



Micro Morphs

The Ultimate Biothreat : Smallpox

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Satellite Broadcast and Web-
cast
CDC Bioterrorism Update:
Smallpox Preparedness
Preliminary Draft
December 5, 2002 - Part 1
December 6, 2002 - Part 2
12:30 - 5:30 PM ET

From the Centers for Disease Control and Prevention Smallpox Basics

Smallpox: An Overview

The Disease

Smallpox is a serious, contagious, and sometimes fatal infectious disease. There is no specific treatment for smallpox disease, and the only prevention is vaccination. The name *smallpox* is derived from the Latin word for “spotted” and refers to the raised bumps that appear on the face and body of an infected person.

There are two clinical forms of smallpox. Variola major is the severe and most common form of smallpox, with a more extensive rash and higher fever. There are four types of variola major smallpox: ordinary (the most frequent type, accounting for 90% or more of cases); modified (mild and occurring in previously vaccinated persons); flat; and hemorrhagic (both rare and very severe). Historically, variola major has an overall fatality rate of about 30%; however, flat and hemorrhagic

smallpox usually are fatal. Variola minor is a less common presentation of smallpox, and a much less severe disease, with death rates historically of 1% or less.

Smallpox outbreaks have occurred from time to time for thousands of years, but the disease is now eradicated after a successful worldwide vaccination program. The last case of smallpox in the United States was in 1949. The last naturally occurring case in the world was in Somalia in 1977. After the disease was eliminated from the world, routine vaccination against smallpox among the general public was stopped because it was no longer necessary for prevention.

Where Smallpox Comes From
Smallpox is caused by the variola

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Smallpox: Overview cont'd.....

virus that emerged in human populations thousands of years ago. Except for laboratory stockpiles, the variola virus has been eliminated. However, in the aftermath of the events of September and October, 2001, there is heightened concern that the variola virus might be used as an agent of bioterrorism. For this reason, the U.S. government is taking precautions for dealing with a smallpox outbreak.

Transmission

Generally, direct and fairly prolonged face-to-face contact is required to spread smallpox from one person to another. Smallpox also can be spread through direct contact with infected bodily fluids or contaminated objects such as bedding or clothing. Rarely, smallpox has been spread by virus carried in the air in enclosed settings such as buildings, buses, and trains.



Humans are the only natural hosts of variola. Smallpox is not known to be transmitted by insects or animals. A person with smallpox is sometimes contagious with onset of fever (prodrome phase), but the person becomes most contagious with the onset of rash.

At this stage the infected person is usually very sick and not able to move around in the community. The infected person is contagious until the last smallpox scab falls off.

Smallpox Disease

Incubation Period

(Duration: 7 to 17 days)

Not contagious

Exposure to the virus is followed by an incubation period during which people do not have any symptoms and may feel fine. This incubation period averages about 12 to 14 days but can range from 7 to 17 days. During this time, people are not contagious.

Initial Symptoms (Duration: 2 to 4 days) *Sometimes contagious**

The **first symptoms** of smallpox include fever, malaise, head (Prodrome) and body aches, and sometimes vomiting. The fever is usually high, in the range of 101 to 104 degrees Fahrenheit. At this time, people are usually too sick to carry on their normal activities. This is called the *prodrome* phase and may last for 2 to 4 days.



Smallpox Disease cont'd... from page 2

Early Rash

Most contagious

(Duration: about 4 days)

A **rash emerges** first as small red spots on the tongue and in the mouth.

These spots develop into sores that break open and spread large amounts of the virus into the mouth and throat. At this time, the person becomes **contagious**.

Around the time the sores in the mouth break down, a rash appears on the skin, starting on the face and spreading to the arms and legs and then to the hands and feet. Usually the rash spreads to all parts of the body within 24 hours. As the rash appears, the fever usually falls and the person may start to feel better.

By the third day of the rash, the rash becomes raised bumps.

By the fourth day, the bumps fill with a thick, opaque fluid and often have a depression in the center that looks like a bellybutton. (This is a major distinguishing characteristic of smallpox.)

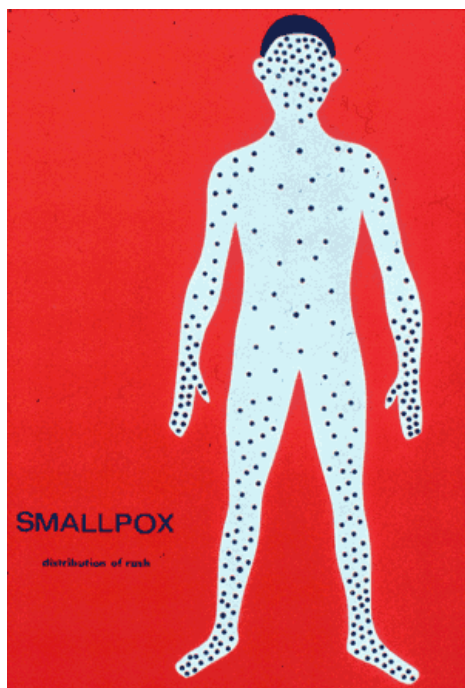
Fever often will rise again at this time and remain high until scabs form over the bumps.

Pustular Rash

(Duration: about 5 days)

Contagious

The bumps become **pustules**—sharply raised, usually round and firm to the touch as if there's a small round object under the skin. People often say the bumps feel like BB pellets embedded in the skin.



Pustules and Scabs

(Duration: about 5 days)

Contagious

The pustules begin to form a crust and then **scab**.

By the end of the second week after the rash appears, most of the sores have scabbed over.

Resolving Scabs

(Duration: about 6 days)

Contagious

The scabs begin to fall off, leaving marks on the skin that eventually become pitted **scars**. Most scabs will have fallen off three weeks after the rash appears.

Scabs resolved

Not contagious

The person is contagious to others until all of the scabs have fallen off.

Rash Distribution

emicro case 1

The patient was a 58-year-old Hispanic male who was admitted through the Emergency Room with complaints of bilateral leg pains. The pain started with his right lower calf. Within hours of onset, the pain increased in intensity and was accompanied with swelling. The patient was also febrile with chills. He denied vomiting or diarrhea.

Fifteen days prior to admission, the patient underwent an upper GI endoscopy which showed duodenitis. Medical history includes Laennec's cirrhosis, gastritis, upper GI bleeding. The patient also drank 3 cases of beer/week and smoked heavily. He was previously treated for cellulitis of the left leg.

Admitting diagnosis: Staphylococcal or streptococcal cellulitis of the leg.

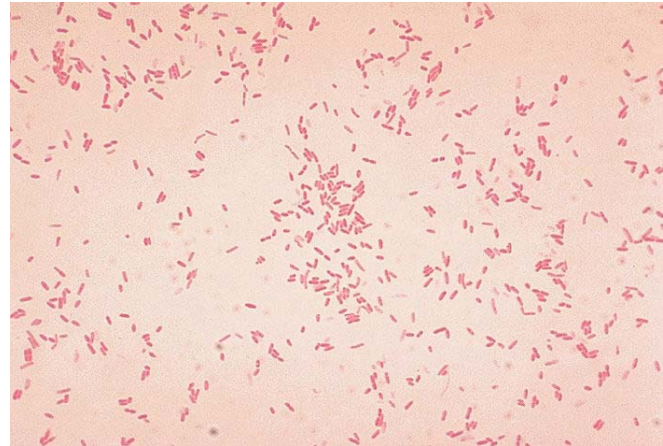
POINTS TO CONSIDER:

- Possible etiologic agents of necrotizing cellulitis
- Risk factors presented by the patient
- Possible sources of infection
- Procedures for maximum recovery and differential laboratory methods

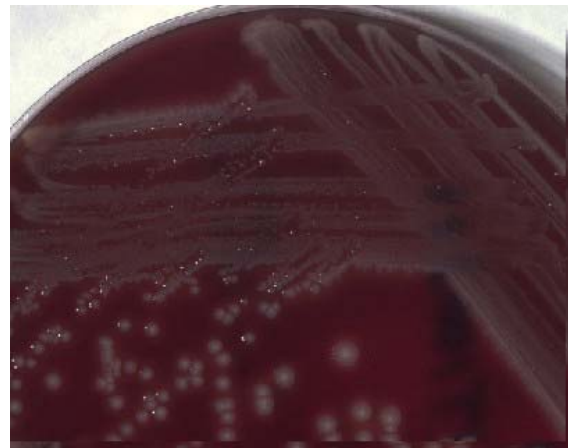
Urine, blood and exudates from blisters were collected for culture. Initial therapy with oxacillin was started. However, the patient deteriorated rapidly within few hours of his admission. The blisters progressed to his trunk. His therapy was changed from oxacillin to multiple broad spectrum antimicrobials. Evidence of septic shock and DIC were apparent and the patient was placed on mechanical ventilator. He remained unresponsive to therapy and expired within 48 hours from his admission.

Laboratory Identification

Urine, blood, and exudates grew oxidase positive Gram negative bacilli, glucose fermenter but non-lactose fermenter on MacConkey. The isolate was motile, produced catalase and indole. The organism produced growth in nutrient broth with 0% NaCl and no growth in 6.5% NaCl.



Microscopic morphology: Gram stain



Colonial morphology on sheep blood agar.

Discussion

The isolate from this case was identified as *Aeromonas hydrophila*

Aeromonas hydrophila is commonly found in soil, freshwater environment and in brackish water. Some but not all strains of *A. hydrophila* are capable of causing infections in humans by infecting open wounds and possibly ingesting the organisms in food or water.

Bergey's Manual of Systematic Bacteriology has classified the genus *Aeromonas* in the Family Vibrionaceae along with *Vibrio* species and *Plesiomonas* species. Recent proposals have suggested the removal of *Aeromonas* from this family and placing it into a separate family. Other related species include *A. veronii*, *A. caviae*, and *A. sobria*, all have been associated with illness in human. *A. salmonicida*, a fish pathogen, has not been isolated from humans.

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emicro case 1 discussion cont'd....

The aeromonads, although have been isolated from routine stool cultures from asymptomatic patients, are not usually considered as members of normal stool flora. Nevertheless, at the present time, the controversy remains as to whether or not these organisms are able to cause human gastrointestinal disease. Volunteer human feeding studies even with high numbers of cells, have not produced diarrheal illness; yet the organism has been isolated in individuals with diarrhea when no other enteric pathogen could be found.

This therefore suggests that some variants of these organisms have the ability to cause disease and that the GI tract may serve as a reservoir of human aeromonads.

A. hydrophila, *A. caviae* and *A. sobria* have been reported as cause of gastroenteritis in apparently healthy individuals but more severe infections may occur in individuals with weak or defective immune system or those with malignancies. Associated risk factors include liver cirrhosis and an immune compromised state.

There are several distinct types of gastroenteritis associated with *Aeromonas hydrophila* that have been described:

- An acute secretory diarrhea with vomiting
- A dysentery illness characterized by loose stool containing blood and mucus.
- A chronic diarrhea lasting about 10 days
- A nebulous syndrome- much like a "traveler's" diarrhea
- A choleric-type producing rice watery stool

Another clinical infection attributed to the aeromonads are wound infections especially those that were previously exposed to contaminated water or soil. These are the second most common form of infection associated with aeromonads. Cellulitis is the most common type of clinical presentation, although myonecrosis with or without gangrene has been reported. Most aeromonad isolates are *A. hydrophila*, *A. veronii* (biovar *veronii*) or *A. schubertii* (newly recognized species). Additional infections include osteomyelitis, meningitis, otitis, cholecystitis.

Aeromonads are gram negative rods that are straight, not curved; are oxidase positive and ferment glucose. Except for *A. media* and *A. salmonicida*, most are motile, with a single polar flagellum. To differentiate aeromonads from closely-related species such as the vibrios, testing for susceptibility to vibriostatic agent O/129 has been suggested. They grow readily on routine bacteriological culture media, although hemolysis is variable, most produce β -hemolysis on SBA. To differentiate aeromonads from closely-related species such as the vibrios, testing for susceptibility to vibriostatic agent O/129 has been suggested.

Because aeromonads may resemble the Enterobacteriaceae because both are glucose-fermenters, but oxidase-positive reaction should be a clue that the isolate is not an enteric bacteria. And because it is a glucose fermenter, it will produce on TSI or KIA, an acid butt- hence non-fermenting, oxidase positive species such as pseudomonads can also be eliminated. However, so are the members to the genera *Vibrio* and *Plesiomonas* and should be differentiated from these species. This isolate is readily identified by rapid, or semiautomated, miniaturized test kit systems, however, currently these systems are inadequate in identifying to the species level because of insufficient discriminatory markers to detect interspecies differences (esculin hydrolysis, decarboxylases and sugar). Discrepancies exist between conventional and miniaturize test kit systems.

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A Personal Note from Connie Mahon



USS MOBILE BAY (CG-53)

War on Terrorism: Casualties of War Hit Home

On 12 October 2002, LTJG David B. Scott, USNR SEAL Team III, my son-in-law, was killed after a parachute jump training exercise in Guam. He was en route to his deployment somewhere in Asia . He was survived by my daughter, ENS Kathleen E. Scott, his parents Jack and Maggie Scott and a brother, Michael. My daughter Kathleen is currently deployed aboard USS Mobile Bay (CG-53) somewhere in the Persian Gulf.

Let us remember that Freedom is not free, and not forget those who serve to protect this freedom.