The Public Health Significance of Coccidioidomycosis (Valley Fever) in the US-Mexico Border Region

Orion McCotter
Border Infectious Disease Surveillance Epidemiologist
Disclaimer

The findings and conclusions in this presentation are those of the author(s) and do not necessarily represent the views of the Arizona Department of Health Services.
Coccidioidomycosis

• Caused by a dimorphic fungi
  – *Coccidioides immitis* (California)
  – *Coccidioides posadasii* (Arizona)

• Grows in the soil

• Found in hot, arid areas (limited rainfall, high summer temps and few freezes)
Arizona 2007 Reported Valley Fever Cases by County

Cases per 100,000 County Residents
- 0 - 5
- 6 - 10
- 11 - 15
- 16 - 20
- 21 - 50
- 51 - 100
- 101 - 150

Arizona 2007 Reported Valley Fever Cases

<table>
<thead>
<tr>
<th>County</th>
<th>Cases per 100,000 Residents</th>
<th>Total Cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pima</td>
<td>90</td>
<td>904</td>
</tr>
<tr>
<td>Maricopa</td>
<td>89</td>
<td>3,459</td>
</tr>
<tr>
<td>Pinal</td>
<td>87</td>
<td>256</td>
</tr>
<tr>
<td>La Paz</td>
<td>69</td>
<td>15</td>
</tr>
<tr>
<td>Graham</td>
<td>66</td>
<td>21</td>
</tr>
<tr>
<td>Gila</td>
<td>27</td>
<td>15</td>
</tr>
<tr>
<td>Mohave</td>
<td>25</td>
<td>50</td>
</tr>
<tr>
<td>Greenlee</td>
<td>24</td>
<td>2</td>
</tr>
<tr>
<td>Cochise</td>
<td>23</td>
<td>32</td>
</tr>
<tr>
<td>Santa Cruz</td>
<td>15</td>
<td>7</td>
</tr>
<tr>
<td>Yavapai</td>
<td>12</td>
<td>26</td>
</tr>
<tr>
<td>Coconino</td>
<td>10</td>
<td>13</td>
</tr>
<tr>
<td>Navajo</td>
<td>10</td>
<td>11</td>
</tr>
<tr>
<td>Apache</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>Yuma</td>
<td>6</td>
<td>13</td>
</tr>
</tbody>
</table>

Data = Cases reported by clinicians or laboratories to the state and local health departments in the year shown. Cases reported in previous years are not included in the current data. Arizona population denominators are projections from the Population Statistics Unit in the Arizona Department of Economic Security (DES) (1981-1990, 1991-1996, 2001-2007) and census enumerations (data for 1980, 1990, and 2000) from the U.S. Census Bureau.
Coccidioidomycosis
(Valley Fever, Cocci)

- Laboratory and Physician reportable in Arizona
- National Reportable Disease in US
- Dissemination may occur in 1-10% of cases*

Coccidioidomycosis (Valley Fever)

- Inhalation of the spores causes a Mycosis in People and Animals
- “Primary” Pulmonary Infection
- Known as Valley Fever, Cocci

Spherules (Hematoxylin-Eosin stain)
Dust Exposure
Risk Factors for Valley Fever

• Primary Disease
  – >65 years old
  – Males ~5%

• Disseminated
  – Immunocompromised
  – Male
  – Race (African American, Filipino)
  – Pregnancy (Late)
  – Diabetes
Presentation of Valley Fever?

• Asymptomatic
  – ~60% of cases

• Primary
  Influenza-like or Pneumonia-like
  – Cough
  – Fatigue
  – Fever
  – Chest pains

• Disseminated
  – Bone
  – Joints
  – Skin
  – Brain (meningitis)
  – Lymph nodes
Coccidioidomycosis Burden

• The pulmonary presentation of Valley Fever often appears as influenza-like illness or a pneumonia
• It is misdiagnosed as a viral or bacterial infection, if diagnosed at all
• In Arizona endemic regions coccidioidomycosis is estimated to represent between 17%-29% of community acquired pneumonias.¹,²
• Correctly identifying coccidioidomycosis infections can greatly reduce medical, financial, and patient emotional burden
• The cases that progress to the disseminated disease can become life threatening

Rates of Reported Valley Fever (VF) in Arizona, 1993-2009

Reported cases per 100,000

Year of Report


0 20 40 60 80 100 120 140 160 180

12.33 11.41 11.85 12.19 15.69 27.28 30.92 36.76 45.1 57.2 47.9 62.7 58.2 88.7 75.1 73 157.2

Lab Reportable
Public Health Mission

• The Arizona Department of Health Services has been working to educate both the public and clinicians about Valley Fever for many years.

• Coccidioidomycosis is endemic to the southwestern United States, parts of northern Mexico, Central and South America.

• Arizona has a large burden of the disease with 60% of nationally reported cases occurring in Arizona.
What We Know?

• Cases waited average of 44 days before seeking care for their valley fever

• Average time between seeking healthcare and getting diagnosed: 5 months (median 23 days)
  – Those who knew about VF prior to seeking healthcare were diagnosed and treated 3 X earlier than those who were not familiar with the disease (79 days vs. 282 days; p-value: 0.04)

• A mean of 3 provider visits occurred before cocci diagnostic testing ordered
Valley Fever in the U.S.*

Cocci in México

- Long known to be endemic: Sonora, Coahuila, Nuevo León and Baja California considered most affected

Gonzales-Ochoa, 1966
Valley Fever in the Americas

Laboratory Diagnostics

• Direct
  – Microscopy (spherules; mycelial forms)
  – PCR probe

• Serologic (Simple and most widely used)
  – Enzyme Immuno Assay (EIA) IgM & IgG
  – Immunodiffusion IgM & IgG
  – Complement fixation IgG titer

• Skin Testing
  – Established exposure and did not indicate current infection
  – No longer available in U.S.

• Culture
Laboratory Diagnostics

• **Serologic** (Simple and most widely used)
  – Enzyme Immuno Assay (EIA) IgM & IgG
  – Immunodiffusion IgM & IgG
  – Complement fixation IgG titer

• Based on your immunologic response
• People can test Negative and be possitive for cocci
• Room for improvement
Physician Education

- ADHS recommends patients with community-acquired pneumonia (CAP) from endemic areas are tested for cocci
- Brochure and poster sent to primary care providers across AZ
- Poster targeting EDs with CAP recommendation
- Annual free CME and development of online CME
Valley Fever Cases Are Increasing

Coccidioidomycosis rate per 100,000 population by year, Arizona - 1993-2006

Valley Fever Mimics Community Acquired Pneumonia (CAP)

29% of Ambulatory CAP cases in Tucson, Arizona had diagnosis of Valley Fever.

Coccidioidomycosis as a Common Cause of Community Acquired Pneumonia. Emerging Infectious Diseases 2006;12:958-62

What Can You Do?

- Order Cocci serology on CAP cases
- Manage Valley fever cases
  - Inform patient of diagnosis
  - Report the case to public health
  - Consider treatment with anti-fungal drugs if the patient is at risk for severe disease

For more information on treatment guidelines, visit www.idsociety.org/pg

Resources
Arizona Department of Health Services
Office of Infectious Disease Services
150 N. 18th Ave, Suite 140
Phoenix, Arizona 85007
(602) 364-4562
www.valleyfeverarizona.org

Valley Fever Center for Excellence
Mail Stop 1111NF
3601 S. 6th Avenue
Tucson, Arizona 85723
Hotline (520) 699-4777
http://www.vice.arizona.edu/
Public knowledge?

- 1/5 Arizonans have never heard of VF
- 60% believe VF is significant health problem
- More than 1/3 of general public do not know how VF is transmitted
Public Education

Cough? Fever? Exhaustion?

Ask your doctor to test you for Valley Fever.

Photo courtesy of CDC.
Impact on People

• Cases were sick for an average of 7 months (median 4 months)

• 75% of cases missed work due to cocci
  – Average: 1 month (median 2 weeks)

• 75% unable to do usual daily activities
  – Average: > 3 months (median 6 weeks)
Impact on Economy

- 2007 Hospital Discharge Database
  - 1,735 cocci-related hospital visits
  - Accounting for $86 million in hospital charges
  - Average: $50,000 hospital visit
Timeline

• 2007- Arizona-Sonora Meetings

• 2008- Border Infectious Disease Conf.
  • CDC Mycotics Ben Park & Myself present

• 2009- BIDS
  • Respiratory Disease Workgroup

• 2010- Binational CME NM-TX-CHI-SO
  • Las Cruces, NM

• Feb 11- Epi and Lab Exchange

• June 11- Arizona Mexico Commission
  • Declaration of Cooperation
  • Signed by States Governor & Health Dir.
Objective / Objetivo: Implement a regional program for epidemiologic surveillance and control of Coccidioidomycosis / Implementar un programa regional para la vigilancia epidemiológica y control de la Coccidioidomycosis

Action Item Target Completion Date / Fecha para concluir la línea de acción: 1 Year / Año

Tactic / Táctica A): Arizona and Sonora will sign a binational Declaration of Cooperation for Epidemiological Surveillance of Coccidioidomycosis. / Arizona y Sonora firmarán una Declaración de Cooperación para la vigilancia epidemiológica de Coccidioidomycosis

Responsible party / Responsable: Arizona Department of Health Services (ADHS) (AZ) / SSS (SON)

Tactic Target Completion Date / Fecha para concluir la táctica: June 4, 2011

Tactic / Táctica B): Epidemiologists and Laboratory Personnel from the Secretaria de Salud del Estado de Sonora will visit the Arizona Department of Health Services and the Bio-5 Laboratory at the University of Arizona for trainings and become familiar with Arizona's Epidemiologic Surveillance / Epidemiologos y personal de Laboratorio de la Secretaria de Salud de Sonora visitarán al Departamento de Servicios de Salud de Arizona y al Laboratorio Bio-5 de la Universidad de Arizona para capacitaciones y para familiasarsescon la vigilancia que se hace en Arizona.
Serial dilutions for the cocci EIA

Looking for immunodiffusion bands (for Histoplasmosis)
Thank You

Border Infectious Disease Surveillance

Orion McCotter

Orion.McCotter@azdhs.gov

520-770-3179