labor, *Code of Federal Regulations*, *Part* 1910, *Occupational Safety and Health Standards.*

30. (215) A condition requiring a medical examination would be if personnel
    a. have skin contact with substances having potential for skin absorption, and a significant Occupational and Environmental Health Working Group (OEHWG) concern exists.
    b. are exposed to 8-hour occupational exposure limit time-weighted average concentrations *less* than one-half the action level.
    c. are exposed to *less* than half of the action level for a specific chemical *not* having a potential for skin absorption.
    d. are being protected from exposures *less* than the occupational exposure limits by using personal protective equipment.

31. (216) What is the medical examination called that is designed to evaluate a worker's health status before exposure to hazards in the workplace?
    a. Baseline.
    b. Termination.
    c. Out-of-cycle.
    d. Special purpose.

32. (217) Which document contains important safety information about hazardous materials used in workplaces?
    a. Safety Data Sheet.
    b. Occupational Health Surveillance Letter.
    c. Industrial Shop Chemical Inventory List.
    d. Bioenvironmental Engineering Industrial Shop Criteria.

33. (218) Which topics should be included in occupational health supervisor's training?
    a. Individual responsibility for safety and health.
    b. Work unit policy on occupational safety and health.
    c. Individual employee procedures for reporting hazardous operations/conditions.
    d. Review of Air Force policy of all relevant aspects of the Air Force occupational safety and health program.

34. (218) Who can workplace supervisors request assistance from in regards to training for employees?
    a. Bioenvironmental Engineering
    b. Public Health
    c. Base Safety.
    d. Fire Chief.

35. (219) An example of an occupational illness is
    a. an animal bite.
    b. a chemical burn from a spill.
    c. a metal sliver in a worker's hand.
    d. a heatstroke due to a hot work environment.

36. (219) When an investigation is necessary for a chemical exposure and an Occupational Illness Report has been initiated, who is the office of primary responsibility (OPR) for corrective action within the shop?
    a. Public Health.
    b. Base Safety Office.
    c. Armstrong Laboratory.
    d. Bioenvironmental Engineering.

37. (220) Which work center has the lowest amount of hazard potential for a developing fetus?
    a. Medical X-ray.
    b. Corrosion control shops.
    c. A radar and communications site.
    d. A shop with aluminum chloride or mercury exposure.

38. (220) Air Force pregnant civilians are referred to Public Health for a workplace evaluation by the
    a. Military Personnel Flight.
    b. supervisor of the pregnant employee.
    c. health care provider at an off-base establishment.
    d. health care provider at USAF medical treatment facility.

39. (221) "A reasonably anticipated skin, eye, mucous membrane, or parenteral contact with blood or other potentially infectious materials that may result from the performance of an employee's duties," is the definition for an occupational
    a. injury.
    b. illness.
    c. exposure.
    d. related incident.

40. (221) What are the two *primary* methods used to control the transmission of the hepatitis B virus (HBV) and the human immunodeficiency virus (HIV) in acute care facilities?
    a. Engineering controls and work practice controls.
    b. Housekeeping procedures and engineering controls.
    c. Work practice controls and personal protective equipment.
    d. Housekeeping procedures and personal protective equipment.

41. (221) A patient whose blood or body fluid is the source of an exposure incident to the employee is referred to as the
    a. index case.
    b. primary case.
    c. source individual.
    d. first-line infection.

42. (222) Which element of an effective ergonomics program is the *first* step for effectively dealing with ergonomic hazards?
    a. Worksite analysis.
    b. Medical management.
    c. Training and education.
    d. Hazard prevention and control.

43. (222) What is the primary control method used to prevent and control hazards?
    a. Administrative controls.
    b. Engineering controls.
    c. Biological controls.
    d. Industrial controls.

44. (223) If a form is used in the Occupational & Environmental Health Program (OEHP) and it does *not* have an entry space for a workplace identifier code, where (if anywhere) should the code be placed?
    a. Upper left margin of the form.
    b. Upper right margin of the form.
    c. Lower right margin of the form.
    d. Nowhere, not required to be placed on the form.

Please read the unit menu for unit 4 and continue ➔

Student Notes

Unit 4. Hearing Conservation Program

NOISE IS THE fastest growing and most widespread form of pollution in the United States, affecting private homes as well as the workplace. It affects millions of people every day. Because many people cannot escape noise in their daily lives, it is important they be aware of its adverse effects and how to prevent or limit potentially hazardous noise exposure.

Noise can harm people in many ways—its effects vary and often include the loss of hearing. Many people do not appreciate the value of hearing until it is lost. Unlike such obvious injuries as fractures, amputations, and blindness, hearing loss is painless and often goes unnoticed until communication is affected. And, worse yet, unlike broken limbs, it is usually uncorrectable.

Frequently, loud noise levels seem enjoyable. For instance, individuals are often exposed to loud noises at concerts, race tracks, and sporting events. How many times have you attended such events and worn hearing protection? Commonly, the answer is, “Never!”

The effect on hearing from these occasional exposures is usually temporary; therefore, most people neither use nor understand hearing protection. Yet, inescapably, noise exposure generates problems.

The Air Force has set up a program to protect personnel from the harmful effects of hazardous noise—the AF Hearing Conservation Program (HCP). PH has primary responsibility for many elements of this program. This unit will discuss your responsibility in this program, including fitting hearing-protection devices, performing hearing tests, and educating noise-exposed personnel. You will also review human audition to better understand the effects of noise on hearing. This unit is intended to provide an overview of the HCP. For further specifics of the HCP, consult applicable publications and operation manuals.

4–1. Hearing Conservation Program

Noise-induced hearing loss can be identified by administering audiograms to persons exposed to occupational noise. Further hearing loss can be prevented by worker education, use of hearing protection devices (HPD), or removing the employee from the noise exposure. Individuals enrolled in the HCP must have a reference and annual audiograms to identify hearing loss before it becomes

severe. The audiogram is important because it reflects the status of the auditory system and measures the undesirable effects of noise. Before you get into the workings of the HCP, take time to review the principles of sound and how the ear operates.

224. Physical properties of sound

To understand the function of the hearing mechanism it is necessary to understand the basic properties of sound.

- Acoustics is a word we often associate with sound. It means the study of the measurement and control of sound. In the Air Force, our BE are our *acousticians*.
- Noise is considered to be any unwanted sound.
- Sound is the sensation that results from the stimulation of the auditory mechanism by pressure variations in any “elastic” medium, like air, water, or solid.

The pressure variations may arise from a vibrating object, such as your vocal cords, or from air turbulence, as when you whistle. As the object vibrates, the surrounding air molecules are set in motion and bump into one another in a chain reaction, traveling through the air and causing the eardrum (tympanic membrane) to vibrate in response. How fast the object vibrates determines the frequency or pitch of the sound.

For vibrations to be considered a sound, the process requires three elements:

- First is the sender, which consists of the source of vibration and energy, needed to initiate the vibration.
- Next, a medium to carry the pressure change, gas, liquid or solid (sound cannot travel through a vacuum).
- Finally, there must be a mechanism (ear or recording device) to be the receiver of the vibrations. For example, to answer that timeless question of, “If a tree falls in the woods and no one is around, does it make a sound?” No, it is only making vibrations because there is no receiver.

The transmission of sound, or how it travels through the medium, occurs as a vibrating sound source causes alternate pressure changes in the molecules surrounding it. A series of alternating compressions (high pressure) and rarefactions (low pressure) make up a sound wave. One complete compression and one complete rarefaction is called a cycle. The speed at which sound waves travel depends on the medium; the denser the medium, the faster sound travels.

Along with frequency, three important elements relating to sound include intensity, duration, and distance. These are briefly explained in the following table as they relate to the physical properties of sound and the human auditory system.

Factor	Explanation
Frequency	Frequency, or pitch of a sound, is expressed in hertz (Hz). The more vibrations per second, the higher the frequency or pitch. For example, 500 Hz is a low frequency sound; 6000 Hz is a high frequency sound. The frequencies of most importance for the HCP are 500, 1000, 2000, 3000, 4000, and 6000 Hz.
Intensity	Intensity is perceived as the loudness of a sound and is expressed in decibels (dB). The higher the number, the louder the intensity or volume of sound. It is a relative measure, because it compares the measured sound with a reference sound (i.e., normal hearing, the softest audible pressure change, etc.).
Duration	Duration refers to the length of time an individual is exposed to sound. For the purposes of hearing conservation, duration is considered the amount of exposure time to hazardous noise. When calculating dosage of allowable exposure for noise-exposed personnel, that duration is an important element.

Factor	Explanation
Distance	The measure of space between the noise producing object and the individual exposed to it. The intensity of sound decreases as the distance increases.

Understanding the variable dimensions of sound can help you devise ways of protecting your hearing while still allowing you to conduct your work and enjoy your recreational activities. Now, let's look more closely at the hearing mechanism.

225. Structure and function of the ear

The ear involves two major sensory functions, hearing and equilibrium. The ear is an extremely delicate, highly sensitive organ that operates with great efficiency. It is important for the Occupational Hearing Conservationist (OHC) to have a basic appreciation and understanding of human audition so we can communicate knowledgably with our customers. The ear is usually covered in three anatomical divisions—outer ear, middle ear, and the inner ear.

Outer ear

The outer ear is made up of the external ear, also called the pinna or auricle. The pinna collects sound waves and funnels them into the external auditory canal, or ear canal. The sound wave travels down the ear canal to vibrate the tympanic membrane (eardrum); it is here at the tympanic membrane that the outer ear terminates.

Middle ear

The middle ear begins at the tympanic membrane which stretches across the ear canal and separates the outer ear from the middle ear. Behind the tympanic membrane is an air-filled cavity containing three ossicles, or small bones, (malleus, incus, and stapes). The tympanic membrane vibrates in response to sound waves. These vibrations are then transferred through the ossicles to the inner ear.

The Eustachian tube runs from the middle ear to the pharynx and is important for equalizing pressure between the middle ear and the outside environment.

Inner ear

The inner ear contains the cochlea, the end-organ of hearing; and the semicircular canals, which control the equilibrium (balance). The inner ear starts at the oval window, which the stapes is attached to and the doorway into the cochlea. The cochlea contains receptors (hair cells) that convert the vibrations from the middle ear into electrical signals that are transmitted to the brain by the auditory nerve. The round window (attached to the cochlea) is a membrane that allows the fluid in the cochlea to move when the oval window is stimulated. The inner ear ends with the auditory nerve. Spanning the length of the cochlea is a structure called the "basilar membrane," which is lined with elastic fibers of varying lengths, and is surrounded with fluid. As vibratory ripples pass through the fluid, the elastic fibers are pushed back and forth. These movements deflect the hair-like nerve endings that project from the sensory cells of the organ of Corti. In turn, the movements of the sensory "hair cells" generate chemical and electrical changes within the cell causing sensory nerve impulses to be sent to the brain.

The basilar membrane is "tonotopic," arranged anatomically according to the frequency of stimulation. This means that the hair cells in the bottom or base of the cochlea are sensitive to high frequencies, and hair cells in the top or apex of the cochlea are sensitive to low frequencies.

Sense of balance

As previously mentioned, equilibrium is controlled by the semicircular canals (attached to the base of cochlea) and related structures. There are three fluid-filled semicircular canals, one in each plane at right angles to each other. When the body moves, fluid inside the ear canals move, stimulating receptor cells. Equilibrium systems can be fooled when a person experiences vertigo, or a state of

dizziness. Pilots are taught to trust their instruments rather than “fly by the seat of their pants,” because what feels right may actually be wrong.

226. Roles and responsibilities

Line officers must follow the chain of command to solve problems related to hazardous noise, beginning with the individual and working up to the base commander. Individuals, in turn, are responsible for wearing proper hearing protection when exposed to noise, and supervisors must promote the required use of such hearing protection by subordinates. The MTF commander implements support under the provisions of AFOSH STD 48–20, *Occupational Noise and Hearing Conservation Program*. The formal education of personnel in the HCP is the primary responsibility of the PH flight. *Informal* education in the program should be practiced by all other sections, as well as emphasized by work center supervisors.

Bioenvironmental Engineering

BE conducts the noise assessment. BE evaluates noise in work centers, as well as identifies exposure and risk in hazardous noise areas, jobs, and situations. Noise control is the responsibility of BE personnel. BE makes noise control engineering recommendations. PH will fit and educate noise-exposed personnel with/about hearing protection.

Public Health

PH is the designated OPR for the HCP. As the OPR, PH has many duties including fitting hearing protective devices, performing audiometric testing/monitoring, educating noise-exposed personnel, monitoring program effectiveness, and monitoring patient no-show rates.

PH conducts the audiometric testing, as well as certain calibration procedures. PH personnel, who are certified USAF Hearing Conservationists, are authorized to perform pure-tone air conduction audiometry, fit members with ear plugs, and conduct lighted ear inspections. There are, however, particular requirements for education and training to work as a hearing conservationist. Initial certification for PH personnel, or the 4E career field, is through the PH Apprentice Course within the USAF School of Aerospace Medicine (USAFSAM). As part of your training, you received a background in physical acoustics, the effects of noise, audition, audiometric testing, and hearing protection. These topics helped prepare you to perform your hearing conservation duties properly. The Air Force, DOD, and federal guidelines require this certification and are specified in AFOSH STD 48–20. This certification must be renewed every five years by completion of a recertification course. Certification serves as legal validation for you to perform in this capacity.

We must stress that there are limitations to the role that hearing conservationists play. They are not audiologists. Therefore, they must not perform tests for which they are not trained (i.e., bone conduction, masking, etc.). This is specified in AFOSH STD 48–20. Remember, only certified personnel can conduct HCP audiometric testing. It is then a joint decision of the health care provider and PH personnel to provide the best course of action for workers based on the results of audiometry and other applicable guidelines.

Program effectiveness

The PH office is responsible for reporting program effectiveness at the installation Environment, Safety and Health (ESOH) council annually and the OEHWG monthly. Monitoring compliance rates, STS rates, and permanent threshold shift (PTS) rates are necessary to provide meaningful information to this important safety functionality. Ensure that the appropriate Defense Occupational and Environmental Health Readiness System (DOEHRS)-Hearing Conservation (HC) documentation is backed-up daily and exported to the DOEHRS-Data Repository (DR) daily.

Monitoring the overall effectiveness of the HCP outcome measures is accomplished by performing an annual trend analysis with the use of test compliance measures, temporary threshold shift (TTS) and PTS rates, as well as no-show rates.

PH must track this information and use the data to determine management actions to improve the HCP. Compliance rates for audiograms shouldn't fall below 90 percent. A generally acceptable no-show rate is less than 10 percent. If any rate on your installation falls outside of the norm, you may need to investigate to find out if there are any problems leading to the hindrance of the overall program effectiveness.

227. Hearing Conservation Program management

The Air Force began a comprehensive HCP in 1956. Revised programs were introduced in 1973 and again in 1982. Today, the Air Force has improved its programs so that AFOSH STD 48–20 implements policy to either meet or exceed those required in OSHA's Title 29, CFR, 1910.95, *Occupational Noise Exposure*, and the DODI 6055.12, *Hearing Conservation Program (HCP)*.

Further, AFOSH STD 48–20 not only applies to all AF active duty personnel but also to Air Reserve (AR) and Air National Guard (ANG), collectively referred to as Air Reserve Component (ARC), as well as all AF civilians.

Hearing conservation program

The primary purpose of AFOSH STD 48–20 is to outline assigned responsibilities and give guidance on how to conduct the HCP. An effective HCP is not the sole responsibility of any one section or organization. Although the PH flight is responsible for the overall management of the HCP, there are many participants in the program, each with an important role.

Noise

Workers exposed to high levels of noise can be affected in many ways. The worker exposed to high noise levels for a short time can exhibit a temporary hearing loss or threshold shift. This loss of hearing can be recovered shortly after by removing the noise source or by removing the worker from the source. In general, most of this recovery occurs within 1–2 hours after exposure, with complete recovery occurring within approximately 14–16 hours. If the worker is continually exposed to excessive noise for a long period of time, the temporary threshold shift can become permanent.

The temporary hearing loss exhibited when the ear is exposed to excessive noise is in itself an alarm mechanism. It serves to warn the worker that unless something is done, a more permanent hearing loss may result. When more permanent hearing loss begins, it can be diagnosed in the 3000–6000 Hz frequency range (high frequency sound). Periodic audiometric tests can identify threshold shifts in this frequency range, thus allowing corrective action before a hearing loss that may affect the worker's ability to understand voice communication at 2000–3000 Hz.

Motivation to prevent hearing loss

Preventing hearing loss is not as easy as it may seem; there are many obstacles to overcome to have an effective program. The obstacles begin with the noise itself. Since the hazards of noise exposure are not apparent to most people, self-motivation to wear hearing protection is almost nonexistent. Hearing is basically an unappreciated sense until it is lost! In our daily lives, we do not think about how wonderful it is to hear the world around us and, therefore, we do not place any special value on our hearing. However, hearing loss from noise exposure is insidious! By the time people realize they have damaged hearing, they cannot do anything to recover it.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

224. Physical properties of sound

1. List three important elements relating to sound?

2. What unit is used to measure frequency?

3. What frequencies are most important to the HCP?

225. Structure and function of the ear

1. What are the two major sensory functions of the ear?

2. After the auricle or pinna collects sound waves, where are they funneled?

3. In what part of the ear are the ossicles located?

4. What part of the basilar membrane is sensitive to high frequency sounds?

226. Role and responsibilities

1. Who is responsible for the formal education of personnel?

2. Who conducts noise assessments?

3. What are the areas of responsibility of PH?

4. How is initial certification for a USAF Hearing Conservationist accomplished by the 4E?

5. Who determines the best course of action for workers based on the results of audiometry?

6. What is included in monitoring the overall effectiveness of the HCP?

227. Hearing conservation program management

1. What is the purpose of AFOSH STD 48–20?

2. When more permanent hearing loss begins, at what range of frequency can it be diagnosed?

4–2. DOEHRS-HC

The DOEHRS-HC database is a tri-service application developed specifically for DOD. This enables accurate hearing conservation data analysis for each branch of service. The database is not used by the civilian sector.

228. Program management database

The DOEHRS-HC is a database application used to test hearing and manage the HCP data within the DOD. The system automates hearing test procedures and provides reporting capabilities as well as maintains standards throughout all branches of the DOD. DOEHRS-HC analyzes the test results and determines whether a significant hearing loss exists or if changes in hearing have occurred. This system is required when performing any audiometric testing for DOD HCPs. The DOEHRS-HC software is frequently updated. Technicians would be well advised to consult the user's manual and updates on the website on a regular basis.

Another system that is used in the DOD HCP is the DOEHRS-DR. The Data Repository is responsible for maintaining the DOD-wide database comprising data exports from DOEHRS-HC sites throughout the world. Mandatory submissions of data can be queried to generate reports or retrieve individual audiometric results. The AF's Data Repository team at the USAFSAM's Epidemiology Consult Service (PHR) is located at Wright Patterson AFB, Ohio.

Hearing Conservation Diagnostic Centers (HCDC) are set up in regional areas and are staffed with at least an otolaryngologist and an audiologist. An HCDC gives direct clinical support to referrals for the HCP. Referral to an HCDC is governed by AFOSH STD 48–20 and done with the use of an AF Form 1672, Hearing Conservation Diagnostic/Center Referral, or DOEHRS-HC referral forms. Patients should not be referred to the HCDC without a referral form, medical records, any pertinent noise exposure data, and current job description. Following the actual HCDC evaluation, the HCDC will provide guidance as to the disposition of the patient. Authorized HCDCs are listed in AFOSH STD 48–20.

229. Perform and record

It's very important to correctly document all aspects of the audiogram process. This data is crucial in identifying hearing loss, findings from audiograms, and for historical data. The lack of documentation could lead to improperly diagnosing hearing loss or huge financial obligations for the DOD.

Noise-exposed personnel

USAF personnel who are occupationally exposed to potentially hazardous noise are placed on the HCP. PH plays a major role in the managing of the HCP. PH technicians are members of the OEHWG. According to AFI 48–145, *Occupational and Environmental Health Program*, PH is also responsible for completion of the COHER form using the ASIMS Web application. PH provides education and training, completes both the reference and periodic audiograms, performs lighted ear inspections, and provides ear plug fitting on noise-exposed personnel.

The following paragraphs are summaries of each task listed above. These summaries are intended only to supplement, not replace, guidance in AFOSH STD 48–20.

Management of the HCP

PH tracks and monitors personnel on the HCP and exam compliance. They are certified to conduct pure tone air conduction audiometric testing, lighted ear inspections, and ear plug fittings through a Council for Accreditation in Occupational Hearing Conservation (CAOHC) accredited course. They are also required to report the information that they gather on the HCP to a variety of sections throughout the installation as well as federal authorities.

OEHWG member

As a member of the OEHWG, PH provides consultation on recommended Medical Surveillance Examinations (MSE) for hazardous noise-exposed personnel. They document these recommendations on the COHER, along with the education and control measures, and present it during the OEHWG. PH also reports trends, information on shop visits, and concerns pertaining to the HCP during this meeting.

Clinical occupational health exam requirements

The COHER is created and updated by PH after BE accomplishes a new or updated on the AF Form 2755, Occupational and Environmental Health Exposure Data. The information on hazardous noise and control measures BE gathers is documented on this form. BE gives that information to PH to research what examinations are required by OSHA, DOD, and the AF. PH documents this information on the COHER.

Training and education

Training and education is extremely important when dealing with preventative medicine. With the HCP, PH not only conducts training and education, they record it and keep the industrial shops on the installation informed on updates to regulations, training opportunities, and technical guidance. Shop supervisors, as well as employees, should be educated on the overall outline of the HCP, to include the purpose of audiograms.

Education for the HCP is mandatory for initial entry into the program and must be accomplished by PH within 30 days of beginning duties in hazardous noise. It is also mandatory that hazardous noise-exposed personnel are educated on an annual basis, which is completed by the employee’s shop supervisor and documented on an AF Form 55, Employee Safety and Health Record, or equivalent. The shop supervisor will receive annual supervisor training from the PH office.

The training requirements that must be covered on an annual basis are listed in the federal, DOD, and AF standards.

Reference audiogram

Monitoring audiometry is only one part of an effective HCP. Regular hearing tests are used to identify noise-related changes in hearing. Certified technicians compare annual hearing test results to baseline tests to look for STS. Early identification allows for early intervention.

All personnel who are exposed to hazardous noise areas must have a reference audiogram.

Reference audiograms provide a baseline audiogram used to compare with subsequent audiograms to determine if hearing loss has occurred. It is preferable for workers to receive reference audiograms *before* they begin working in hazardous noise duties, but they must be accomplished within 30 days of starting the job. As a result, it is best for the individual to schedule within the appropriate time frame. The reference audiogram is documented on DD Form 2215, Reference Audiogram.

An individual must meet the following prerequisites before reference testing is accomplished and considered valid.

Noise free

Personnel must be noise free for at least 14 hours before testing. “Noise free” means no exposure to noises greater than 72 dB, with or without hearing protection. As a rule of thumb, background noise that requires a raised voice to be heard at a distance of three feet probably exceeds 72 dB. In the AF HCP, employees may not wear HPDs to make themselves “noise free.”

Free from ear, nose, and throat problems

Individuals must be free from ear, nose, and throat (ENT) problems. Noise-free audiograms (NFA) must be preceded by otoscopic screening to determine if any condition exists that could interfere with obtaining accurate hearing thresholds. The technician should ask the patient if he or she has any ENT problems. Most importantly, use common sense. If an ENT problem that could affect hearing is suspected, delay the testing until it is resolved.

Hearing tests

Previous military entrance processing station (MEPS) or other entrance station records cannot be used as a reference since they are not legal hearing conservation documents.

During the reference audiogram appointment, an AF Form 1753, Hearing Conservation Examination, must be completed.

Individuals with test results rating an H–1 profile may begin duties in hazardous noise. Individuals with greater than an H–1 profile must undergo a fitness and risk evaluation to determine if they have adequate hearing to perform the required duties and to ensure they will not be a safety risk to themselves or others. The examining practitioner will make the final recommendation. Profile definitions are described in the following table.

Profile	Explanation						
H–1	The H1 profile qualifies applicants for Flying Classes I and IA, initial Flying Class II, and initial III, AF Academy, special operational duty, and selected career fields as noted in the Officer and Enlisted Classification Directories. *Definition: Unaided hearing levels in either ear with no single value greater than:						
	Hz	500	1000	2000	3000	4000	6000
	dB	25	25	25	35	45	45
H–2	The H2 profile qualifies for AF enlistment, commission, initial Space and Missile Operations duty, and continued special operational duty but requires evaluation for continued flying. *Definition: Unaided hearing levels in either ear with no single value greater than:						
	Hz	500	1000	2000	3000	4000	
	dB	35	35	35	45	55	
H-3	The H3 profile is disqualifying for enlistment and civilian commission. It requires evaluation and MAJCOM waiver for continued flying and audiologic evaluation for fitness for continued active duty. Aircrew with H–3 who change aircraft require an in-cockpit evaluation prior to waiver consideration. *Definition: Any loss that exceeds H–2 profile.						
H-4	The H4 profile require evaluation for continued service via either ARC Fitness for Duty (FFD), Worldwide Duty (WWD) processing, or review by the Deployment Availability Working Group (DAWG) IAW AFI 10–203, *Duty Limiting Conditions*, for return to duty (RTD), ALC Fast Track, or Medical Evaluation Board (MEB). *Definition: Hearing loss sufficient to preclude safe and effective performance of duty, regardless of level of pure tone hearing loss, and despite use of hearing aids. This degree of hearing loss is disqualifying for all military duty.						

Reasons to refer someone after completing a reference audiogram include results greater than H–1 profile, asymmetric hearing, low frequency hearing loss, high frequency hearing loss, abnormality found during the lighted ear inspection, or if they answer yes to any of the asterisk questions on the AF Form 1753.

Periodic audiogram

Periodic audiograms are documented on the DD Form 2216, Hearing Conservation Data form, and are normally conducted annually; the only exception is if a close scrutiny audiogram is needed or required. For periodic audiograms, the individual does not have to be noise free; however you should still document their noise-free hours, if any. A periodic audiogram will be done on all personnel who are exposed to hazardous noise.

For all audiograms, make sure to verify all the members' demographic information. The technician should be able to see the member inside the booth during the testing. The member cannot bring anything into the booth that will interfere with the testing (gum, glasses, earrings, cell phone, etc.). The technician will give clear and precise instructions to the member and will put the headphones on the member. For the instructions, it is important to know whether you use the pulse tone or the steady tone. The pulse tone is better for those that have tinnitus.

Close scrutiny (stringent audiometric monitoring) audiogram

Occasionally there may be a need to monitor an individual or shop more closely. The close scrutiny audiogram is also documented on the DD Form 2216 and allows more stringent monitoring of individuals who work in excessive noise areas or areas with unknown noise exposure. An example of unprotected and unknown noise exposure would be headphone noise for radio operators and linguists. You may also need to monitor an individual if a physical or other medical problem exists and ear protection cannot be worn properly. Usually the PCM or OEHWG will make these recommendations.

Termination audiograms

Termination audiograms are completed when an individual is permanently removed from working in a hazardous noise area. Most times these audiograms will be performed when a person retires or separates. However, some individuals may still be employed but not work in hazardous noise. Disposition for a termination audiogram should be the same as for periodic audiograms. On occasions where it is not possible for the person to return for the appropriate follow-up activities, fully document this in the medical record. Workers terminated from the HCP who subsequently return to hazardous noise duties should have a current audiogram compared to their original reference audiogram. If the current results do not indicate a STS, the original DD Form 2215 will serve as the reference audiogram. If an STS is present, use the new audiogram to establish a reference.

Lighted ear inspection

The lighted ear inspection (LEI) is required to be completed prior to all audiograms. First, visually check for drainage/blood in each ear. Next, check for collapsing canals, which can affect the outcome of a member's audiogram. Then, using an otoscope, check each ear canal and tympanic membrane for any abnormalities. If there is any reason why they shouldn't accomplish their audiogram or ear plug fitting, refer them to their PCM.

Ear plug fitting

During the reference audiogram appointment and after checking the ear canal, PH will fit, train, and educate the member with earplugs. Reasons why you would not fit someone with earplugs include more that 25 percent of earwax, any foreign object (from metal flakes to beads), canal deformities, and drainage and or blood. Once inserted, make sure to gently pull on the member's earplugs to check for resistance indicating an airtight seal. Fit both ears since 20 percent of the population has different left and right ear canal sizes. Educate on proper wear, washing, and storage of the earplugs, and when they should get new ones.

During the periodic audiogram, the worker should bring his or her current hearing protection in to have PH check to make sure it is still in working condition and will create an airtight seal. After the member's audiogram, you should have the member insert the hearing protection he or she brought and re-educate. Make sure that the hearing protection he or she uses is on the BE-approved PPE list for your installation. They cannot just go to a store and purchase what they want.

230. Audiometer calibration check

Several steps are in place to ensure audiometer is functioning correctly. A team approach is used daily and annually to identify malfunctioning audiometers and rectify any issues. The documentation of the calibration is extremely important and you must ensure it's correctly accomplished.

Calibration of equipment

An audiometer is like any other piece of equipment. It may be working properly, but then again, it may not. Calibration is the process in which the audiometer is checked against a known standard to ensure accuracy. An annual calibration, a daily calibration check, and a functional listening check of the audiometer are required by federal law and AF mandates. The Air Force uses standards set by the American National Standards Institute for our calibrations.

Annual electroacoustic calibration

The Medical Equipment Repair Center (MERC) performs electroacoustic calibrations on audiometers once a year or when they are found to be out of calibration. MERC uses an electronic coupler and analyzer to check frequency and output levels. If levels are found to be inaccurate, MERC will make adjustments necessary for proper operation.

Daily calibration and functional check

From a medical/legal standpoint, the daily calibration check is the most important audiometer calibration. An individual with known hearing levels is tested at the beginning of each day. Results are compared to a baseline that was accomplished immediately following annual calibration and the daily calibration results are recorded on a DD Form 2217, Biological Audiometer Calibration Check. If there is a discrepancy (difference of +/- 5 dB at 500, 1000, 2000, 3000, or 4000 Hz or +/- 10 dB at 6000 Hz when compared to the baseline), check headphone placement and retest. If the problem persists, test a second individual with a known baseline. If a discrepancy still exists, discontinue use of the audiometer and contact MERC for assistance.

The use of an electroacoustic artificial ear, such as the Bio-Acoustic Simulator (BAS)-200 or similar device, may be substituted for testing an individual. Regardless of the approach, daily calibration checks must be preceded by a daily functional check. During the functional check, the hearing conservationist listens to the headphones at various intensities for any abnormal output (i.e., static, clicks, distortion, etc.). DOEHRS-HC software and federal/military regulations require daily functional and calibration checks to be performed before initiating any patient testing. DOEHRS-HC automatically records calibration and functional check information in the database. Calibration forms are generated by DOEHRS-HC, and may be easily retrieved for periodic printing.

Calibration recordkeeping

Record of annual calibration is maintained within your DOEHRS-HC database. DOEHRS-DR will keep records on the annual electroacoustic calibration dates for 30 years. Daily biological calibration checks should be maintained at the MTF for five years but can be destroyed after this period.

Bioenvironmental engineering certification of booths

BE must certify audiometric test booths once a year or if the testing environment changes. This should be done before MERC calibrates the audiometer and the first daily biological calibration check is completed. Using a sound-level meter with octave band analysis, they are ensuring that the testing environment does not exceed specified sound-pressure levels (SPL).

231. Conduct occupational audiometric testing

The purpose of audiometric monitoring/testing is to detect hearing loss at its earliest stages, preferably before it becomes a communication handicap. Personnel involved with the program use the test results to alert individuals of hearing loss and evaluate the effectiveness of personal HPDs. DOEHRS-HC is used throughout the US Military and is a DOD computer software package designed to perform audiometric testing and manage audiometric findings.

The HCP is part of the Occupational Health Program in the Air Force. At a minimum, the AF must comply with OSHA's federal regulations for the HCP. However, the AF can make it more stringent, as they have in certain areas of the program.

PH enrolls personnel identified by supervisors as occupationally exposed to hazardous noise, by BE survey and recommended by OEHWG, into a testing program that includes reference, periodic (at least annually), and termination audiograms.

According to AFOSH STD 48–20, audiometric testing must comply with the following:

- Be performed by a licensed or certified audiologist, otolaryngologist, physician, or by a technician certified by the CAOHC or who has completed equivalent training.
- Standard instructions shall be given to individuals before testing.
- Be conducted in a BE-certified testing environment.
- Include pure tone, air conduction, and hearing threshold examinations of each ear at the test frequencies of 500, 1000, 2000, 3000, 4000, and 6000 Hz.
- Audiometers must receive annual electroacoustic calibration and be conducted on audiometers that have received a functional and biological operation check before each day's use. Audiometric monitoring for reference audiograms must have an audiometric case history (AF Form 1753), IAW regulations.
- Workers terminated from the HCP who subsequently return to hazardous noise duties should have a current audiogram compared to their original reference audiogram.

232. Process audiometric forms/referrals

The processing of audiometric forms/referrals will ensure audiograms are properly documented and the information is available for future use. If proof of the audiogram is not available the member may not receive the proper follow-up needed or it may result in the DOD paying unwarranted compensation to separating individuals.

SF 600/513 or AF Form 1672

AF Form 1672 is a two-part form. The unit completes the top portion indicating the reasons for referral. The bottom portion of the form is designed to be completed by the consulting provider and should provide the unit with specific recommendations. Copies of all pertinent parts of the employee's health record, including copies of hearing tests, should be attached to the referral.

DOEHRS-HC uses the SF 600 or SF 513. Under options in DOEHRS-HC you can choose to use the SF 600 or the SF 513 as the referral form. DOEHRS-HC will populate the top two sections and the patient identification section in the bottom right. The audiologist, ENT, or physician will complete the rest of the form and should provide specific recommendations.

Referral criteria

The conditions and recommendation actions regarding referral criteria are provided within the following table:

Condition	Recommended action
On preplacement, have a hearing profile exceeding H–1 (see AFI 48–123).	Fitness and Risk Evaluation*.
May not, for medical reasons, be able to perform the job capably or safely in a noise hazard environment.	Fitness and Risk Evaluation, after referral to HCDC/Hearing Conservation Center (HCC).
Have a PTS following 2nd noise-free evaluation. (Audiologists and physicians are permitted by OSHA regulations to reestablish reference audiograms without HCDC/HCC referrals).	Referral to HCDC/HCC.
Are unable to wear standard HPDs.	Referral to HCDC/HCC.
Complain of inability to correctly hear or understand routine spoken communications, auditory cues, and signals.	Referral to HCDC/HCC.
Need special hearing skills and complain of hearing problems. (For example: Morse or voice-intercept operators, air traffic controllers, etc.)	Referral to HCDC/HCC.
Are unable to test using standard procedures or equipment.	Referral to HCDC/HCC.
Have a 40 dB or greater difference between ears at any frequency. (Requires masked audiogram.)	Referral to HCDC/HCC.
Have asymmetric hearing loss greater than or equal to 20 dB difference between ears at any two consecutive frequencies.	Referral to HCDC/HCC. (Once referral is completed annual f/u is not required if asymmetry is stable).
Exhibits behavior resulting in invalid or unreliable test results suggesting an exaggerated hearing loss or a problem unrelated to a known physical illness or disease.	Referral to HCDC/HCC, and Fitness and Risk Evaluation.
Meet other referral criteria as determined by the consulting audiologist or program manager.	Referral to HCDC/HCC.

233. Fitness and risk evaluations

The fitness and risk evaluation is used to ensure personnel can continue to perform assigned duties related to jobs they were hired to perform. This process uses a team approach and is crucial to protecting the workers from unnecessary hazards in the workplace.

Fitness and risk

Workers who cannot perform essential job functions, and/or pose a safety risk to themselves or others because of a medical condition, will be evaluated for fitness and risk. A fitness and risk evaluation must be requested by the medical provider or line management. It should be considered when a worker does the following:

- Shows a second PTS in either ear.
- Exceeds the H–1 profile and work in a hazardous noise area.
- Complains of not hearing/understanding spoken communications, auditory cues, or signals.
- Exhibits behavior resulting in invalid or unreliable audiograms.
- Exhibits behaviors that call into direct question the ability to work in the assigned job.
- Cannot be fit with standard HPDs.

Flying personnel

If flying personnel meet the preceding criteria or exceed hearing standards for their flying class, they will be evaluated as directed in AFI 48–123, *Medical Examinations and Standards*.

Nonflying personnel

The provider initiates the fitness and risk evaluation in coordination with the HCPM. The provider must address clinical status and job safety.

Provider

At a minimum, the routine clinical exam (AF Form 1753—Section II) will be performed.

Hearing conservation diagnostic center/hearing conservation center

If a worker has the following, then the clinical evaluation must be conducted by either HCDC/HCC or a licensed or certified civilian audiologist as part of the fitness and risk evaluation.

- A second PTS in the same ear.
- Suspected conductive pathology; or
- Invalid or unreliable audiometric test results.

Job capability and fitness survey

The Military Personnel Flight prepares a list of the minimum essential tasks and auditory requirements a worker must have to qualify for his or her job. HCPM interviews the worker, visits the workplace, and for each task recommends whether the worker can capably perform the task. When requested, safety officials and the shop supervisor will analyze job safety.

Public Health

PH needs to track this member and make sure that the follow-up appointments are kept and that the end result is updated and documented within the HCP.

234. Documentation of noise exposed personnel

Records are used in the HCP to document everything from identification of noise sources to notifying the supervisor when a worker has a STS. Records are important historical documentation of the health and industrial shop on the HCP. The most important aspects of recordkeeping are accuracy, thoroughness, organization, legibility, and retrievability. Don’t forget it is also a legal requirement.

Occupational and environmental health exposure data

The OEHED is used by BE to document the Hazardous Noise Sources, level of exposure to noise, and type of control that is authorized for use. This form is sent to PH and approved by the SGP at the OEHWG. This form is filed in the member’s medical record.

Clinical occupational health exam requirements

The COHER is completed in the ASIMS WEB application system. After BE completes the OEHED, PH completes research on the hazards to determine what exam requirements are necessary for preventative measures. PH documents the examinations required as well as the regulation it came from. Also included on this form should be education and training required, any explanatory notes, and the required PPE. PH will present this at the OEHWG and get it approved by the SGP. The current form will be saved in ASIMS and a current signed copy needs to be placed in the member’s medical record during the examination.

Aeromedical service information management system web

ASIMS is the process by which the medical group, commanders, and AF individuals keep track of individual medical readiness. There is an occupational health module within ASIMS that helps PH monitor and track the HCP.

AF Form 2754

AF Form 2754, Chronological Record of Workplace Surveillance, is an electronic form within ASIMS, in the Occupational Health Module. Each shop has an AF Form 2754 that should be used to

document specific items that are occurring within an individual shop, as it provides a history of items that have happened within a certain shop that creates a timeline. For example, if a shop has a trend involving Hearing Conservation it should be documented on this electronic form. When the OEHED and COHER are updated, they should be recorded on this form. Further, the HCP you would use it for HCP documentation purposes.

Occupational Safety and Health Administration reportable

OSHA-reportable hearing loss is defined as work-related positive threshold shifts, for the worse, relative to the current reference audiogram of an average of 10 dB at 2000, 3000, and 4000 Hz, if the average level of hearing is at least 25 dB above audiometric zero, in either ear. PH will provide OSHA-reportable hearing loss information to base safety for inclusion on the OSHA 300 Log or electronic equivalent. (Audiometric test results reflect the worker's overall hearing ability in comparison to audiometric zero. Therefore, using the worker's current audiogram, you must use the average hearing level at 2000, 3000, and 4000 Hz to determine whether or not the worker's total hearing level is 25 dB or more.)

In the following table, if at any step a "no" is encountered, the process ends and the hearing change is not recordable.

Step	Procedure
Step 1	Compared to the original baseline audiogram or last audiogram showing a recordable shift in hearing, is there an STS in either ear? If yes, continue to step 2.
Step 2	Is the average hearing level on the current hearing test at 2000, 3000, and 4000 Hz in the same ear greater than or equal to 25 dB HL? If yes, continue to step 3.
Step 3	Is the STS confirmed upon 30-day retest (or was a retest not conducted)? If yes, continue to step 4.
Step 4	Has a qualified health care professional determined that the shift in hearing is more likely than not work related? If yes, continue to step 5.
Step 5	Record the case on Form 300 within 7 days of retest (or within 37 days of test if retest not conducted).

The AF uses the AFSAS to create an AF Form 190, Occupational Illness/Injury Report.

Air Force safety automated system

The AFSAS is used by BE, PH, health care providers, and the Installation Safety Office to complete occupational illness/injury investigations. If there is an OSHA-reportable hearing loss, it needs to be documented using AFSAS. To request an AFSAS account, go to https://afsas.af.mil/ and click on request AFSAS account.

AF Form 55

AF Form 55, Employee Safety and Health Record, is used to record initial and annual workplace-specific hearing conservation training on shop or unit hazardous noise exposures, equipment, and controls.

DD Form 2215

DD Form 2215, Reference Audiogram, is used to document the baseline audiogram prior to entry into hazardous noise duties. The form must be entered into the member's medical record.

DD Form 2216

DD Form 2216, Hearing Conservation Data, is used to record the following audiograms: periodic (annual), close scrutiny, termination, follow-up #1 (14-hour follow-up), follow-up #2, and pre/postdeployment. The form must be entered into the member's medical record and exported to the DOEHRS-DR at least daily.

DD Form 2217

DD Form 2217, Biological Audiometer Calibration Check, is used to document the daily biological calibration check. This form should be printed out monthly and a hard copy kept for five years. Periods of nonuse and actions taken to troubleshoot calibration failures should also be documented.

235. Select, fit, and educate on protective devices

Since August 1948, the Air Force has recognized the need for mandatory use of personal hearing protection by those who routinely work in noise. In that same year, the Air Force published Air Force Regulation (AFR) 160–3, *Precautionary Measures Against Noise Hazards*, and earplugs were issued to all personnel who encountered hazardous noise. Since that time, this publication has been replaced with far more updated instructions, both for the individual and for medical personnel.

Select

Day-to-day, long-term exposure to hazardous noise represents a real threat to unprotected ears. Properly worn personal hearing protection, along with appropriate administrative and engineering controls, can help prevent noise-induced hearing loss from routine or infrequent encounters with potentially hazardous noises.

Earplugs serve as filters and provide the most noise attenuation within the mid and high frequencies (e.g., above 1000 Hz). Earplugs or earmuffs provide the least noise attenuation in the lower frequencies.

Generally, earplugs or earmuffs provide noise attenuation of approximately 20 dB. When worn in combination (earplugs and earmuffs), the noise attenuation is not additive. The use of a muff in combination with an ear plug will only add approximately 3 dB attenuation to the noise reduction rating of the ear plug. However, it is up to BE to calculate the effectiveness of HPDs in the workplace.

Workers exposed to intense noise should wear maximum hearing protection. The basic rule is “If you are in noise that makes it difficult to hear voices or alarm signals, your chances of hearing those desired signals are actually enhanced when you wear the protective devices.”

If the magnitude of noise is so great that it interferes with speech communication, then it may also constitute an auditory risk to unprotected ears. Most people who try to communicate in the presence of high-intensity noise tend to regulate the level of their voice to compensate for the interfering effect of the noise. The only way to protect hearing and allow for effective communication is to have all noise-exposed workers wear hearing protection. Most workers will automatically compensate by using an appropriate vocal effort to overcome the attenuation offered by the hearing protection.

Premolded and formable earplugs are available as standard items. One example of premolded devices is the quad-flange earplug. The quad-flange is a “universal” fit and one size will fit most people. Personnel responsible for fitting and dispensing earplugs will train users on proper insertion, wear, and care. While premolded earplugs are reusable, they may deteriorate and should be replaced periodically.

Available hand-formable earplugs include wax-impregnated devices (Flents), foam cylinders (E-A-R), and polymer foams. Formable earplugs come in just one size. Individual units may procure approved formable earplugs. Supervisors must instruct users on the proper use of these earplugs as part of the annual education program. These earplugs may be washed and reused but should be replaced after two or three washings or when they no longer stay compressed long enough to be inserted correctly.

A small percentage of the AF population cannot be fitted with standard premolded or formable earplugs. Custom earplugs can be made to fit the exact size and shape of the individual’s ear canal. Individuals needing custom earplugs must be referred to an audiologist at an authorized HCDC.

Fit

Fitting the correct earplug to each employee is very important. You must select the best earplug the worker will be willing to use on a daily basis. The fitting will help identify the plug that is most comfortable to the employee. You may need to fit several models to identify the best earplug for the worker.

Earplugs

Earplugs require careful fitting. Quad-flange plugs are designed as "universal fit" and should be inserted only as far as needed to create an airtight seal. At no time should earplugs simply be handed out. Each plug must be fitted individually. Once fitted, they must be checked annually to ensure they are comfortable, properly inserted, and oriented in the external ear canal. Also, the wearer's attitude relative to wearing the protectors must be acceptable.

Earplugs should be readily available. Medical personnel should make every effort to educate employees on the proper maintenance, insertion, and replacement of these plugs. This can be accomplished at newcomers' briefings, annual shop visits, and commander's calls.

Earmuffs

Earmuffs are devices similar to earplugs, but instead of being inserted within the external ear canal, they are worn around the ear (circumaural) to reduce the level of noise that reaches the ear. Their effectiveness depends on an airtight seal between the cushion and the head. An earmuff offers about the same attenuation as a well-fitted earplug.

Earmuff cushions should be kept clean. The plastic, gel, or foam cushions can be cleaned in the same way as earplugs, but the inside of the earmuff should not get wet. If the inside should inadvertently get wet, the worker should remove the noise-attenuating material and allow it to completely dry before reinsertion. When not in use, earmuffs should be placed in open air so any moisture, which may have been absorbed within the cups, will evaporate.

Educate

Occupational health education for noise-exposed employees must be conducted at various levels, ranging from informal individualized education to base-wide educational programs. The overall effectiveness of these sessions depends on one essential factor—how convinced employees are that they alone can prevent noise-induced hearing loss.

Employees should have a thorough understanding of the undesirable effects of noise and the proper use and care of HPDs before they begin work in hazardous noise areas; therefore, initial education should be conducted before the individual begins hazardous-noise duties. Ideally, it will be accomplished when hearing protection is dispensed but no greater than 30 days after beginning duties in a hazardous noise area. PH educates noise-exposed personnel on the harmful effects of hazardous noise and the proper wear and care of HPDs. The education program will provide information about the adverse effects of noise and how to prevent noise-induced hearing loss. At a minimum, all training will cover the following topics:

- The effects of noise on hearing and the purpose of hearing protection. This will include proper selection, fit, use and care of personal hearing protectors, and the ability to demonstrate proper fitting techniques.
- The advantages, disadvantages, and attenuation of various hearing protectors.
- Mandatory requirement of assigned protective equipment and administrative actions that may follow for failure to wear.
- The purpose of audiometric testing and an explanation of test procedures.
- Hearing loss may lead to disqualification from current duties if hearing is critical to job performance.

PH should document all training, education, and earplug fitting on either a log or SF 600. This documentation should also be filed in the industrial case file.

Personnel should receive continuous training in regard to the effects of hazardous noise. There are many ways this may be accomplished; however, as a minimum, personnel are required to receive reference and annual training along with re-education when a threshold shift is identified. Annual training is accomplished by the worker's immediate supervisor. Supervisors should contact PH for training assistance, if needed.

Additional training is given when a person has an STS on an audiogram. Personnel must receive additional information in reference to the STS as well as have their hearing protection checked and refitted.

Although PH provides HCP education at newcomers' orientations and in conjunction with required audiograms, the work site is also a good place to reinforce education and effective wear of hearing protectors. PH may plan workplace visits to shops where hearing loss trends are identified or technical guidance is requested. When visiting a shop, it is very important for you to wear appropriate hearing protection since your example will be observed by the workers. Your visits may include "spot checks" of employees and supervisors in the workplace. Individuals who do not wear HPDs should be identified and the noncompliance documented on the AF Form 2754, Chronological Record of Workplace Surveillance form, in the case file. The need for hearing protection should be emphasized, and supervisors of those individuals should be advised to take appropriate administrative action. PH personnel can see firsthand whether or not employees use hearing protection and can reinforce to supervisors their important role in the program.

The care and maintenance of HPDs is very important. Reusable HPDs should be washed in lukewarm water using hand soap, rinsed in clear water, and most importantly, thoroughly air-dried before the next use. Earplugs that are wet or damp should never be placed in ears or in their storage cases. If the earplugs are routinely used, they and their cases should be cleaned frequently. If not used daily, the earplugs and cases should be cleaned after each use.

Advantages of personal hearing protection

The following provide several advantages for most people who properly wear their personal HPDs:

- Prevent auditory fatigue or TTS.
- Prevent PTS.
- Reduce general fatigue.
- Reduce annoyance and emotional irritation.
- Increase work performance and efficiency.
- Enhance outside activities that would otherwise damage their hearing.
- Improve the ability to hear in the presence of interfering noise, thus improving communication.

Auditory fatigue

Any noise exposure (protected or unprotected) that results in auditory fatigue should be considered an overexposure to the specific noise. Although research has failed to directly correlate specific temporary threshold shifts with subsequent permanent shifts, temporary shifts due to noise indicate the auditory system has been overexposed. Therefore, even a temporary shift is considered undesirable. Audiometric monitoring of individuals who work in hazardous noise is the only way to determine if a permanent decrease in hearing has occurred.

Permanent hearing loss

Permanent hearing loss from noise exposures is first observed above 2000 Hz, with the greatest change at 4000 Hz. Eventually, the 1000 and 2000 Hz ranges in hearing will begin to suffer.

General fatigue

General fatigue may result from working in excess noise. If a job requires people to communicate in the presence of noise, raising the voice to effectively communicate may cause fatigue for these individuals. This type of fatigue is generalized so that the person is more tired than would normally be expected at the end of the work period. However, people who routinely wear hearing protection report less fatigue at the end of work periods when compared to similar work periods when no hearing protection is worn.

Annoyance

Noise may cause annoyance or irritable behaviors. Many workers who start wearing HPDs discover they are less annoyed or irritable at the end of work periods when they wore earplugs or ear muffs when compared to similar work periods without them. Although this type of worker response is not easy to verify, general comments made by workers should not be ignored.

Increase work performance

Personnel who routinely wear HPDs show improved performance and work efficiency. Although this phenomenon has been observed throughout the years, it still lacks defined scientific evidence.

Enhance outside activities

Off-duty activities, recreational activities, or "moonlighting" may involve exposures to potentially hazardous noise. Since accumulated sequential noise exposure may result in a noise-induced hearing loss, all on- and off-duty activities must be considered. Combining on- with off-duty exposures to high-intensity noise can result in permanent noise-induced hearing loss. Therefore, wearing personal hearing protection is particularly essential for those who routinely work in noise and also have additional off-duty exposures, such as gunfire or loud music. It is also mandatory for those on the HCP. Auditory risk limits generally assume those who work in hazardous noise will enjoy a period of "auditory rest" before the next exposure. Clearly, this is not always the case.

Improve hearing in noise

One of our most serious concerns is whether people who wear HPDs will be able to hear warnings, signals, and speech (particularly cries for help). Frequently, people believe if they put earplugs in their ears, they will not be able to hear alarm signals or what others say. This is not the case. As stated previously, people with normal hearing who wear hearing protection in a noisy environment usually can hear and understand the desired signals more easily than people not using hearing protection. Earplugs, similar to sunglasses, which exclude the glare of light and make it easier to see, make it easier to hear in the presence of loud noise.

Occasionally, an individual will complain that wearing hearing protection makes it more difficult to hear and understand speech in the presence of noise. There are two possible reasons for these complaints:

Noise not intense enough

Perhaps the noise is not intense enough for hearing protection to be required. Hearing protection can cause speech interference when the noise level is less than 85 absolute dB (dBA). While hearing protection might be desired in those circumstances, its use should be discontinued if critical speech communication will be missed.

Substantial hearing loss already

A second reason could be that the person already has a substantial hearing loss. In this case, the alternatives are to use a different type of hearing protection, find another means of communication, or remove the individual from those duties. Discontinuing hearing protection use would simply aggravate the problem. IAW AFOSH STD 48–20, the MTF commander must ensure all military and civilian personnel exposed to potentially hazardous noise are issued or fitted with personal HPDs. In

addition, each individual who is issued such devices must be thoroughly indoctrinated in their use and care.

Personnel who wear HPDs should be instructed to report immediately to PH if irritation or discomfort of the ear canals or head occurs from routine use of these devices.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

228. Program management database

1. How is the DOEHRS-HC system used?

2. What does DOEHRS-HC analyze?

229. Perform and record

1. Who conducts annual training?

2. What is the intent of the reference audiogram?

3. When establishing a reference audiogram, when should you try to schedule the exam?

4. Below what noise level is considered noise free?

5. What additional evaluation must individuals undergo if their test results exceed those of an H–1 profile?

6. Who recommends when and how often to perform close scrutiny audiograms?

230. Audiometer calibration check

1. Who accomplishes annual electroacoustic calibration checks?

2. What is considered medically and legally the *most* important calibration?

3. What is considered a discrepancy on the daily calibration check?

4. How is the daily calibration check accomplished?

5. Explain the daily functional (listening) check.

6. How long should the daily biological calibration checks be maintained?

231. Conduct occupational audiometric testing

1. What is the purpose of audiometric monitoring/testing?

2. At a *minimum*, who must the AF HCP comply with?

3. IAW AFOSH STD 48–20, who can perform audiometric testing?

232. Process audiometric forms/referrals

1. What are the three referral forms used in the HCP?

2. For the AF Form 1672, how many parts are there and who fills out each part?

3. What two referral forms are found in DOEHRS-HC?

233. Fitness and risk evaluations

1. Who will be evaluated for fitness and risk?

2. Who can request a fitness and risk evaluation?

3. What is PH’s role in the fitness and risk evaluation?

234. Documentation of noise-exposed personnel

1. What is the definition of OSHA-reportable hearing loss?

2. What is documented on the DD Form 2215 and DD Form 2216?

3. On what form is the daily biological calibration check recorded?

235. Select, fit, and educate on protective devices

1. How can people improve their ability to hear and understand speech in noisy environments?

2. What are four things you should check to ensure earplugs have been fitted properly?

3. What type of ear-protective device is similar to an earplug but does not insert into the ear canal?

4. Describe the proper care of ear muffs.

5. How should the earplugs be cleaned?

6. What causes auditory fatigue?

7. Why is it important that personnel wear earplugs even for off-duty exposures to high-noise levels?

4–3. Standard Threshold Shift

A patient with an STS must receive one, or both, of the 14-hour follow-up NFAs, follow-up #1 and the confirmatory audiogram, follow-up #2. These two follow-up tests will confirm the presence or absence of permanent threshold shifts. All follow-up tests must be completed within 30 days of the annual exam. If the 30-day window is exceeded, the last test completed within the allowed time period will be counted as the final test. Disposition of the patient should be made based on these results. So, if there was a shift on the annual and no follow-up tests were accomplished within the 30 days, the shift should be counted as a PTS and all referrals/notifications should be made as if all tests were completed and shift did not resolve.

As you know, PH schedules and performs audiograms. PH technicians must recognize STS, refer patients to health care providers when appropriate, and schedule patients for correct follow-up tests. PH also ensures recommendations are made for patients needing referral to a USAF HCDC. Finally, PH must ensure patients referred to HCDCs are followed, according to current guidance.

Reports are available through DOEHRS-HC to help track patients with STS requiring follow-up tests or referral. However, the best way to make sure all STS follow-ups are completed is to use some type of tracking log. An example is shown in the following table:

Patient	Doe, John	Smith, Stan
Identification (ID)	20/2111	20/7513
Work place ID (WPID)	6713	2706
Annual audio	040920	040921
Date AF 1753	0920	0921
Follow-up (FU) #1 date	0922	0923
FU #1 shift +/ -	+	-
FU #2 date	0922	NA
FU #2 shift +/ -	+	NA
PTS – Y/N	Y	NA
PTS memorandum for record (MFR) date	0925	NA
# Days to PTS follow-up	3	NA
Date referred to HCDC	0922	NA
# Days – annual to date referred	2	NA
HCDC appointment date	1008	NA
Baseline reestablished	1011	0923
OSHA report required	N	NA
Fitness & risk assessment – Y/N	N	N
Comments		

236. Identification of significant threshold shift

You are tasked to perform audiograms to ensure any shift in hearing is detected early, and steps can be taken to prevent further hearing loss. At times, workers will have shifts considered temporary; and other times, workers will experience long-term hearing loss. The different types of hearing loss are discussed in the following paragraphs.

Threshold shift determination

PH must ensure patients with changes in hearing receive proper follow-up examinations. Determining if there is a threshold shift is the first step.

Standard threshold shift

A STS occurs when there is a change in hearing levels, relative to the baseline (reference) audiogram, of an average of +/–10 dB or more at 2000, 3000, and 4000 Hz in either ear. Although DOEHRS-HC will automatically calculate STS, the following discussion will serve as a quick refresher.

To calculate the average change in hearing levels from the baseline to the annual hearing test, first subtract the thresholds of the baseline test from the annual test at 2000, 3000, and 4000 Hz. Then add the three values together and divide by three to determine the average.

The following table is an example of calculating the averages when the annual audiogram results, minus the reference audiogram, equal the following values:

Frequencies (Hz)	2000	3000	4000	Average =	STS?
Change in	–10	+10	+20	6.6	No
Hearing	0	+10	+20	10.0	Yes
Levels	+10	+20	+20	16.6	Yes

Negative shift

When annual test results are better than the baseline, an improved shift (negative shift) in hearing thresholds is identified. In other words, there is an improved shift in hearing thresholds of –10 dB or better, at 1000, 2000, 3000, and 4000 in either ear. When this occurs, a follow-up test is required and should be done on the same day as the annual. The result of this follow-up may be used to create a re-established reference (new reference) audiogram if the results are better or the same. Be sure to have the PCM concur by signing the new DD Form 2215.

Permanent threshold shift

In the HCP, any standard threshold shift found on monitoring audiometry which is still present after the second 14-hour NFA will be considered a PTS.

Temporary threshold shift

A TTS is a temporary loss of hearing due to exposure to high-intensity noise. In the HCP, any standard threshold shift found on monitoring audiometry which resolves after a 14-hour noise-free period after the first or second follow-up is a TTS.

Early warning sign

Any change of 15 dB or greater at 1000, 2000, 3000, or 4000 Hz in either ear will be considered an early warning sign (EWS) and requires targeted patient counseling but no follow-up tests.

237. Process follow-up

It’s very crucial you understand the proper follow-up required for workers who experience hearing loss. The proper follow-up will identify the seriousness of the hearing loss and ensure workers are managed accordingly.

Follow-up #1 audiogram

Individuals who experience STS are retested following a 14-hour noise-free period. Fourteen hours of auditory rest is usually adequate to allow temporary threshold shifts to return to pre-exposure threshold levels. If a patient is seen for a follow-up #1 audiogram and no STS is detected, the individual should be reeducated regarding noise and hearing protection and then returned to normal duty. If a STS is found, a second follow-up exam (follow-up #2) must be accomplished.

If a person has a negative threshold shift, improved hearing threshold from reference audiogram, and it is not resolved after the first follow-up, the reference audiogram is re-established using these results.

Follow-up #2 audiogram

When a STS is found on the first 14-hour NFA, it is immediately followed by the second noise-free test. This audiogram is to recheck hearing levels. If no STS is noted at this time, the patient is

returned to work following counseling. If the STS persists, the shift is considered to be a PTS. The worker must be notified within 21 days of the determination using an MFR. The worker's supervisor is also notified within 10 days after worker notification has been accomplished. A referral to the PCM and HCDC must be also be generated.

Self-Test Questions

After you complete these questions, you may check your answers at the end of the unit.

236. Identification of significant threshold shift

1. Define a standard threshold shift.

2. Define a negative shift.

3. Define TTS.

237. Process follow-up

1. What is the disposition of a patient who does not have an STS on the 14-hour follow-up audiogram?

2. If a STS is found, what must be accomplished?

3. What should be done if an individual has an STS that is considered a PTS?

Answers to Self-Test Questions

224

1. Intensity, duration, and distance.
2. Hz.
3. 500, 1000, 2000, 3000, 4000, and 6000 Hz.

225

1. Hearing and equilibrium.
2. The external auditory canal.
3. Middle ear.
4. The bottom or base of the cochlea.

226

1. PH flight.

2. BE.
3. Fitting HPDs, performing audiometric testing/monitoring, educating noise-exposed personnel, monitoring program effectiveness, and monitoring patient no-show rates.
4. Attending Hearing Conservation or PH Apprentice Course at USAFSAM.
5. Joint decision with health care provider and PH.
6. Annual Trend Analysis including test compliance, TTS rates, PTS rates and no-show rates.

227

1. To outline assigned responsibilities and give guidance on how to conduct the HCP.
2. 3000–6000 Hz.

228

1. It is a database application used to test hearing and manage the HCP data within the DOD.
2. Test results, and determines whether a significant hearing loss exists or if changes in hearing have occurred.

229

1. Shop supervisors' conduct annual training for their workers; PH conducts annual training for the supervisors.
2. To establish a baseline audiogram, used to compare with subsequent audiograms to determine if hearing loss has occurred.
3. Before the time in which the actual work in noise begins. If this is not possible, accomplish within 30 days of starting the job.
4. Below 72 dB.
5. A fitness and risk evaluation to determine if they have adequate hearing to perform the required duties and to ensure they will not be a safety risk to themselves or others.
6. The PCM or OEHWG.

230

1. MERC.
2. The daily calibration check.
3. A difference of +/- 5 dB at 500, 1000, 2000, 3000, or 4000 Hz or +/- 10 dB at 6000 Hz when compared to the calibration baseline.
4. By testing an individual's hearing levels each day and comparing the results with his or her previously accomplished baseline test. An electroacoustic artificial ear, such as the BAS–200 or similar, may be used.
5. A hearing conservationist listens to the headphones at various intensities for any abnormal output, such as static, clicks, and ear distortion.
6. For five years.

231

1. To detect hearing loss at its earliest stages, preferably before it becomes a communication handicap.
2. With OSHA.
3. By a licensed or certified audiologist, otolaryngologist, physician, or by a technician certified by the CAOHC or who has completed equivalent training.

232

1. AF Form 1672, Hearing Conservation Diagnostic/Center Referral, SF 600 and SF 513, Hearing Conservation Disposition.
2. Two parts, the unit completes the top portion and the consulting provider completes the bottom portion.
3. SF 600 and SF 513, Hearing Conservation Disposition.

233

1. Workers that cannot perform essential job functions, and/or pose a safety risk to themselves or others, because of a medical condition.

2. The medical provider or line management.
3. To track the member and make sure that the follow-up appointments are kept and that the end result is updated and documented within the HCP.

234

1. Work-related positive threshold shifts, for the worse, relative to the current reference audiogram of an average of 10 dB at 2000, 3000, and 4000 Hz, if the average level of hearing is at least 25 dB above audiometric zero, in either ear.
2. DD Form 2215 documents the baseline audiogram prior to entry into hazardous noise duties; and DD Form 2216 documents periodic (annual), close scrutiny, termination, follow-up #1, follow-up #2, and pre/postdeployment audiograms.
3. DD Form 2217.

235

1. Have all noise-exposed workers wear hearing protection.
2. Comfort, properly sized, properly inserted and oriented in the external ear canal, and behavioral attitudes relative to wearing the protectors are acceptable.
3. Ear muffs.
4. The cushions should be kept clean, dry, and stored in the open air.
5. Washed in lukewarm water using hand soap, rinsed in clean water, and thoroughly air dried before the next use.
6. An overexposure to noise.
7. Combining on- and off-duty exposures to high-intensity noise may cause permanent hearing loss.

236

1. A change in hearing levels, relative to the baseline (reference) audiogram, of an average of +/–10 dB or more at 2000, 3000, and 4000 Hz in either ear.
2. Improved shift in hearing threshold.
3. Any standard threshold shift found on monitoring audiometry which resolves after a 14-hour noise-free period after the first or second follow-up.

237

1. The individual should be reeducated regarding noise and hearing protection and then returned to normal duty.
2. A second follow-up exam must be accomplished.
3. Notify the person in writing within 21 days of identifying the shift, and provide a referral to the PCM and HCDC.

Complete the unit review exercises before going to the next unit.

Unit Review Exercises

Note to Student: Consider all choices carefully, select the *best* answer to each question, and *circle* the corresponding letter. When you have completed all unit review exercises, transfer your answers to the Field-Scoring Answer Sheet.

Do not return your answer sheet to the Air Force Career Development Academy (AFCDA).

45. (224) The frequency or pitch of a sound is expressed in what?
    a. Hz.
    b. kH.
    c. SPL.
    d. dBA.

46. (225) From where does the external auditory canal receive sound waves?
    a. Auricle.
    b. Ossicles.
    c. Basilar membrane.
    d. Tympanic membrane.

47. (225) All the following components make up the structures of the inner ear with the exception of the
    a. semicircular canals.
    b. organ of Corti.
    c. cochlea.
    d. pinna.

48. (225) Which part of the ear is considered tonotopic?
    a. Ossicles.
    b. Otolith organs.
    c. Basilar membrane.
    d. Tympanic membrane.

49. (226) Hearing conservationist recertification must be renewed every
    a. year.
    b. 3 years.
    c. 5 years.
    d. 6 years.

50. (226) What is the generally acceptable patient no-show appointment rate for a base when monitoring the hearing conservation program (HCP)?
    a. Less than 3 percent.
    b. Less than 10 percent.
    c. No more than 5 percent.
    d. No more than 15 percent.

51. (227) After approximately what time period do individuals who have been exposed to high noise levels for a short time usually make a complete recovery?
    a. 14 to 16 hours.
    b. 1 to 2 hours.
    c. 5 to 10 days.
    d. 1 to 2 days.

52. (227) At what frequency range in hertz (Hz) can permanent hearing loss be diagnosed?
    a. 1000 to 2000 Hz.
    b. 2000 to 3000 Hz.
    c. 3000 to 6000 Hz.
    d. 6000 to 9000 Hz.

53. (228) Which is a database application used to test hearing and manage the Hearing Conservation Program (HCP) data within the Department of Defense (DOD)?
    a. HCDC.
    b. NIOSH.
    c. DOD GEIS.
    d. DOHERS-HC.

54. (228) What form is used to refer a patient to the Hearing Conservation Diagnostic Center (HCDC)?
    a. DD Form 2217.
    b. DD Form 2216.
    c. AF Form 1672.
    d. AF Form 977.

55. (229) If workers *cannot* receive audiograms before they begin working in a hazardous noise environment, within how many days prior to beginning a job must the reference audiogram be performed?
    a. 7.
    b. 14.
    c. 30.
    d. 60.

56. (229) The reference audiogram is documented on a
    a. DD Form 2215.
    b. DD Form 2216.
    c. DD Form 2217.
    d. AF Form 2272.

57. (230) Who sets the standards for calibration that the Air Force uses today?
    a. American National Standards Association.
    b. American National Standards Institute.
    c. International Standards Organization.
    d. American Standards Association.

58. (230) On what form are the daily calibration checks recorded?
    a. DD Form 2215.
    b. DD Form 2216.
    c. DD Form 2217.
    d. AF Form 2272.

59. (230) When compared to the baseline audiogram measured in decibels (dB) at various frequencies measured in hertz (Hz), what difference constitutes a discrepancy on a daily calibration check?
    a. +/- 5 dB or more at 500 through 4000 Hz or +/- 10 dB at 6000 Hz.
    b. +/- 5 dB or less at 2000 through 4000 Hz.
    c. Only +/- 10 dB at 2000 through 4000 Hz.
    d. Only +/- 10 dB at any frequency.

60. (231) Why do we perform audiometric monitoring?
    a. Detect hearing loss at its earliest stages.
    b. Motivate supervisors to conduct annual training.
    c. Detect workers who wear their hearing protection correctly.
    d. Motivate workers to self-report non wear of hearing protection.

61. (231) How often is the audiometer electroacoustic calibration performed?
    a. Monthly.
    b. Annually.
    c. Bi-Monthly.
    d. Bi-Annually.

62. (232) What form is used for a referral in the Hearing Conservation Program (HCP)?
    a. AF Form 1672.
    b. AF Form 1753.
    c. DD Form 2215.
    d. DD Form 2217.

63. (232) What is the recommended action for a worker who is unable to wear hearing protective devices (HPD)?
    a. Re-establish baseline audiogram.
    b. Medical discharge from service.
    c. Return to duty section.
    d. Refer to HCDC/HCC.

64. (233) Who must request fitness and risk evaluations?
    a. Occupational Safety and Health Administration.
    b. Medical provider or line management.
    c. Wing Commander.
    d. Supervisor.

65. (233) Which publication is used to evaluate flying personnel who exceed hearing standards for their flying class?
    a. AFOSH STD 48–20.
    b. AFI 48–116.
    c. AFI 48–117.
    d. AFI 48–123.

66. (234) Occupational Safety and Health Administration (OSHA) reportable hearing loss is defined as a work related positive threshold shift, relative to the current reference audiogram of an average of how many decibels (dB) at 2000, 3000, 4000 hertz (Hz)?
    a. 21 dB.
    b. 15 dB.
    c. 12 dB.
    d. 10 dB.

67. (235) By what amount will earplugs or earmuffs generally reduce noise levels in decibels (dB)?
    a. 10 dB.
    b. 15 dB.
    c. 20 dB.
    d. 25 dB.

68. (235) What is the additional attenuation factor in decibels (dB) you can expect when earmuffs are worn in combination with earplugs?
    a. 3 dB.
    b. 5 dB.
    c. 10 dB.
    d. 15 dB.

69. (235) Initial education should be accomplished for new employees who are exposed to hazardous noise no greater than
    a. 30 days after beginning duties in a hazardous noise area.
    b. 7 days after beginning duties in a hazardous noise area.
    c. 60 days of the reference audiogram.
    d. 30 days of the reference audiogram.

70. (235) When employees are *not* complying with the wearing of hearing protection devices, document it on
    a. Hearing Conservation Data.
    b. Assessment and Disposition.
    c. Chronological Record of Workplace Surveillance.
    d. Occupational Health Training and Protective Fit Testing.

71. (235) Which part of the cleaning process for earplugs is the *most* important?
    a. Air dried.
    b. Sanitized in bleach.
    c. Rinsed in clear water.
    d. Washed in lukewarm water.

72. (235) Where should personnel report if they experience irritation or discomfort of the ear canals or head as a result of routine use of hearing protection?
    a. Audiologist.
    b. Public Health.
    c. Hearing Conservation.
    d. Physical Examination Section.

73. (236) A standard threshold shift found on monitoring audiometry which resolves after a 14-hour noise-free period after the first or second follow-up will be considered a
    a. positive threshold shift.
    b. negative threshold shift.
    c. permanent threshold shift.
    d. temporary threshold shift.

74. (237) When a standard threshold shift (STS) is found on the first 14-hours noise-free audiogram (NFA),
    a. re-establish patients baseline.
    b. immediately refer to audiology.
    c. conduct a termination audiogram.
    d. immediately follow with a second noise-free test.

Student Notes

Glossary

Abbreviations and Acronyms

AAC	Assignment Availability Code
AFI	Air Force Instruction
AFMS	Air Force Medical Service
AFOSH	Air Force Occupational Safety and Health
AFPMB	Air Force Pest Management Board
AFR	Air Force Regulation (Found in Unit 4 – AFR 160-3)
AFSAS	Air Force Safety Automated System
AF WEB HA	Air Force Web Health Assessment
AGE	aerospace ground equipment
AHLTA	Armed Forces Health Longitudinal Technology Application
AL	action level
ALC	Assignment Limitation Code
AMC	Aerospace Medicine Council
ANG	Air National Guard
AR	Air Reserve
ARC	Air Reserve Component
ASIMS	Aeromedical Service Information Management System
AST	aspartate aminotransferase
BAS	Bio-Acoustic Simulator
BE	Bioenvironmental Engineering
CA	Civilian Administration
CAOHC	Council for Accrediation in Occupational Hearing Conservation
CBRNE	chemical, biological, radiological, nuclear and high-yield explosive
CDC	Centers for Disease Control and Prevention
CFR	Code of Federal Regulations
CIA	Central Intelligence Agency
CNS	central nervous system
COHER	Clinical Occupational Health Examination Requirements
CPR	cardiopulmonary resuscitation
CPS	clinical preventive services
DAWG	Deployment Availability Working Group
dB	decibels
dBA	absolute decibels
DCMS	Dental Classification Management System

DD	Department of Defense (used with forms)
DHA/HIT	Defense Health Agency/Health Information Technology
DNA	deoxyribonucleic acid
DOD	Department of Defense
DODI	Department of Defense instruction
DOEHRS	Defense Occupational and Environmental Health Readiness System
DR	Data Repository (used with DOEHRS for DOEHRS-DR)
DRHA	Deployment Related Health Assessment
DVEP	Disease/Vector Ecology Profiles
EHR	electronic health record
EMF	electro-magnetic frequency
ENT	ear, nose, and throat
ESOH	Environmental Safety and Occupational Health
EWS	early warning sign
FFD	Fitness for Duty
FHM	Force Health Management
FU	Follow-up
G6PD	Glucose-6-phosphate dehydrogenase
HBV	hepatitis B virus
HC	Hearing Conservation (used with DOEHRS for DOEHRS-HC)
HCC	Hearing Conservation Center
HCDC	Hearing Conservation Diagnostic Center
HCN	hydrogen cyanide
HCP	health care provider
HCP	Hearing Conservation Program
HCV	hepatitis C virus
HG	hectogram
HIV	human immunodeficiency virus
HPD	hearing protection devices
HRR	health record review
Hz	hertz
IAW	In accordance with
ID	Identification
IMR	individual medical readiness
LEI	lighted ear inspection
MAJCOM	major command
MEB	Medical Evaluation Board
MEPS	Military Entrance Processing Station

MFR	memorandum for record
MHA	mental health assessments
mm	millimeters
mm Hg	millimeters of mercury
MSE	Medical Surveillance Examinations
MSME	Medical Standards Management Element
MTF	medical treatment facility
NCMI	National Center for Medical Intelligence
NCOIC	noncommissioned officer in charge
NDI	nondestructive inspection
NFA	noise-free audiogram
NIOSH	National Institute of Occupational Safety and Health
OEEL	occupational & environmental exposure limit
OEEL-TWA	occupational & environmental exposure limit time-weighted average
OEHED	Occupational and Environmental Health Exposure Data
OEH-MIS	Occupational and Environmental Health Management Information System
OEHP	Occupational & Environmental Health Program
OEHWG	Occupational and Environmental Health Working Group
OH	Occupational Health
OHC	Occupational Hearing Conservationist
OHE	Occupational Health Exam
OPR	office of primary responsibility
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated biphenal
PCM	primary care management or primary care manager
PCMH	Patient-Centered Medical Home
PCS	permanent change of station
PDHA	Post-Deployment Health Assessment
PDHRA	Post-Deployment Health Reassessment
PH	Public Health
PHA	preventive health assessment
PHR	Epidemiology Consult Service
PHWG	Population Health Working Group
PPE	personal protective equipment
PTS	permanent threshold shift
QNFT	quantitative fit training
RAC	risk assessment code
RF	radio frequency

RFR	radio frequency radiation
Rh	rhesus
RTD	return to duty
SCBA	self-contained breathing apparatus
SDS	Safety Data Sheets
SF	standard form
SGP	Chief of Aerospace Medicine
SPL	sound pressure levels
SRTS	Spectacle Request Transmission System
STD	standard
STS	significant threshold shift
TB	tuberculosis
TDY	temporary duty
TLD	thermoluminescent dosimeter
TTS	temporary threshold shift
UHM	Unit Health Monitors
USAFSAM	USAF School of Aerospace Medicine
USPHSTF	US Preventive Health Services Task Force
UV	ultraviolet
WHO	World Health Organization
WIC	workplace identifier code
WMSD	work-related musculoskeletal disorder
WPID	work place ID
WWD	worldwide duty

Student Notes

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