

Seroincidence and Risk of Coccidioidomycosis Infection Among Active Duty Personnel Stationed at Naval Air Station Lemoore in the San Joaquin Valley of California

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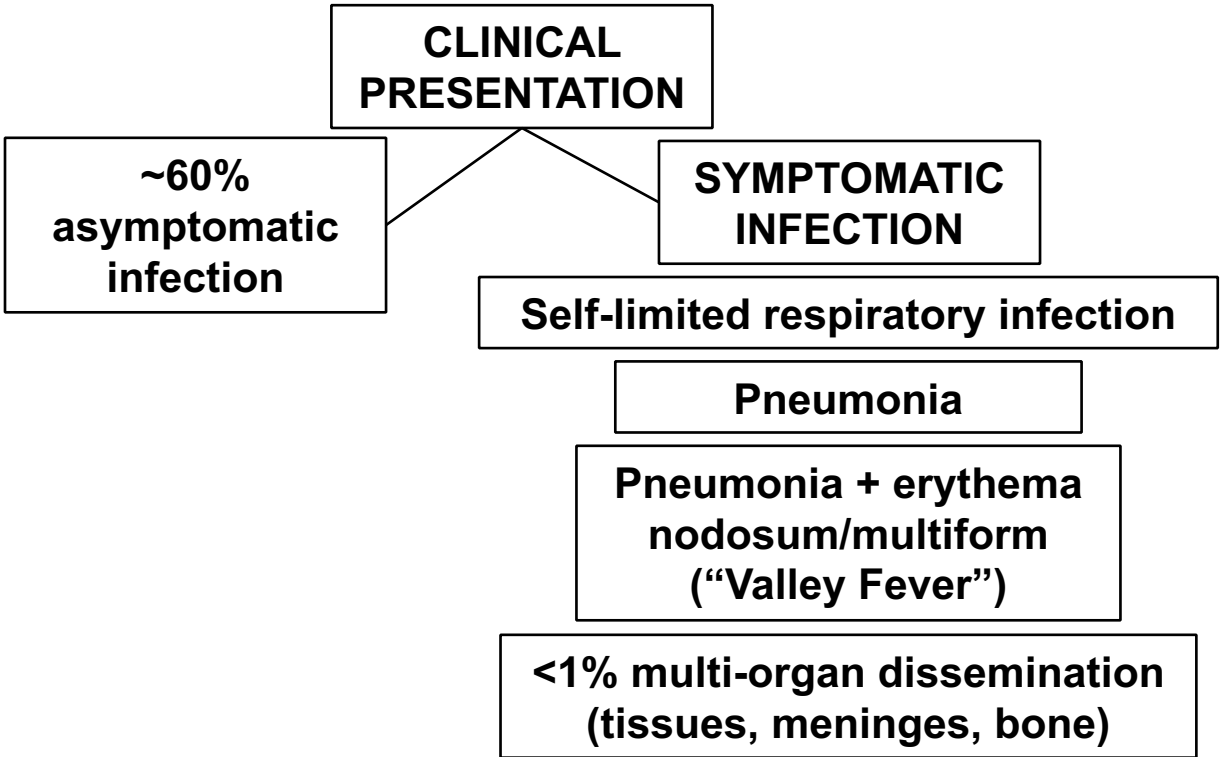


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Background

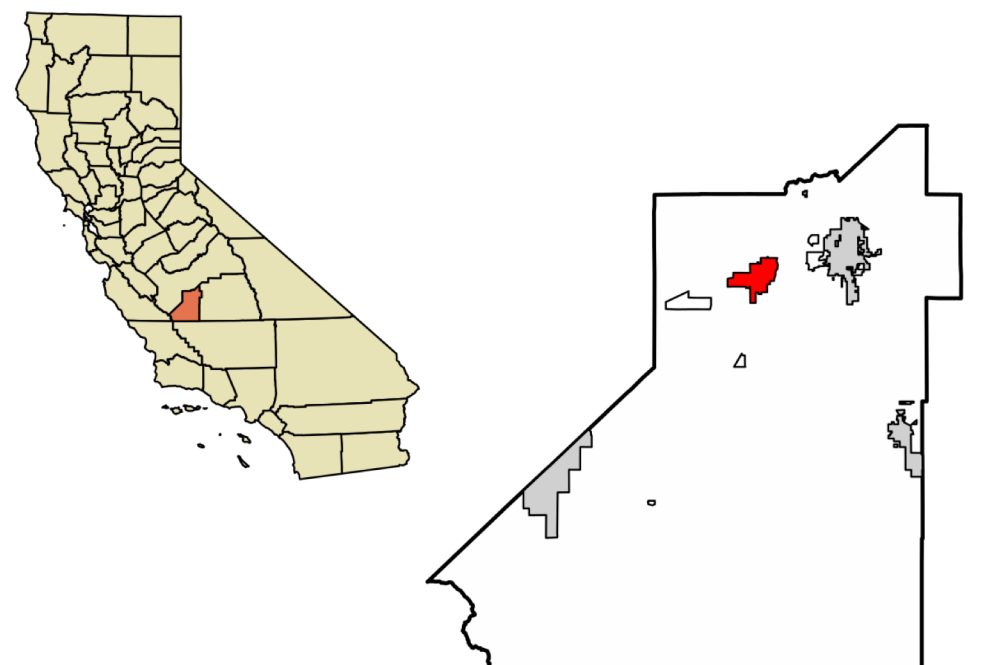
- Coccidioidomycosis is an endemic mycosis native to SW United States (CA, AZ), Central/South America
- Dimorphic fungus *Coccidioides* (spp. *immitis* and *posadasii*) is causative agent via inhalation of soil containing arthroconidia spores
- Epidemiology is poorly understood, based largely on skin testing and observational studies from mid-20th century:
 - geographic distribution
 - seasonal incidence
 - risk factors for exposure/infection
- Pathogenicity determined from limited case studies/series. Gaps in the literature include:
 - clinical course
 - prognosis
 - risk factors for clinical progression



Limited *Coccidioides* seroincidence data support these assumptions

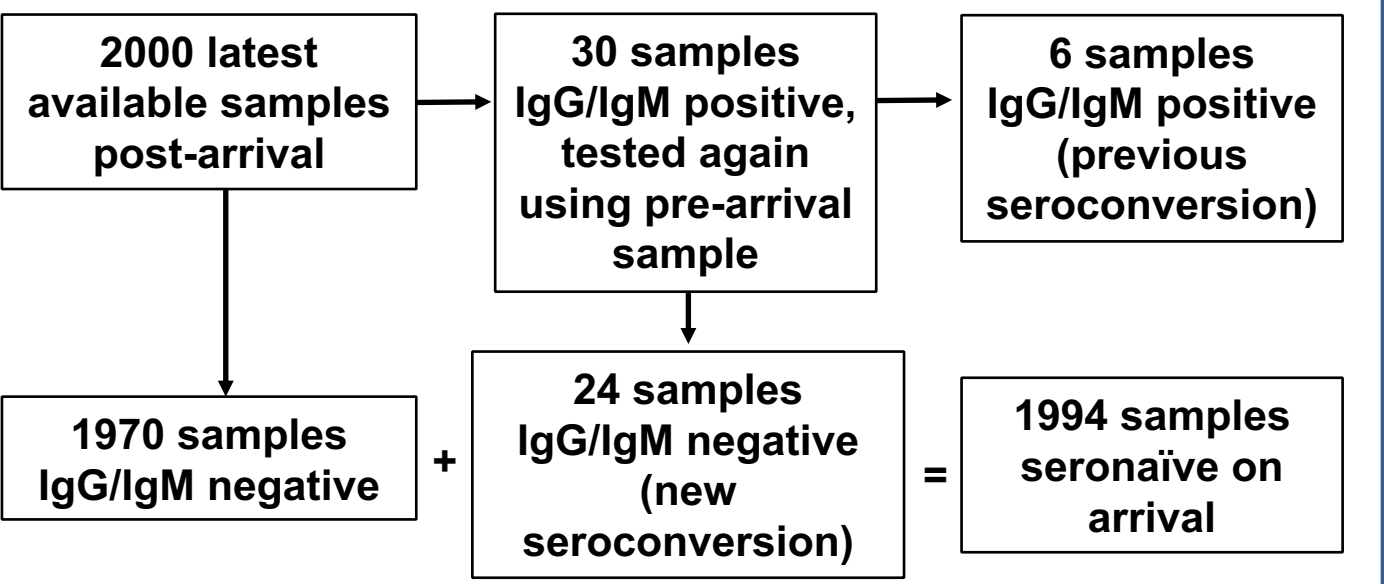
Methods

- Retrospective cohort study of exposure to *Coccidioides* spp.
- 2000 U.S. military personnel transferred to Naval Air Station Lemoore in Kings County, California between 2011 and 2017
- IgG and IgM anti-*Coccidioides* antibodies detected by ELISA (IMMY, Norman, OK) before and after arrival to this endemic area. Positives and equivocal results confirmed by immunodiffusion (UC Davis).



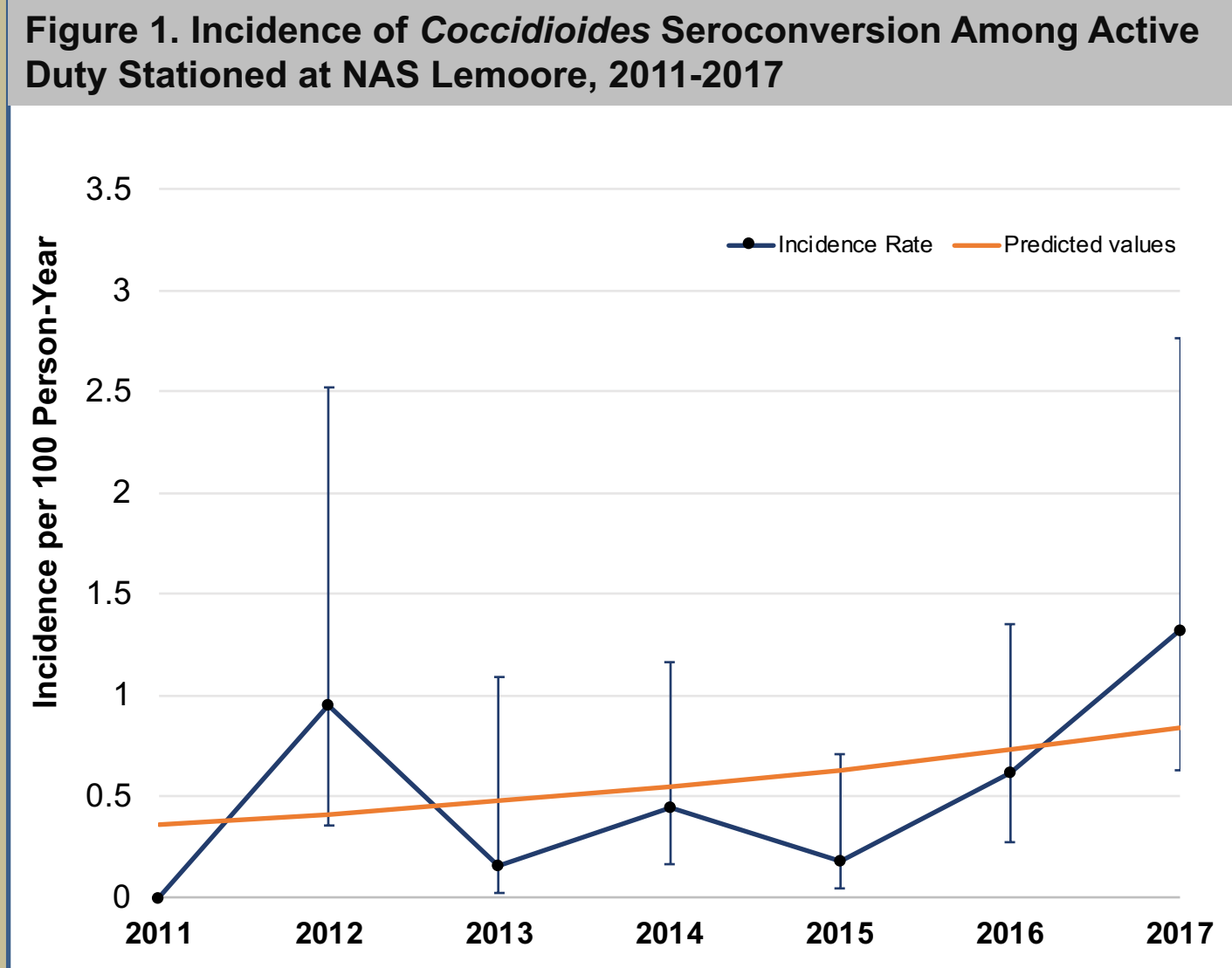
Source: Democratic Luntz at English Wikipedia. Downloaded from: https://en.wikipedia.org/wiki/Lemoore,_California. Accessed: 15Sep2020

Methods (cont.)



- Pre- and post-arrival banked serum samples from the DoD Serum Repository
- Time in endemic area calculated by subtracting sample collection date from station arrival date
- Medical histories and participant demographics such as military occupational specialty codes collected from electronic medical record
- Participants stratified by history of *Coccidioides*-specific or general respiratory illness ICD9/ICD10 codes

Results (cont.)



Results

Table 1. Demographics of Active Duty at NAS Lemoore by Seroconversion Status and Cocci/Pneumonia Diagnosis

	Seroconversion		p*	Cocci/Pneumonia Diagnosis		p*	Total
	No	Yes		No	Yes		
Age	23.0[20.0-27.0]	22.5[19.0-26.5]	0.5358	24.0[20.0-27.0]	21.0[19.5-25.0]	0.0572	23.0[20.0-27.0]
Gender	Male	1657(83.86)	20(83.33)	>0.999	1644(84.05)	33(75.00)	1677(83.85)
	Female	319(16.14)	4(16.67)		312(15.95)	11(25.00)	323(16.15)
Race/Ethnicity	Caucasian	910(46.05)	6(25.00)	0.1098	892(45.60)	24(54.55)	916(45.80)
	African American	298(15.08)	5(20.83)		299(15.29)	4(9.09)	303(15.15)
	Asian/Pacific Islander	120(6.07)	2(8.33)		118(6.03)	4(9.09)	122(6.10)
	Hispanic	338(17.11)	4(16.67)		335(17.13)	7(15.91)	342(17.10)
Grade	Enlisted	1791(90.64)	24(100.00)	0.1999	1772(90.59)	43(97.73)	1815(90.75)
	Warrant Officer	4(0.20)	0		184(9.41)	1(2.27)	185(9.25)
Total	1976(98.80)	24(1.20)		1956(97.80)	44(2.20)	2000	

Values are presented as n(%) *For continuous variables, p-values were calculated with Mann-Whitney U/Wilcoxon Rank Test. For categorical variables, p-values were calculated with Chi-Square/Fisher exact.

Table 2. Seroconversion Status of Active Duty at NAS Lemoore by Cocci/Pneumonia Diagnosis

Seroconversion	Cocci/Pneumonia Diagnosis Concomitant with Seroconversion					Total
	No	Yes			Total	
		Pneumonia	Cocci & Pneumonia	Total		
No, or unknown	1929(97.92)	Pre-arrival: 21(1.07) Post-arrival: 18(0.91)	Pre-/Post-arrival*: 1(0.05)	Pre-arrival: 1(0.05)	1970(98.50)	
Previous exposure	6(100.00)	0	0	0	6(0.30)	
Yes, or possible	21(87.50)	0	1(4.17)	2(8.33)	24(1.20)	
Total	1956(97.80)	21(1.05)	19(0.95)	3(0.15)	2000	

Values are presented as n(%) *One subject has two pneumonia-related diagnosis before arrival and one Cocci-related diagnosis after arrival

Results (cont.)

- 24 of 1994 (1.2%) seronegative participants tested newly positive for anti-*Coccidioides* antibodies after at least 12 months on station
- Annual seroconversion incidence 0.0-1.32 from 2011-2017
- Overall seroconversion incidence 0.5 per 100 person years
- Seropositive participants more frequently diagnosed with coccidioidomycosis/pneumonia than seronegative (p=0.027)
- No statistically significant association between demographic characteristics (age, gender, race, education, military service, military rank) and seroconversion or disease on both adjusted and unadjusted models
- Majority of seroconversion and disease seen in Electrical/Mechanical Equipment Repairers (63.33% and 45.45% respectively) followed by Electronic Equipment Repairers (13.33%, 20.45%) although no statistically significant differences among the occupational specialty codes
- Clinical disease detected in three seroconverters (10%)

Conclusions

- Coccidioides* seroincidence similar to that observed in the literature, adding longitudinal evidence to epidemiologic assumptions about coccidioidomycosis
- A trend toward increasing incidence over this six year study is consistent with the classification of coccidioidomycosis as an emerging infectious disease
- Despite assumptions of environmental transmission patterns based on disease ecology and limited observational studies, we did not detect a difference in transmission based on military occupational specialty codes or other demographics thought to increase risk
- Rates of diagnosed disease in our cohort were lower than the historically-assumed 40% symptomatic rate
- Our study is limited by its retrospective nature, coccidioidomycosis is likely underreported
- Further clinical and epidemiologic coccidioidomycosis research, particularly in broader endemic regions, is warranted

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