FEATURE ARTICLE
Continuing Education

Preparing for Smallpox

Occupational Health Nursing Update

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Smallpox, the scourge of humankind for thousands of years and the eradication of which is considered one of mankind's greatest victories, is threatening a return. With the potential for smallpox to be used as a weapon of terror, the world is again preparing to do battle with one of the most significant diseases ever to plague humans. Occupational health nurses may know about smallpox from what they have read or what they have heard from the news media or in training programs. A few may have had firsthand experience, perhaps as a child, with the disease. For others, a small round scar on their upper arm and a recollection of hearing about this disease in nursing school may be their only experience with smallpox. This article provides a brief history of the disease, information related to vaccination against the disease, and current prevention strategies for the disease.

SMALLPOX HISTORY

No reliable evidence indicates when humans were first afflicted with smallpox. However, it is estimated that the disease has plagued humankind for more than 3,000 years. Egyptian mummies indicate that smallpox ravaged humans as far back as 1500 BC (Fenner, 1988). Smallpox is credited with playing a major role in the decline of at least three civilizations. The Ethiopian Empire of 568 AD, the Aztecs of Central America, and the Native American tribes of North America were decimated by smallpox. Smallpox, brought back by Roman warriors, also greatly weakened the Roman Empire (Fenner, 1988). As recently as 1967, smallpox was credited with the deaths of 2 to 3 million worldwide (Mayo Foundation for Medical Education and Research, 2002)

Smallpox has had such an impact on the human race that many societies have specific gods, goddesses, and saints associated with the disease. During the Middle Ages, St. Nicaise, the Bishop of Rheimsa, was revered as the patron saint of smallpox. Sitala (shitala) mata is an Indian folk goddess closely associated with smallpox. In China, the goddess of smallpox is T'ou-Shen Niang-Niang. The Japanese hung a picture of Tametomo, a 12th century hero reputed to have fought off a smallpox demon, in the rooms of smallpox victims. Among the Yorubas and other neighboring tribes in Africa, Sopana is the smallpox deity (Fenner, 1988).

The paradox of smallpox is that it also represents one of humankind's greatest achievements. Smallpox is the only disease to be eradicated as an active disease in the human species. On December 9, 1979, after a 13 year worldwide effort called the "Intensified Smallpox Eradication Program," the World Health Organization (WHO) officially certified that smallpox had been eradicated from the globe (Fenner, 1988).

Although no active cases of smallpox have been found in the world since 1977, the WHO allows two laboratories to keep the smallpox virus in storage. Both the Centers for Disease Control and Prevention (CDC) in Atlanta, Georgia and the Vector Laboratories in Russia are known to store live smallpox virus. However, recent world events and information from Russia indicate these may not be the only places where the smallpox virus can be found. The disease, once conquered, is now threatening to return as a weapon of terror.

The federal government has formalized policies and protocol for many of the issues related to smallpox immunization and treatment. Although the most current information has been included in this article, it is recommended individuals access the CDC website at http://www.bt.cdc.gov/agent/smallpox/index.asp for the latest information.

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Table

Rash Types

Rash Type	Description	Size	Texture
Macule	Area of color change on the skin	< 1.5 cm	Flat
Papule	Small palpable lesion. Solitary or multiple.	0.5 to 1.5 cm	Usually visibly raised above the skin surface.
Pustular Lesion	Fluid filled blister. Usually white or yellow. Solitary or multiple	0.5 to 1.5 cm	Visibly raised, may have white or yellow blister present

McClain, 1997.

Variola Virus

Smallpox is a member of the *Poxviridae* family. *Poxviridae* are among the largest known viruses, with a 200 nm × 250 nm size (Donahue, 2000). In vertebrates, poxviruses are a part of the subfamily known as *Chordopoxvirinae*. This subfamily is further broken down into genus according to the vertebrate species. Smallpox is classified as a member of the genus *Orthopoxvirus*. The specific causative agent of smallpox is the variola poxvirus. Although similar to a variety of animal poxviruses, humans are the only known natural host of the variola poxvirus. The CDC scientists have recently artificially induced smallpox in a research population of monkeys, but monkeys are not considered natural hosts (Preston, 2002).

Natural History of Smallpox Disease

The variola virus enters the human body primarily through the respiratory tract after exposure to droplet nuclei from an infected individual. The assumed infectious dose of variola is 10 to 100 organisms (Donahue, 2000). Historically, transmission of the virus in the population does not occur as quickly as the transmission of diseases such as varicella (i.e., chicken pox) or measles, and typically occurs from close contact with an infected individual. Household members appear to be the most susceptible to infection. This may be because infected individuals are most contagious when their symptoms are the most severe, at which time they are, more than likely, bed ridden (Henderson, 1999).

Variola virus is highly stable in a variety of atmospheric and temperature conditions outside of the host. Active virus has been recovered from scabs 13 years after collection, and it is thought that the bodies of smallpox victims preserved in permafrost or sealed, dry crypts could still harbor the virus (McClain, 1997). Smallpox is normally more prevalent in winter and early spring months. Recorded outbreaks in Europe occurred largely in the winter and rarely in the summer (Henderson, 1999).

Once in the upper or lower respiratory tract, smallpox travels to regional lymph nodes and disseminates systemically to other lymphoid tissues. On approximately the fourth day after infection, an asymptomatic viremia develops. This is followed by multiplication of the virus in the spleen, bone marrow, and other lymph nodes. The virus is picked up by the body's leukocytes and localizes in the small blood vessels of the oral and pharyngeal mucosa and the dermis. From here, the virus infects other surrounding cells (Henderson, 1999).

The average incubation period is 12 to 14 days (range 7 to 17 days) from date of infection to onset of symptoms. During the incubation period, the infected individual has no symptoms, may feel fine, and is not contagious.

The first phase of symptoms, the prodromal stage, includes fever, acute malaise, rigors, vomiting, headache, and backache, with 15% of smallpox patients developing delirium (McClain, 1997). These symptoms typically last 2 to 3 days. During this stage, the infected individual is sometimes contagious.

The eruptive stage begins after the prodromal stage. During the first few days of the eruptive stage, exanthema (i.e., lesions) appears in the oral cavity. This is the most contagious stage of the disease. It is this shedding of the virus by the oral mucosa into the saliva that makes the victim so infectious. With every exhalation and during speech, viral particles are spread outside the body. Individuals who have developed a cough spread even more of the virus. This stage lasts approximately 4 days.

Along with the oral mucosa ulcers, a fine macular rash (see Table) also starts to appear on the face and forearms. This rash progresses to the legs and, during the next week, spreads to the trunk. This pattern of rash is a critical feature of smallpox that differentiates it from other viruses, such as varicella (chickenpox). Varicella starts on the trunk and spreads outward. Smallpox starts at the head and spreads to the extremities and then to the trunk. Smallpox frequently can be found on the palms of the hands and the soles of the feet. Varicella is seldom found in these areas. Another differentiating feature of smallpox is that the stages of rash are nearly uniform. This is in comparison to varicella where rashes in various stages can be found on the body.

The macular rash quickly progresses to a papular rash and then to pustular vesicles. From 8 to 14 days after the onset of the rash, the pustules form scabs and eventually fall off. Depressed and depigmented scars are left after the scabs fall off. Individuals with smallpox should be considered infectious from the onset of exanthem until all scabs separate. This can be from 7 to 28 days after infection (McClain, 1997).

Variations of the Disease

Two distinct types of smallpox include variola major and variola minor. Variola minor typically was found in Africa, South America, and Europe. Symptoms were usually milder with less toxicity and a lesser rash. Mortality from variola minor was reported as 1% of unvaccinated individuals who developed smallpox. Variola major was found predominantly in Asia and parts of Africa. Historically, it had a fatality rate of 30% of unvaccinated individuals and 3% of vaccinated individuals who developed the disease (McClain, 1997).

Variola major can manifest itself in one of four ways (CDC, 2002a):

- Ordinary smallpox.
- Modified (i.e., a mild form found in previously vaccinated individuals).
- Flat-type smallpox.
- Hemorrhagic-type.

Flat-type smallpox historically was seen in 2% to 5% of individuals with smallpox, and was characterized by a severe systemic toxicity and soft, flat skin lesions. Individuals with flat-type smallpox had a mortality rate of 66% in vaccinated individuals and 95% mortality in unvaccinated individuals (McClain, 1997).

Hemorrhagic-type smallpox historically was seen in fewer than 3% of individuals with smallpox, but had a nearly 100% mortality rate. Death typically occurred due to the extreme toxemia prior to the onset of the pox lesions. Hemorrhagic-type smallpox takes its name from the extensive petechiae and mucosal hemorrhage that develop in victims of this form of smallpox. With hemorrhagic smallpox, individuals hemorrhage from every part of their bodies. Hemorrhagic smallpox appeared to happen more often in pregnant women and in anergic or immunocompromised individuals (McClain, 1997).

VACCINATION

Smallpox is considered to be one of the first, if not the first, disease for which a vaccine was developed. An immunization practice to lessen and prevent smallpox called variolization is mentioned in a number of early texts, and appears to have been practiced by early civilizations including Egyptian, Indian, and Chinese (Fenner, 1988). Variolization involved inoculating the skin of uninfected individuals with material from an infected individual's smallpox lesion. It was believed that variolization caused a milder case of smallpox, and once recovered, the individual was then immune to further smallpox infection. Approximately 1 in 200 variolizations resulted in severe cases of smallpox (Donahue, 2000).

Lady Mary Wortley Montague wrote about the practice of variolization in 1717 and is credited with introducing variolization to Great Britain in 1721. Voltaire wrote about this "inoculation" in a letter from 1733 (Donahue, 2000). It is also noted that African slaves in the United States talked about low smallpox rates in Africa from a similar inoculation practice. It is reported that, faced with the potential use of smallpox as a weapon against his troops by the British, George Washington had all the Continental soldiers at Valley Forge who had not already had smallpox, immunized through variolization (Shareef, 2002).

In the late 1700s, British scientist Edward Jenner investigated stories that English milkmaids who had been in contact with cows infected with cowpox did not develop smallpox. Jenner believed the infectious material from the cows (he called the material a "virus") provided protection to the milkmaids against smallpox. 1n 1796, Jenner used cowpox material to vaccinate an 8 year old boy. The boy later was able to resist infection when exposed to smallpox. Jenner is credited with developing the world's first vaccine. The word "vaccinate" comes from the Latin vaccinus "relating to cows" (Donahue, 2000).

As the world entered the 20th century, vaccination for smallpox was widespread throughout the industrialized countries of the world. Although better immunization methods had been developed and were being used in Europe and North America, variolization was still widely practiced in Asia and Africa.

Vaccine

The current smallpox vaccine is a distinct species of *Orthopoxvirus* called vaccinia. The origins of the vaccinia virus are unknown. It could be a hybrid of cowpox virus and variola, or could have been derived from a laboratory virus now extinct in nature. Because all *Orthopoxvirus* exhibit cross-protection, immunization with vaccinia virus gives protection against variola (smallpox) virus (Fenner, 1988). Because of the recent concern related to possible terrorist use of smallpox, four pharmaceutical companies are currently manufacturing the vaccinia vaccine. This should ensure adequate supply of the vaccine (CDC, 2003b).

U.S. Vaccination Policy

Prior to the adoption of the current CDC vaccination plan, experts were divided about the best approach to handle an outbreak of smallpox. One group believed the vaccine should be made available to the entire population—the idea being that if enough individuals were immunized, any cases of smallpox that may develop would not be able to gain a foothold and spread very far. Others believed the method used to originally eliminate smallpox, called ring vaccination, should be used. Ring vaccination is the process of starting from the diagnosed case of smallpox and working outward, vaccinating all who may have had contact with the smallpox carrier. Ring vaccination works because immunization can be effective even after exposure to smallpox. Administration of the vaccinia vaccine within the first 2 to 4 days after initial exposure may prevent infection or reduce the extent of the disease (CDC, 2001).

In October 2002, the CDC released a working plan to address vaccination of the U.S. population. This plan is updated as needed. The vaccination plan has two primary parts. The first is a pre-event plan. This plan is to vaccinate health care workers and other personnel who would be caring for individuals with smallpox and those vaccinating or assisting at vaccination sites for the public following a confirmed case of smallpox (CDC, 2002b).

The pre-event plan calls for inoculating critical personnel through a series of stages. The first stage involves

immunizing immediate response teams that would respond to any case of smallpox and set up an immediate ring vaccination program. Vaccinating public health personnel who would vaccinate other pre-event groups is also a part of the first stage. At this time, the majority of the first stage of the smallpox vaccine plan has been implemented.

The second stage involves each state developing a plan to immunize groups of health care workers at hospitals within each state. Information about this stage can be found in the Advisory Committee on Immunization Practices, Recommendations for Using Smallpox Vaccine in a Pre-Event Vaccination Program can be found at http://www.cdc.gov/mmwr/preview/mmwrhtml/m2d226.htm. The second stage of the pre-event program was initiated in January of 2003 and is currently being conducted. In the event of a smallpox outbreak, the immunized hospital workers provide the teams to start immunizing the population and also provide care for the individuals with smallpox. The CDC Smallpox Response Plan is designed to vaccinate approximately 6,000 individuals per clinical site per day.

The second part of the CDC smallpox plan is to immediately respond to any area in the country where a case of smallpox has been reported. This response includes local, state, and federal response teams. The CDC plan (CDC, 2002b) documents all aspects of surveillance, contact investigation, immunization, immunization follow up, and supplies.

Because any case of smallpox could potentially indicate a terrorist attack, the release of smallpox virus at multiple locations is a possible scenario. Population disease surveillance plans, both pre- and post-outbreak, has been planned for and is being implemented (CDC, 2002b).

Compensation for Injury or Wage Loss

One area yet to be fully defined is how individuals will be compensated if they are injured by the vaccinia vaccine or cannot work following vaccination. The CDC states:

> The Advisory Committee for Immunization Practices (ACIP) has recommended that recently vaccinated healthcare workers who follow the appropriate guidelines for vaccine site dressing and hand hygiene do not need to be placed on leave…(CDC, 2002c).

Compensation for injury is another issue that has not been fully clarified. The CDC, in the information about smallpox, makes this statement:

> There is no federal program to reimburse you for time lost from work, either because of illness due to vaccination or concern about spreading the virus to others. Your employer can tell you if they, or workers compensation, will cover these expenses (CDC, 2003d).

This information, combined with new laws reducing or eliminating the ability to seek compensation from the vaccine manufacturer, raises the issue of who will pay for the potential effects of the vaccine. This has been one of the primary issues raised by various unions and other employee groups concerned about the effects of the vaccination. The U.S. Congress has recently taken up the issue of compensation of individuals injured by the smallpox vaccine. No legislation had been passed at the time this article was submitted. Occupational health nurses need to check with state workers' compensation plans to determine whether any situations will be covered. It is recommended that occupational health nurses work with human resources or insurance departments to evaluate what coverage, if any, will be available for employees.

VACCINATION PROCEDURES

Screening

Although most individuals vaccinated with vaccinia vaccine experience minimal to mild side effects (e.g., swelling and tenderness of regional lymph nodes, fever, pustule at the site of the vaccination), others may experience severe side effects and even death. Side effects are usually milder in individuals who have been previously vaccinated. To assist in reducing the number of individuals experiencing side effects, the CDC has developed a medical screening process to identify individuals who should not be vaccinated during the pre-event stage. Individuals scheduled for vaccination need to thoroughly read the vaccination information distributed by the CDC prior to receiving the vaccination. The CDC Smallpox Pre-vaccination Information Packet can be found at http://www.bt.cdc.gov/agent/smallpox/vaccination/infopacket.asp.

Physicians or other trained health care providers need to review the medical risks with the individual being vaccinated to assure the risks are understood and individuals with medical risks are not vaccinated (CDC, 2002b). Should an actual outbreak of smallpox occur, state and federal officials would determine whether any individuals with medical risks should be vaccinated (CDC, 2002b).

According to the CDC vaccination program (CDC, 2003e), individuals with any of the following medical conditions should not be vaccinated during the pre-event stage:

- Human immunodeficiency virus or acquired immunodeficiency syndrome.
- Anergic or immuocompromised from drug treatment or medical conditions.
- A history or presence of eczema or atopic dermatitis, active acute or chronic skin conditions such as broken skin from burns, severe acne, or psoriasis.
- Currently pregnant.
- A severe allergy to one of the vaccine components (i.e., polymyxin, B sulfate, streptomycin sulfate, chlortetracycline hydrochloride, neomycin sulfate).
- A heart condition diagnosed by a health care provider (with or without symptoms).
- Three or more of the following risk factors: high blood pressure (diagnosed by a health care provider); high blood cholesterol (diagnosed by a health care provider); diabetes or high blood glucose (diagnosed by a health care provider); a first degree relative (i.e., mother, father, brother, sister) who developed a heart condition before age 50; current cigarette smoker.

Hand contact with the vaccine site, or contaminating the hands while changing the vaccine site dressing can also transfer the virus to others. Because of this potential,

Vaccination Instructions

The Centers for Disease Control and Prevention (CDC) has published the following instructions for vaccination.

1. Review patient history for contraindications.

2. Choose the site for vaccination.
The deltoid area on the upper arm is recommended.

3. Skin preparation.
No skin preparation is required. Under no circumstances should alcohol be applied to the skin prior to vaccination as it has been shown to inactivate the vaccine virus.

4. Dip needle.
The needle is dipped into the vaccine vial and withdrawn. The needle is designed to hold a tiny drop of vaccine of sufficient size and strength to ensure a take if properly administered. The same needle should never be dipped into the vaccine vial more than once, in order to avoid contamination of the vaccine vial.

5. Make perpendicular insertions within a 5 mm diameter area.
The needle is held perpendicular to the site of insertion. The wrist of the vaccinator should be maintained in a firm position by resting on the arm of the vaccinee or another firm support.
- A number of perpendicular insertions are made in rapid order in an area approximately 5 mm in diameter. The number of insertions should be in accordance with the package insert, using 3 insertions for primary vaccination and 15 insertions for revaccination with the Dryvax vaccine. A trace of blood should appear at the site of vaccination within 15 to 20 seconds. During primary vaccination, if no trace of blood is visible after 3 insertions, an additional 3 insertions should be made using the same bifurcated needle without reinserting the needle into the vaccine vial.
- The bifurcated needle is for one-time use only and should be discarded in an appropriate biohazard container immediately after vaccinating each patient.

6. Absorb Excess Vaccine
After vaccination, excess vaccine should be absorbed with sterile gauze. Discard the gauze in a safe manner (usually in an infection control receptacle) in order not to contaminate the site or infect others who may come in contact with it.

7. Cover vaccination site.
It is important that the vaccination site be covered to prevent dissemination of virus. Recommended coverings include the following:
- Gauze loosely secured by first aid adhesive tape (taking care to obtain history of tape sensitivity).
- When working in a health care setting, vaccinees should keep their vaccination site covered with gauze or a similar absorbent material. This dressing should, in turn, be covered with a semipermeable dressing. Products combining an absorbent base with an overlying semipermeable layer also can be used to cover the vaccination site. Healthcare workers do not need to be placed on leave after receiving a smallpox vaccination.
- Vaccinees in settings where close personal contact is likely (such as parents of infants and young children) should cover the vaccination site with gauze or a similar absorbent material, wear a shirt or other clothing that would cover the vaccination site, and also make sure to practice good hand hygiene.

Note: The use of semipermeable dressing alone could cause maceration of the vaccination site and increased, prolonged irritation and itching at the site, thereby increasing touching, scratching, and contamination of the hands. Thus, only those working in healthcare settings should use semipermeable dressings (over gauze or a similar absorbent material as described above).

8. Educate vaccinee.
To avoid contact transmission of the virus, vaccinees must be cautioned to do the following:
- Do not rub or scratch the vaccination site.
- Keep the site covered and change gauze-only dressings every 1 to 2 days or if wet. Change semipermeable dressings at least every 3 to 5 days.
- Keep the vaccination site dry, covering it with a water-proof bandage while bathing.
- Discard gauze carefully in plastic zip bags.
- Set aside a laundry hamper for clothes, towels, sheets and other items that may come into contact with the vaccination site.
- Wash clothing or other materials that come into contact with the vaccination site in hot water with detergent and/or bleach. Wash hands afterward.
- Wash hands thoroughly with soap and hot water or with alcohol-based hand rubs such as gels or foams after touching the vaccination site, or bandages, clothing, towels, or sheets that have come into contact with the vaccination site.
- When the scab falls off, throw it away in a plastic zip bag.
- Report any problems by calling the phone number provided on the "Post-Vaccination and Follow-Up Information" sheet, calling your health care provider, or visiting and emergency room.
- Return 7 days after vaccination for a "take" check (to see if the vaccination was successful).

9. Record the vaccination.
Record vaccination information as instructed by the CDC.

Centers for Disease Control and Prevention (2003c).

individuals who have family members who may be at risk of side effects from vaccinia virus should not be vaccinated during the pre-event vaccination stage.

Administration

It is possible that occupational health nurses in health care facilities will be actively involved with the vaccination of health care personnel. Prior to administering vaccinia vaccine, occupational health nurses must be formally trained and instructed about vaccination technique and follow up information. The CDC has published a number of aids to assist with this training (see Sidebar on page 231). These can be seen at http://www.bt.cdc.gov/agent/smallpox/training/index.asp. Heath care workers giving the vaccine must be vaccinated prior to administering the vaccine and need to take great care not to spread the vaccine through hand contact. Gloves must be changed after disposing of the bifurcated needle in a biohazard container and prior to touching anything after the vaccination. An alcohol based hand sanitizer may be of use for cleaning the hands of the health care worker giving the vaccine if there is no contamination of the hands with blood or other body fluids (CDC, 2003a).

With the potential of vaccinated health care workers spreading the vaccinia virus to clients and other non-vaccinated employees, it has been asked if vaccinated workers should not return to work until they are no longer infectious. The CDC does not recommend keeping employees off the job until the vaccine site has scabbed over. Because of liability issues, the decision to keep vaccinated health care workers off the job needs to be made by the individual facility (CDC, 2002c).

Vaccine Side Effects and Treatment

According to the CDC, when smallpox vaccination was still a routine childhood immunization, the rate of serious side effects was 1,253.8 cases per million vaccinations and 108.2 cases per million revaccinations. The death rate was 1 per every million primary vaccinations and 0.25 per every million revaccinations (CDC, 2001a). Using these figures, it is estimated there could be more than 300 fatalities from the vaccination of the entire population (CDC, 2001b).

Vaccine immune globulin (VIG) is the treatment of choice for serious vaccinia related reactions. Vaccine immune globulin is derived from the plasma of individuals who have been successfully vaccinated with vaccinia virus. It is available in intravenous and intramuscular preparations under Investigational New Drug protocols through CDC and the U.S. Department of Defense (Cono, 2003).

Reactions to the vaccinia virus can range from mild and self limiting to severe and life threatening. Typical reactions to the vaccinia vaccination are mild and self limited and include the following (Cono, 2003):

- Fever.
- Headache.
- Fatigue.
- Myalgia.
- Chills.
- Local skin reactions.
- Nonspecific rashes.
- Erythema multiforme.
- Lymphadenopathy.
- Pain at the vaccination site.

Severe and life threatening reactions to vaccinia virus include:

- Ocular vaccinia.
- Generalized vaccinia.
- Eczema vaccinia.
- Progressive vaccinia.
- Postvaccinial encephalopathy.
- Encephalomyelitis.
- Fetal vaccinia.

Inadvertent inoculation was, and could be, one of the most commonly reported adverse reactions from the vaccinia virus. Inadvertent inoculation occurs when the vaccinia virus is transferred to a part of the body other than the inoculation site. Typical areas of inadvertent inoculation include the face, eyelid, nose, mouth, lips, genitalia, and anus. Areas inoculated may develop a secondary lesion. This is usually a self limiting side effect, but inoculation of areas of the body such as the eye, should be evaluated by a physician and may require topical antiviral treatment or VIG (Cono, 2003). The CDC has posted information about these and other adverse reactions on their web site http://www.bt.cdc.gov/agent/smallpox/training/index.asp.

Vaccination Follow Up

Because of the possibility of spreading vaccinia virus to other non-immune individuals, vaccinated individuals should have routine follow up by trained health care personnel through the entire period from inoculation until the scab falls off. The follow up includes periodically (i.e., every shift) inspecting the immunization site, evaluating the integrity of the dressing and semi-permeable membrane, and changing the dressing and semi-permeable membrane every 3 to 5 days or as needed. Vaccination follow up also includes evaluating the health and side effects of the vaccinated individual (CDC, 2002b).

ROLE OF THE OCCUPATIONAL HEALTH NURSE

Occupational health nurses can play an important role in the pre-event stages of the CDC vaccination plan and if an outbreak of an infectious disease such as smallpox occurs. Occupational health nurses possess the knowledge and skills to be an integral part of any smallpox preparations planned and implemented by health care facilities. The planning related to how best to handle the vaccination and monitoring of employees is a task well suited to the occupational health nurse.

Occupational health nurses may evaluate the pre-vaccination status of employees and administer vaccine. Monitoring side effects of vaccinated health care workers also will be an important part of this process. Although the need to vaccinate is driven by a potential threat to the nation, the actual screening, administration, and follow up of vaccinated individuals follow protocols familiar to occupational health nurses.

Education has always been one of the areas occupational health nurses have incorporated into their practice. There are, and will be, misinformation and other views relating to smallpox and vaccinia vaccination. Occupational health nurses are a source of accurate and timely information for workers, management, and the community.

SUMMARY

Smallpox has plagued humans for thousands of years. Although smallpox has been eliminated as an active disease in humans, there is a threat that terrorist organizations or nations could use smallpox as a weapon against the population of the United States. The U.S. government has recognized this threat and has asked the CDC to prepare for such a possibility. A plan to identify, treat, and vaccinate the population in any area of the country where an outbreak of smallpox might occur has been developed and is being implemented. The CDC plan calls for rapid response by local, state, and federal response teams. Preparation of these teams is currently underway. Parts of the CDC plan, including educating and screening individuals who may be part of the response teams, vaccinating personnel, and following up with the vaccinated personnel, are activities consistent with the occupational health nurse's role.

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IN SUMMARY

Preparing for Smallpox

Occupational Health Nursing Update

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1. Smallpox has plagued humans for thousands of years and has been one of the most feared diseases throughout the ages. After a worldwide effort by the World Health Organization, smallpox was eradicated from the human population. It is the only disease that has been totally eliminated from humans.

2. Because of a potential that terrorists could reintroduce smallpox into the population, the U.S. government has developed a plan to respond to any smallpox outbreak in the United States. This plan includes surveillance for cases of smallpox, preparation of teams that would respond to a smallpox outbreak, and vaccination of the population that may have been exposed to a smallpox victim.

3. Occupational health nurses have the skills and knowledge to be an integral part of any component of the U.S. Government's smallpox response plan.

Preparing for Smallpox: Occupational Health Nursing Update

This issue of the AAOHN JOURNAL contains a Continuing Education Module on "Preparing for Smallpox: Occupational Health Nursing Update" 1.1 contact hours of continuing education credit will be awarded by AAOHN upon successful completion of the posttest and evaluation.

A certificate will be awarded and the scored test will be returned when the following requirements are met by the participant: 1) The completed answer sheet is received at AAOHN on or before April 30, 2004; (2) A score of 70% (7 correct answers) is achieved by the participant; (3) The answer sheet is accompanied by a $10.00 processing fee. Expect up to 6 weeks for delivery of the certificate.

Upon completion of this lesson, the occupational health nurse will be able to:

1. Identify key points in the history of smallpox.
2. Describe the natural history of smallpox disease.
3. Outline the components of an effective smallpox vaccination program.

AAOHN is accredited as a provider of continuing education in nursing by the American Nurses Credentialing Center's Commission on Accreditation. AAOHN is additionally approved as a provider by the California Board of Registered Nursing (#CEP9283) and the Louisiana State Board of Nursing (#LSBN3).

Contact hour credits received for successful completion of the posttest and evaluation may be used for relicensure, certification, or re-certification.

Directions: Circle the letter of the best answer on the answer sheet provided. (Note: You may submit a photocopy for processing.)

1. The World Health Organization officially certified on _____ that smallpox had been eradicated worldwide.
A. August 8, 1967.
B. November 14, 1972.
C. December 9. 1979.
D. October 11, 1984.

2. Which of the following is true related to the transmission of the variola virus?
A. The infectious dose of variola is 150 to 300 organisms.
B. Variola virus is highly unstable in varying temperature conditions outside the host.
C. Transmission is quite fast in the population compared to measles and varicella.
D. Transmission follows exposure to droplet nuclei from an infected person.

3. During the prodromal stage of smallpox, an occupational health nurse would expect to observe:
A. Fever, malaise, vomiting, headache, and backache.
B. Exanthema in the oral cavity.
C. A fine macular rash.
D. No symptoms.

4. The occupational health nurse recognizes that compared to varicella, the rash of variola:
A. Appears first on the face and forearms.
B. Starts on the trunk and moves outward.
C. Seldom spreads to the palms of the hands or soles of the feet.
D. Can be found in various stages on the body.

5. Which of the following forms of variola major has the highest mortality rate?
A. Ordinary smallpox.
B. Flat-type smallpox.
C. Modified smallpox.
D. Hemorrhagic-type smallpox.

6. The average incubation period from date of variola infection to onset of symptoms is:
A. 6 to 8 days.
B. 9 to 11 days.
C. 12 to 14 days.
D. 17 to 21 days.

7. According to The Centers for Diease Control and Prevention (CDC) Smallpox Response Plan and Guidelines (2002), the second stage in the pre-event plan calls for vaccinia vaccination of:
A. Immediate response teams.
B. Hospital health care workers within each state.
C. Public health personnel who would vaccinate other pre-event groups.
D. Family members of persons exposed to smallpox.

8. The occupational health nurse advises management that the CDC will provide this free of charge for someone with an adverse reaction to the vaccinia vaccine:
A. Hospitalization.
B. Medical consultation.
C. Medical expenses.
D. Drugs to treat certain reactions.

9. When educating other nurses about the administration of vaccinia vaccine, the occupational health nurse emphasizes that:
A. The needle is held at a 45° angle to the site of insertion.
B. 3 or 15 insertions are made rapidly in an area of 5 mm in diameter.
C. Alcohol is applied as the skin preparation.
D. Blood at the site indicates the vaccination will not take.

10. The occupational health nurse counsels that mild, usually self limiting, reactions to the vaccinia virus include:
A. Erythema multiforme.
B. Ocular vaccinia.
C. Eczema vaccinia.
D. Generalized vaccinia.

ANSWER SHEET
Continuing Education Module

Preparing for Smallpox: Occupational Health Nursing Update

May 2003

(Goal: To gain ideas and strategies to enhance personal and professional growth in occupational health nursing.)

Mark one answer only!
(You may submit a photocopy of the answer sheet for processing.)

1.	A	B	C	D	**6.**	A	B	C	D
2.	A	B	C	D	**7.**	A	B	C	D
3.	A	B	C	D	**8.**	A	B	C	D
4.	A	B	C	D	**9.**	A	B	C	D
5.	A	B	C	D	**10.**	A	B	C	D

EVALUATION (must be completed to obtain credit)

Please use the scale below to evaluate this continuing education module.

	4 - To a great extent	3 - To some extent	2 - To little extent	1 - To no extent
1. As a result of completing this module, I am able to:				
A. Identify key points in the history of smallpox.	4	3	2	1
B. Describe the natural history of smallpox disease.	4	3	2	1
C. Outline the components of an effective smallpox vaccination program.	4	3	2	1
2. The objectives were relevant to the overall goal of this independent study module.	4	3	2	1
3. The teaching/learning resources were effective for the content.	4	3	2	1
4. How much time (in minutes) was required to read this module and take the test?	50	60	70	80

Please print or type: (this information will be used to prepare your certificate of completion for the module).
DEADLINE: APRIL 30, 2004. Allow up to 4 weeks for processing.

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