

Coccidioidomycosis (“Valley Fever”): *An Environmental Health Risk Endemic to the U.S.-Mexico Binational Border Region*

Paul Dulin, Environmental and Social Impact Assessment Specialist
Former Director, Office of Border Health, New Mexico Dept. of Health

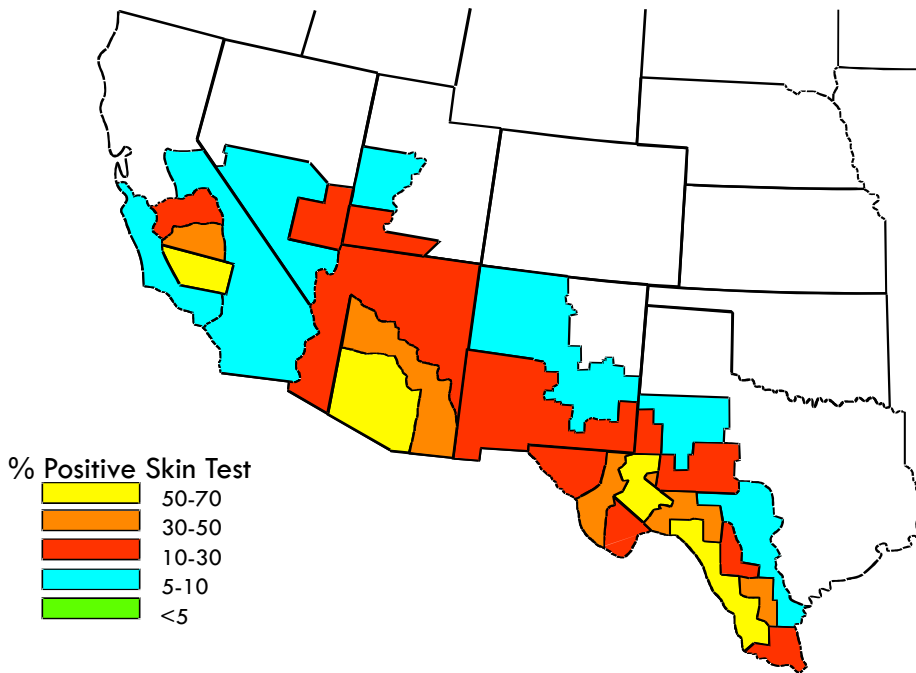
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Dust storm approaching Las Cruces from the southwest on August 8, 2004. (Source: taken by Amaraporn Punjuba from the base of the Organ Mountains, with "A" Mountain in the foreground.)

Coccidioidomycosis Epidemiology

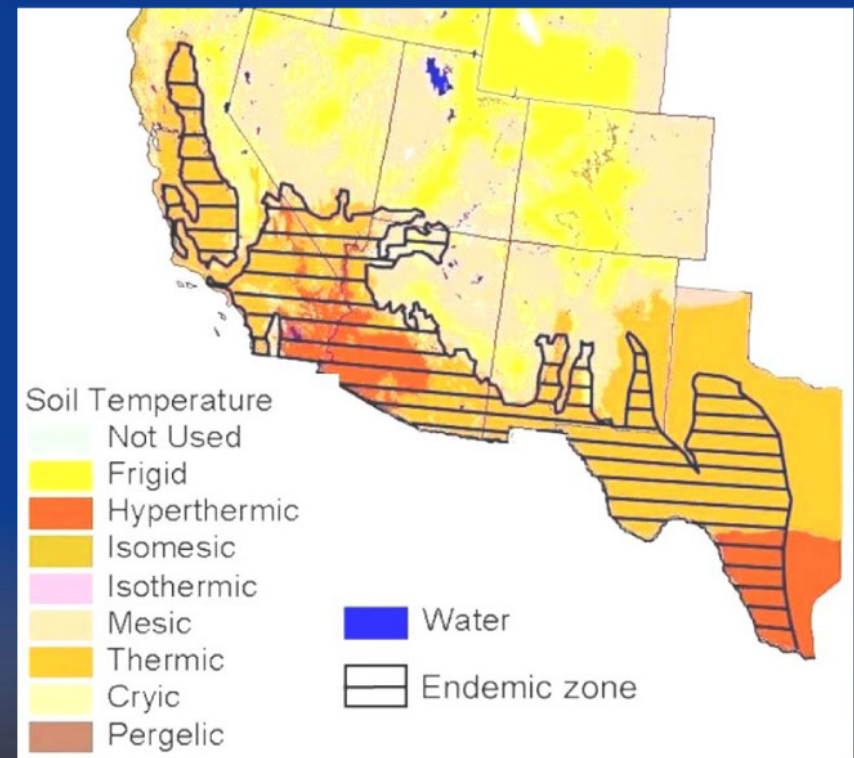


P. Q. Edwards and C. E. Palmer. Prevalence of sensitivity to coccidioidin, with special reference to specific and nonspecific reactions to coccidioidin and to histoplasmin. *Dis.Chest* 31:35-60, 1957

- Caused by a fungus found in “thermic” soil
 - ▣ *C. immitis*
 - ▣ *C. posadasii*
- Hot, arid areas: limited rainfall, high summer temps, few freezes
- Endemic areas: Southwestern US, Mexico, parts of Central and South America

Soil Temperature

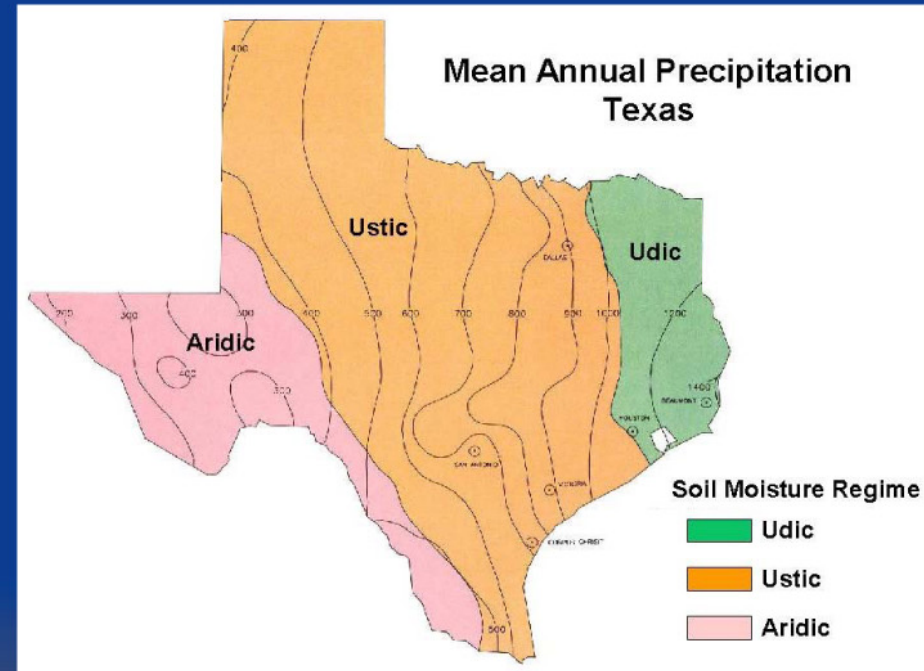
- Endemic area in SW very similar to hyperthermic and thermic soil maps
- Outbreaks outside endemic area (Dinosaur Natl Monument, Utah) occurred in pocket of hyperthermic soil



Courtesy of Fred Fisher, Univ AZ Geosciences

Soil Aridity is Important, too

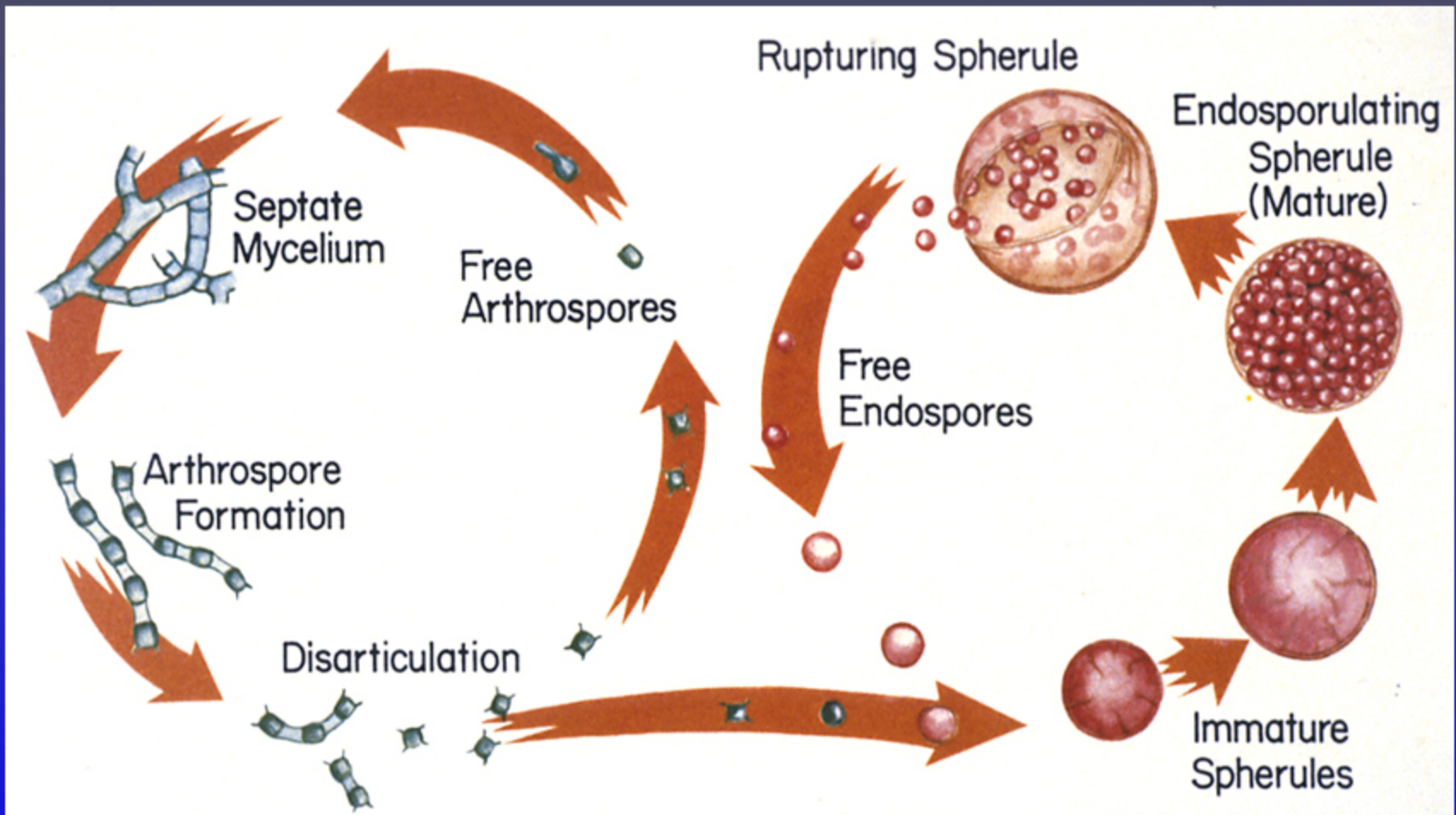
- Dry conditions important
- Spores need Aridic soil moisture
- May help with “natural selection” of hardy cocci spores
- May help with dissemination of spores



Histologic Identification of spherules

In the Soil

In infected tissue



Transmission

- Inhalation of airborne arthrospores from soil
 - ▣ Distributed by wind
 - ▣ Soil disturbance, construction
 - ▣ Outdoor activities, gardening, golf etc.
- Usually found in soil 2-8 inches deep
- Incubation period: 1 – 4 weeks
- No person-to-person spread



Presentation of Valley Fever?

- Asymptomatic
 - ▣ ~60% of cases

- Primary Form of Disease

Influenza, TB or Pneumonia-like

- ▣ Cough
- ▣ Fatigue
- ▣ Fever
- ▣ Chest pains



- Disseminated
 - Bone
 - Joints
 - Skin
 - Brain (meningitis)
 - Lymph nodes



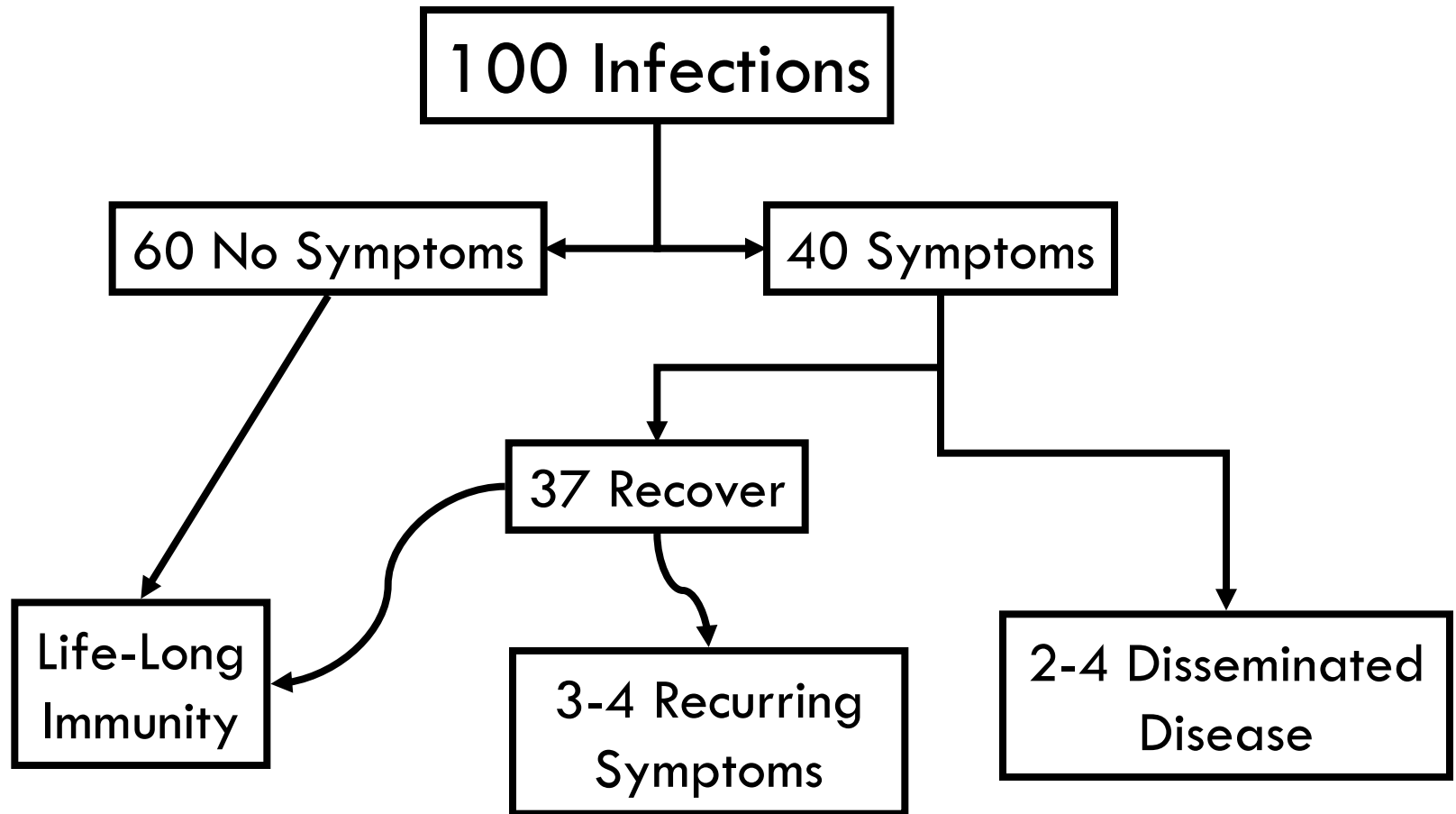




Risk Factors for Valley Fever

- Primary Disease
 - >65 years old
 - Males (due to their vocations and activities)
- Disseminated
 - Immuno-compromised (chemotherapy, HIV/AIDS, TB, diabetes)
 - Pregnancy (third trimester)
 - Race (African American, Filipino)

Coccidioidomycosis: Spectrum of Disease



Diagnosis

- Difficult to determine clinically because of similarity to symptoms of other diseases
- Cocci must be laboratory confirmed for Dx;
- Most beneficial for sicker patients (may benefit most from Rx)
- Other benefits of Dx may include:
 - ▣ Avoidance of use of bacterial antimicrobics
 - ▣ Earlier identification of complications
 - ▣ Decreased need for added expensive Dx studies
 - ▣ Reduction in patient anxiety

Guidelines for Treating Cocci

- IDSA Guidelines (2005) available at <http://www.journals.uchicago.edu/doi/pdf/10.1086/496991>
- Many infections do not require treatment.
- Every infection needs to be assessed for location, extent and chronicity of symptoms
- Treat according to location and characteristics of infection.
- If treatment needed, most infections can be treated with azoles (anti-fungals)

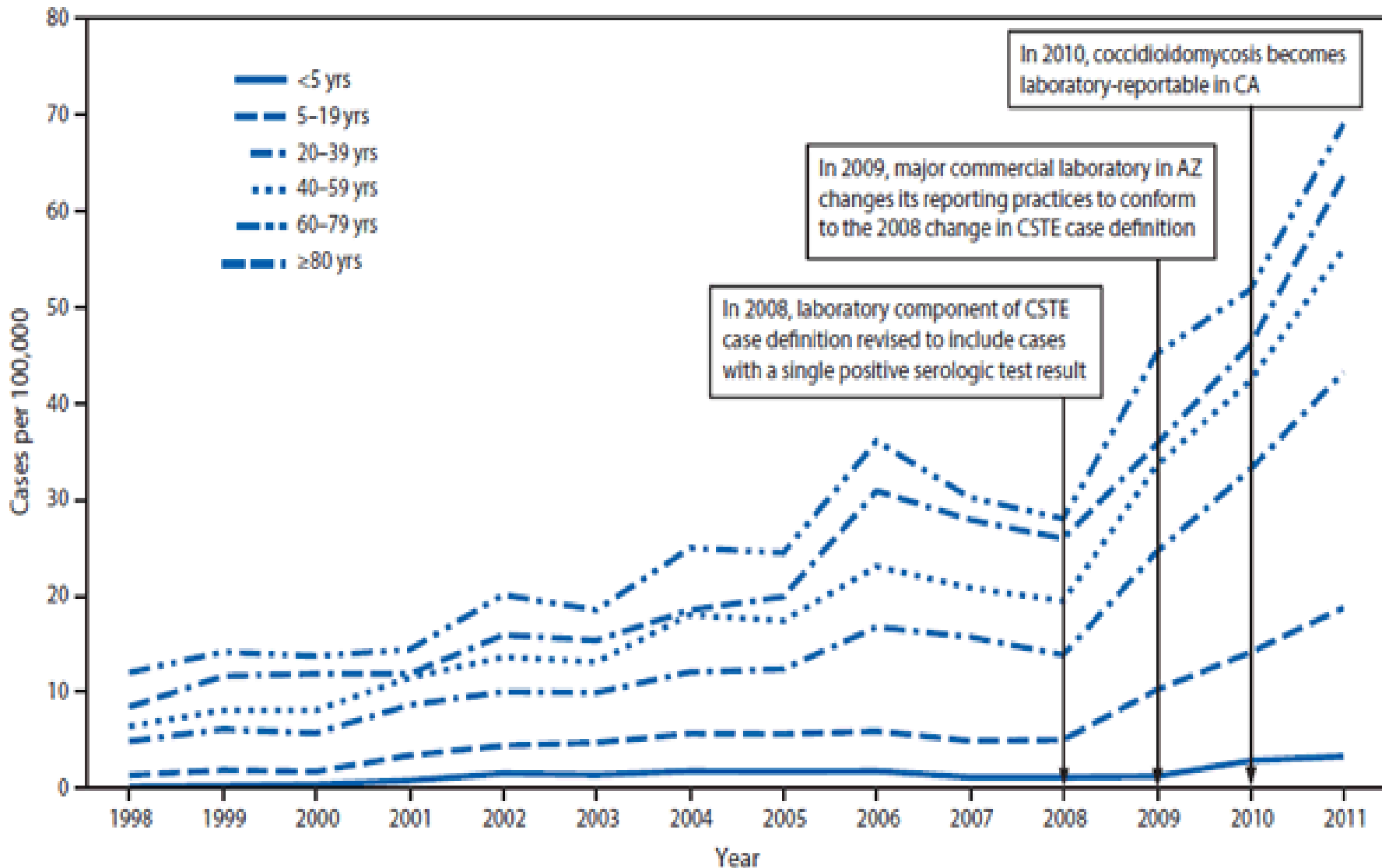
Number of Cases of Valley Fever in U.S. Border States

Reporting Year	Arizona	California	New Mexico	El Paso, TX
2008	4768	2383	38	-
2009	10233	2395	50	-
2010	11884	4431	55	-
2011	16473	5217	75	-
2012	12920	4147	40	-
2013	5861	3318	33	3
2014	5624	2217	38	11

Number and incidence per 100,000 population of cocci cases, by region, age group, and sex — Arizona, California, Nevada, New Mexico, and Utah, 2011
(CDC, MMWR, March 29, 2013 / 62(12);217-221)

Area and age group (yrs)	Male		Female		Total	
	No.	Incidence	No.	Incidence	No.	Incidence
<5	73	4.0	47	2.7	120	3.3
5-19	969	17.4	1,064	20.0	2,046	18.8
20-39	3,015	40.1	3,286	45.8	6,352	43.2
40-59	3,801	55.8	3,834	55.5	7,684	56.0
60-79	2,491	73.4	2,455	90.2	4,988	69.1
≥80	522	79.4	540	52.3	1,074	63.6
All ages	10,398	40.3	11,288	43.4	22,401	43.2

Coccidioidomycosis incidence per 100,000 population, by age group for Arizona, California, Nevada, New Mexico, and Utah, 1998–2011



Why such discrepancies in the numbers of cases in Arizona and California vs. New Mexico and Texas?

- Probability that cocci is underreported in New Mexico and Texas (*where it is not reportable*) due to limited knowledge of the disease among the provider community.
- Climate and soil variations that limit growth of the fungi.

The impact on the healthcare system of missed or delayed cocci diagnosis

- Misdiagnosed as viral or bacterial pneumonia, COPD, bronchitis, asthma, TB, lung cancer
- Unwarranted and ineffective treatments with antibiotics or antivirals
- Burden on healthcare (unnecessary costs of continuous testing, mis-prescribed treatments, and hospitalizations)
- Patient anxiety (what is wrong with me, why am I not getting better?)

2010 New Mexico Knowledge, Attitudes and Practices Survey

- Paper/electronic survey sent out to all registered NM physicians, physician assistants and nurse practitioners in the State
- Total response: 425 respondents, or 14%
- 28% feel confident in their ability to diagnose Cocci
- 31% feel confident in their ability to treat Cocci
- 44% do *not* know if Cocci is reportable to DOH
- 69% do *not* consider Cocci when they have a patient that presents with symptoms of respiratory disease
- 4% have received targeted education on Cocci

New Mexico Office of Border Health Cocci Initiative

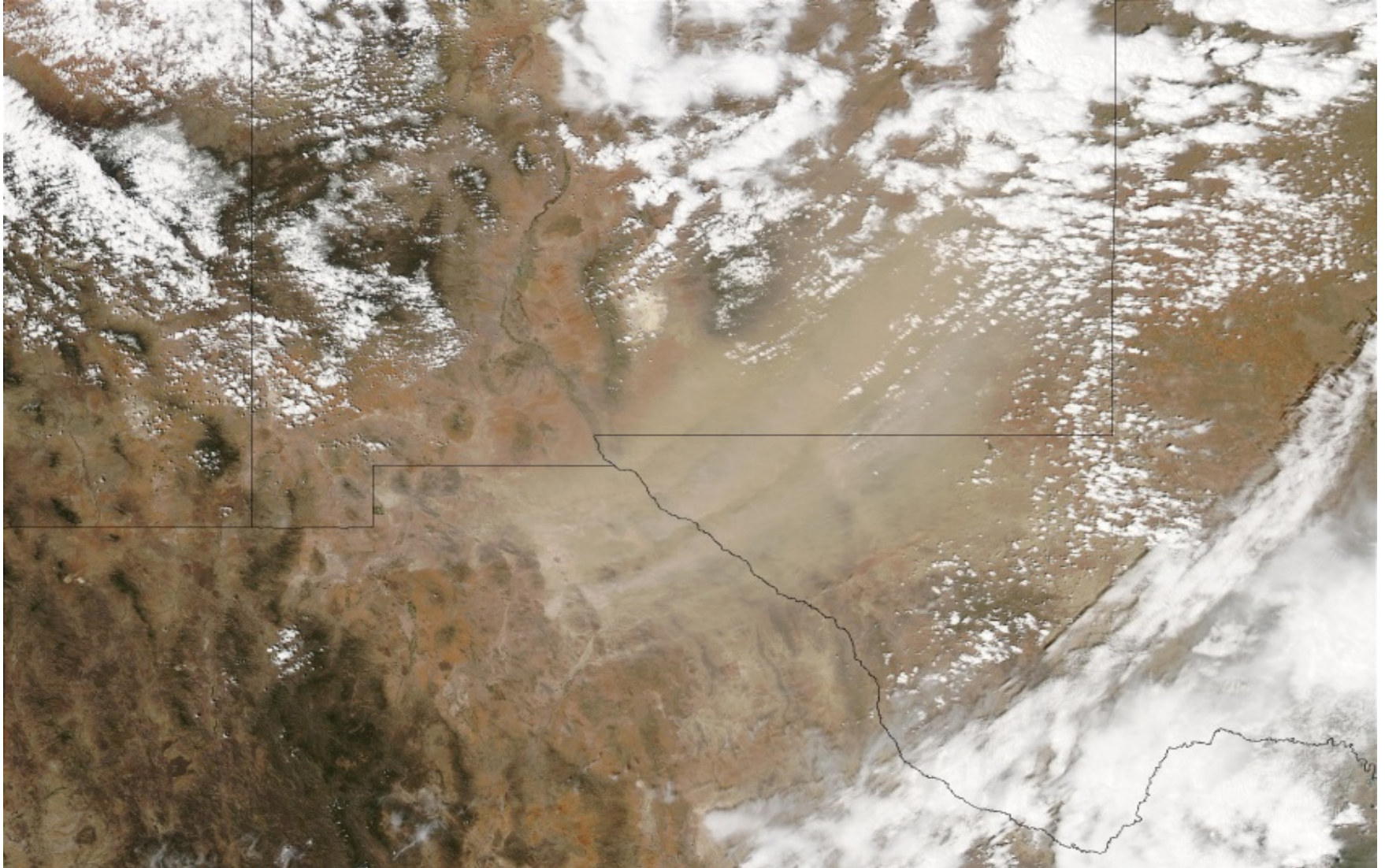
- Education and awareness campaign for clinical providers in New Mexico
 - ▣ Continuing medical education events in Las Cruces, May 2010 and June 2013 with 120 clinicians trained in cocci diagnosis and treatment
 - ▣ Distribution of tutorial on Cocci from Valley Fever Center of Excellence
- Public education and awareness campaign
 - ▣ Billboards (in conjunction with TB)
 - ▣ Documentary: “*Valley Fever: The Zebra among the Horses*”
 - ▣ Educational materials in provider offices (posters, pamphlets)
- Increased testing and diagnosis
- Increased reporting

What about Cocci in Mexico?

- Northern Mexico is within the endemic area
- No surveillance systems have existed for cocci, not considered a notifiable disease
- Laboratory capacity had not been developed in Mexican state public health laboratories
- Symptoms and clinical features indistinguishable from TB
- As is in New Mexico and Texas, the tendency exists in Mexico for under- and misdiagnoses



Similar Soils and Climate, and Regional Winds and Storms: *Shared Exposure and Risk*





Four Corners

- A collaboration designed to better estimate the true burden of disease in the border region and generate a binational response to it.

PROYECTO “CUATRO ESQUINAS”

Binational “Four Corners” Initiative: New Mexico-Chihuahua-Arizona-Sonora

- Signed agreements between Health Secretaries and Governors of all four states
- Spanish translation of continuing medical education modules for clinicians
- Spanish-language media for improving awareness among the general public
- Lab & Epi personnel exchanges and training
- Improving capacity for labs for confirming cocci through provision of equipment & reagents
- Improved epidemiology & reporting (surveillance)

Lab Results for Sonora, Mexico



Preliminary Lab Results for Sonora 2012-2013

Total samples	2012	Positive
Samples tested	33	9%
Negatives	30	

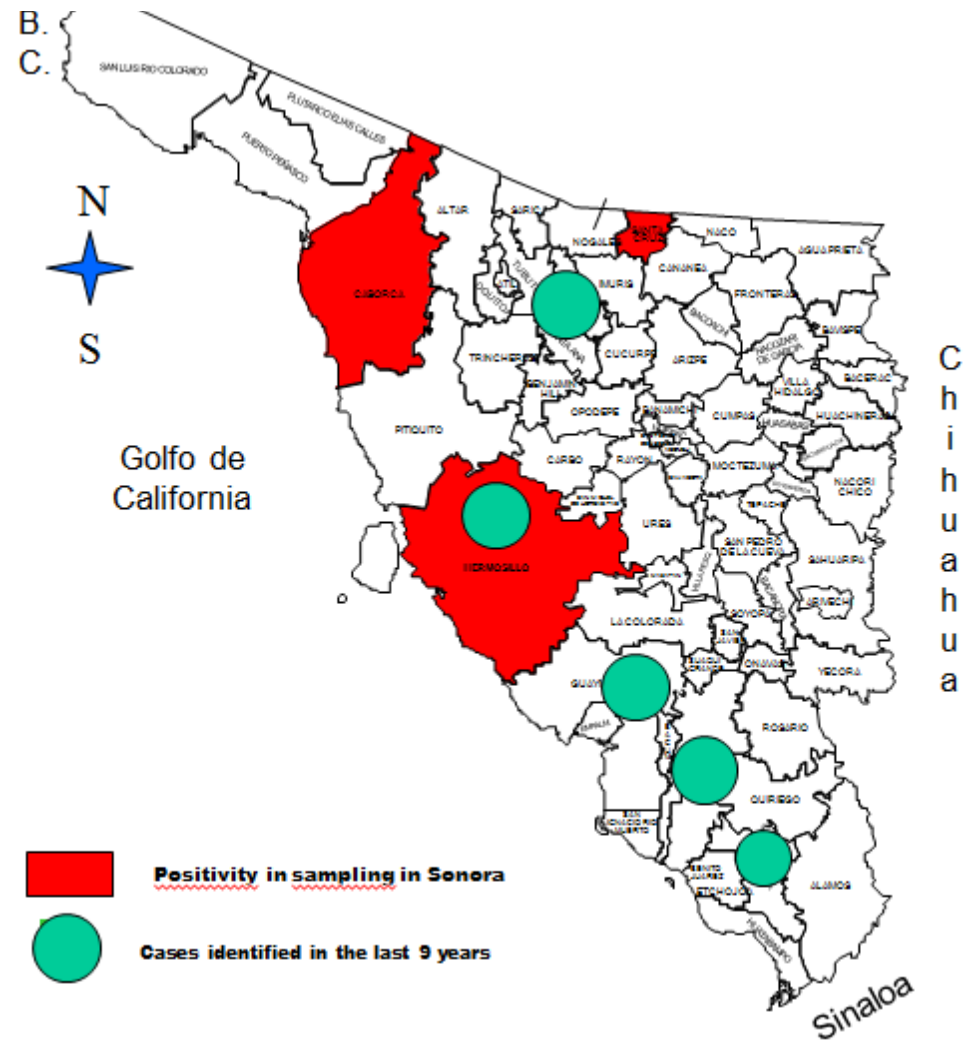
Total samples	2013	Positive
Samples tested	126	19%
Negatives	102	

Positive samples 2012 by Antibody		
IgM	IgG	1
IgG		1
IgM		1

Positive samples 2013 by Antibody		
IgM	IgG	8
IgG		12
IgM		4

Residence of Sonora EIA Positive Cases

Municipality	No. of Cases
Agua Prieta	1
Caborca	5
Guaymas	4
Hermosillo	14
San Luis RC	1
Santa Ana	2
Total	27



Lab Results for Chihuahua, Mexico



Chihuahua, 2013

Cases Tested for Cocci with EIA

Total Samples Submitted	207	
Total EIA positive	78	38%
Negative	123	59%
Undetermined (IgG or IgM) with Negative	6	3%
Undetermined (IgG or IgM) with Positive	3*	1%

* Included in Total EIA positive

Respiratory Profile (Surveillance)	
TB	172
Cocci	33
Influenza	1

Chihuahua EIA Positive Cases in 2013

Origin of Patient	Number of Patients
Bocoyna	3
Chihuahua City	12
Creel	9
Delicias	30
Juarez	21
Nuevo Casas Grandes	3



Continuation and Expansion of Cocci Interventions

- Expand knowledge in the clinical and public health community concerning the burden of cocci disease, with emphasis on New Mexico, Texas, and Mexican Border states, and how to diagnose and treat it.
- Continue implementing pilot surveillance for coccidioidomycosis in Mexico border states of Sonora and Chihuahua, to serve as model for all of Mexico.
- Establish/maintain state laboratory capacity and epi surveillance in all Mexican border states.
- Provide sustained financing in the U.S. and Mexico to support the efforts listed above and—eventually—to develop a cocci vaccine to be administered to those at risk in endemic areas in the binational border region.

Expanding Participation

- The Binational Cocci Working Group was established in 2012 with participation of: State Health Departments of New Mexico, Arizona, California, Sonora and Chihuahua, CDC/Mycotics Branch & Div. of Global Migration & Quarantine, Mexico National Diagnostics and Reference Laboratory, and the Mexico General Directorate of Epidemiology.
- The El Paso Dept. of Public Health and Texas State Health Services should join the Working Group.
- CDC and the Mexico General Directorate of Epidemiology should take the lead in convening the Working Group and provide guidance to the states on cocci interventions.

Acknowledgements

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For more information on Cocci, contact Ms. Perez-Lockett at: katharine.Perez@state.nm.us