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*Coccidioidomycosis (Valley Fever)*  
*Outbreak from a Utah*  
*Archaeology Field Trip*

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## *Objectives*

- Define Coccidioidomycosis (Valley Fever)
- Provide brief history of THREE (3) Valley Fever outbreaks associated with archaeology fieldwork projects
- Discuss awareness and prevention steps
- Your questions and Answers

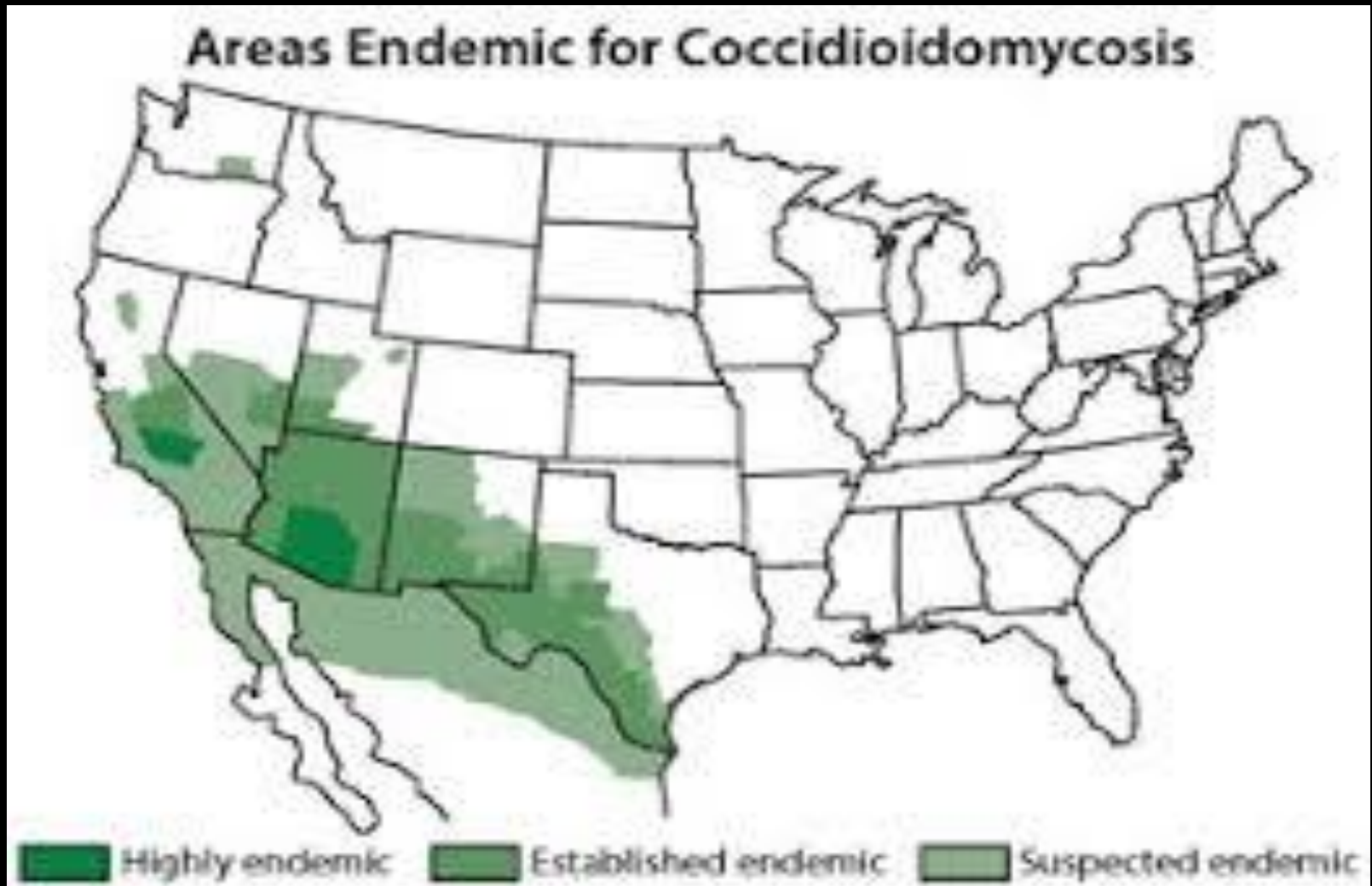
# *Definition of Coccidioidomycosis (Valley Fever)*

- 1. Inhaling spores of *Coccidioides immitis*, soil fungus endemic to southwestern U.S., Mexico, South America**
- 2. Valley Fever arises from the ground disturbance common in construction, military maneuvers, other desert activities, dust storms, & in museum or archaeology digs.**
- 3. Symptoms include cough, shortness of breath, chest pain, myalgia (aches), headache/sore throat; confirming studies include positive X-ray, skin tests, and + antibody test to *C. immitis*; average 10 days from initial exposure to symptoms (range 9-15 days)**

# *Sifting materials on site*



# *Focus on Southwestern U.S.*



Valley Fever (*C. immitis*) spores



# + *Chest X-ray for “Cocci”*





# Life cycles of VALLEY FEVER

The fungus that causes valley fever (*Coccidioides immitis*) grows one way in the ground and another way in an infected person or animal

**1** Valley fever fungus grows in dry, sandy soils in parts of the Southwest.

The fungus grows in hair-like structures called Mycelia that are microscopic chains of live and dead cells. As they grow, the dead cells break loose and become wings on the live cells.

**2**

Living fungal spores take flight.

Wind and other disruptions release the spores into the air. The spores' wings allow them to travel long distances.

**3**

Once airborne, the spores can be easily inhaled.

In the lungs, the spores change form once more. They become balls called spherules. They are filled with baby spherules that are released and reproduce in the same fashion. The growing fungus can fill the lungs, causing infection, pneumonia and other problems.

## Groups at higher risk of severe infection from valley fever

- Pregnant women
- African-Americans, Filipinos
- HIV, Hodgkin's disease and Lymphoma patients
- Diabetics and people with organ transplants
- People undergoing adrenal corticosteroid therapy

## Common symptoms of valley fever

- Fever
- Cough
- Chest pain
- Fatigue
- Shortness of breath
- Chills
- Muscle and joint pain
- Night sweats
- Lack of appetite and weight loss

Sources: Valley Fever. Center for Excellence. Californian research

MICHAEL BORJON/THE CALIFORNIAN

## Life Cycle of *Coccidioides immitis*

(Illustration: Michael Borjon/*The Bakersfield Californian*)

# *First Coccidioidomycosis Outbreak, 1970 (Werner et al., 1972)*

- Summer project excavating Indian ruins, 103 archaeology students from Queens College NY & CS Chico; ages 17-26 (largest in med. lit.)
- 61 (65%) had illness compatible with Valley fever; no masks worn & temps were very hot (>42 C). Index case was 19 year old female presenting @ CSC Health Center w/fever, shaking chills, headache, cough, chest pain & + skin test
- 34% had X-ray abnormalities, with pneumonia; + soil culture

## *2nd Coccidioidomycosis Outbreak, 1972 (Werner et al., 1973)*

- Summer project excavating Indian ruins, 39 archaeology students from CS Sacramento; 17 had symptoms consistent with VF
- Latency ~15 days from initial digging/sifting; attack rate higher for women than men (59 v. 41%); none required hospitalization
- Outbreak farther north near Red Bluff, CA; again very hot weather (>40 C)

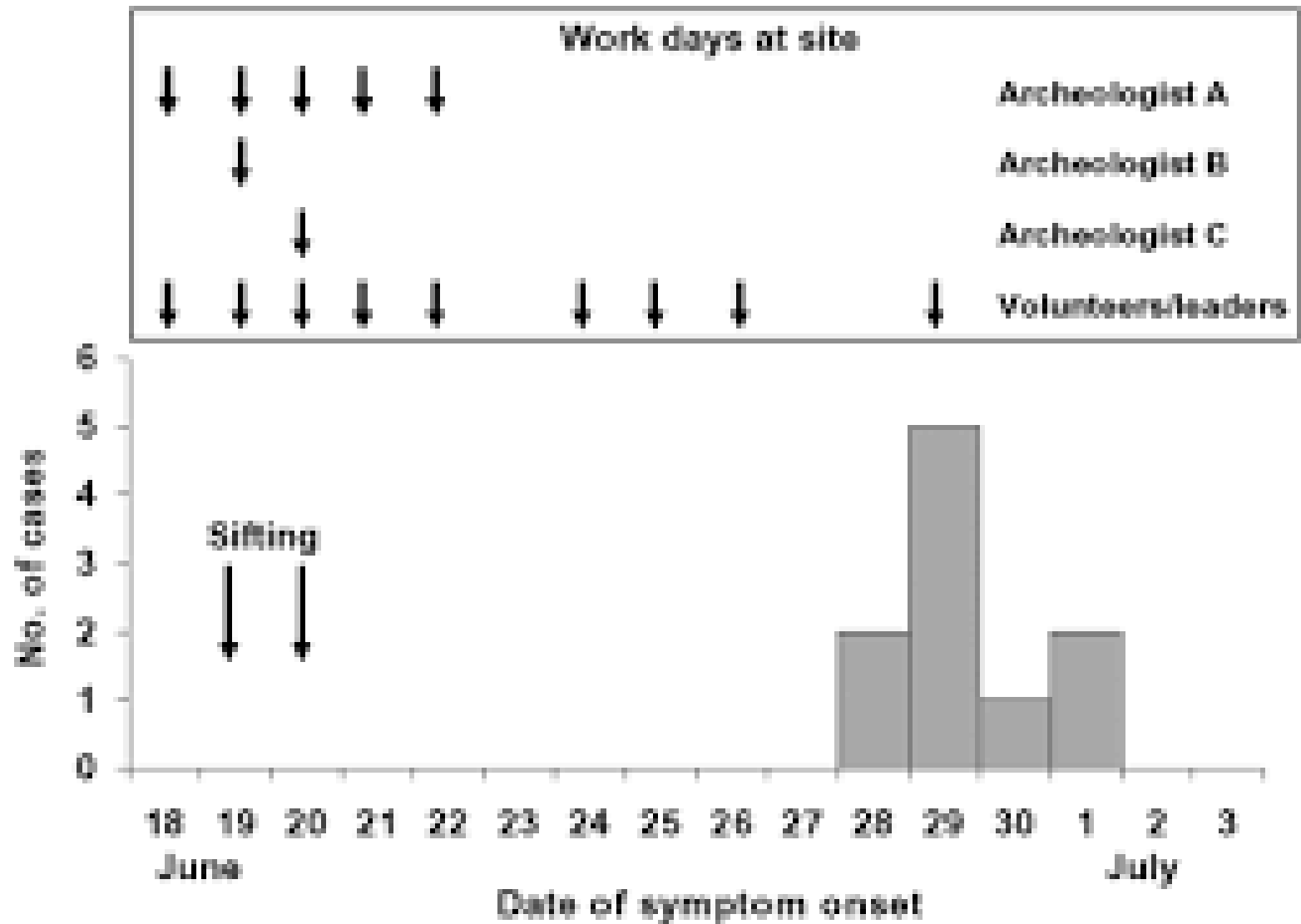
## *3rd Coccidioidomycosis Outbreak, 2001 (Peterson et al., 2004)*

- Dig at Dinosaur National Monument (DNM) in NE Utah led to 8 persons (6 students & 2 vol. leaders) having symptoms consistent w/ ‘Cocci’; all sought care at local ER.
- All worked at Swelter Shelter where NA petroglyphs and pictographs were discovered in 1960s
- 18 studied (8 cases & 10 DNM archaeologists) w/interviews & serology testing

**DINOSAUR  
NATIONAL MONUMENT  
FOSSIL BONE QUARRY**















## • *DNM Investigation--2.*

- Median incubation 10 days, w/symptoms including breathing difficulties, cough, fever, fatigue, shortness of breath, and skin rash (not reported in CA outbreaks)
- X-rays showed bilateral patchy infiltrates
- All cases treated w/antifungal medication fluconazole; resolved in ~3 days.
- 9/10 cases had IgM antibodies to *C. immitis*
- Tested for other antibodies but found neg.

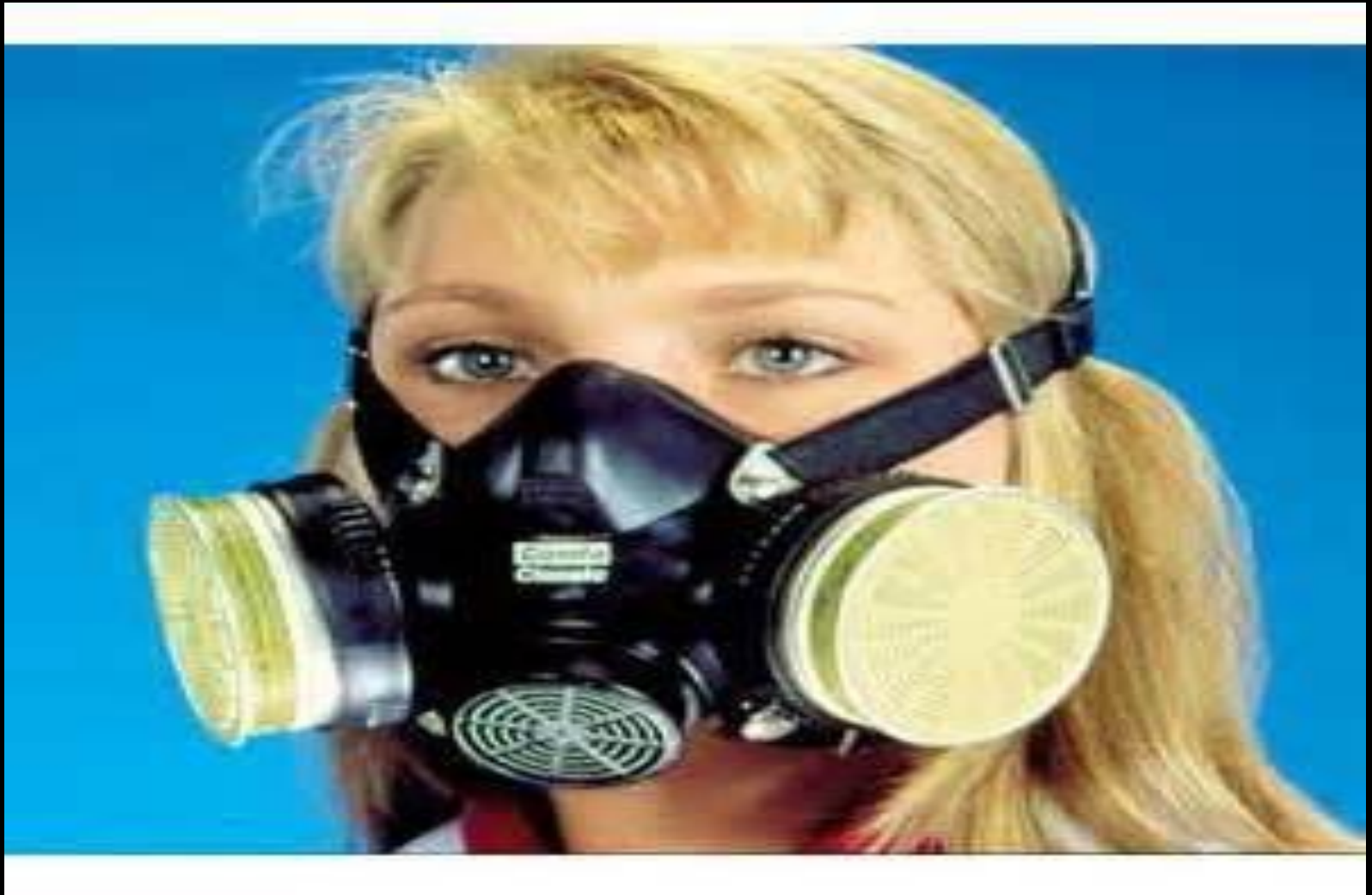
## † *Prevention Recommendations*

- NIOSH recommends wet methods, minimize soil disturbance, & wearing N95 respirators when working around Swelter Shelter.
- Suggestion that fieldwork occur \*after\* rainfall events; soil alkalinity plays a role.
- 40 additional DNM workers were studied for serological response and none had + antibody response to *C. Immitis*

## *Some Cautions*

- ~97% of U.S. Valley Fever cases are from AZ and CA; pregnant women, weakened immune system, African & Philipinos have higher risk
- New outbreaks reported among solar farm construction workers, movie set crew, & Central Valley (CA) inmates and prison staff
- AZ study (by Jones et al, 2017) suggests mortality rate from coccidioidomycosis is much greater than previously assumed

# *NIOSH-approved N95 Respirator*



## † *Conclusion*

- If you are planning dusty museum field work in the southwest, be concerned about possible risk for coccidioidomycosis, especially during hot weather
- Prevention includes staff and volunteer education; using wet methods; appropriate respiratory protection (NIOSH approved N95 respirators)
- Be alert to symptom clusters including cough, SOB, chest pain, myalgias/headaches, rash, fever/chills & sore throat [NOT transmissible person to person]. May need serology and chest X-ray for diagnosis

# *Questions*



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