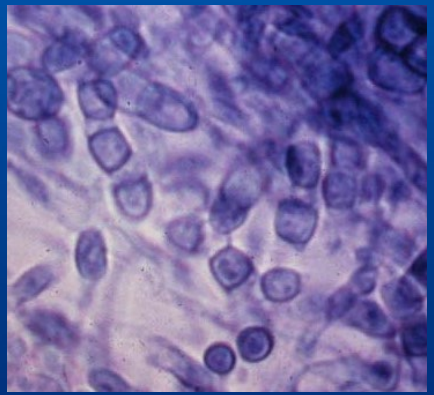
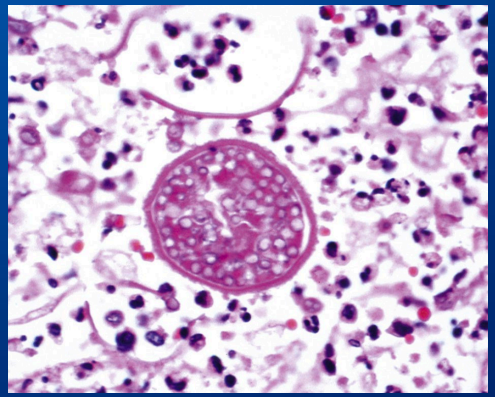
Valley Fever as a Veterinary Disease

Jane E. Sykes BVSc(Hons) PhD MBA DACVIM
Professor of Small Animal Internal Medicine
(Infectious Diseases)

Coccidioidomycosis
Veterinary Impact

- Dogs, horses, camelids, marine mammals
- Other domestic animals (cats, cattle)
- Captive and free-ranging wildlife (e.g., non-human primates)





DOI: 10.7589/2014-06-143

Journal of Wildlife Diseases, 51(2), 2015, pp. 295–308

COCCIDIOIDOMYCOSIS AND OTHER SYSTEMIC MYCOSES OF MARINE MAMMALS STRANDING ALONG THE CENTRAL CALIFORNIA, USA COAST: 1998–2012

Sara E. Huckabone,[1] Frances M. D. Gulland,[2] Suzanne M. Johnson,[3] Kathleen M. Colegrove,[4] Erin M. Dodd,[5] Demosthenes Pappagianis,[3] Robin C. Dunkin,[6] David Casper,[6] Erin L. Carlson,[3] Jane E. Sykes,[3] Weiland Meyer,[7] and Melissa A. Miller[3,5,8]

Ref 1

Coccidioidomycosis
Camelids

ISHAM
INTERNATIONAL SOCIETY FOR HUMAN AND ANIMAL MYCOLOGY

Medical Mycology, 2021, 59, 571–577
doi:10.1093/mmy/myaa082
Advance Access Publication Date: 17 September 2020
Original Article

Original Article

Coccidioidomycosis in llamas and alpacas diagnosed at the University of California, Davis (1990–2016)

SE Grayzel[1,*], GR Thompson, III[2], B Martínez-López[3], JE Dechant[4], I McHardy[5] and JE Sykes[6]

Received: 6 July 2018 | Revised: 19 November 2018 | Accepted: 20 November 2018
DOI: 10.1111/tbed.13088

ORIGINAL ARTICLE

WILEY

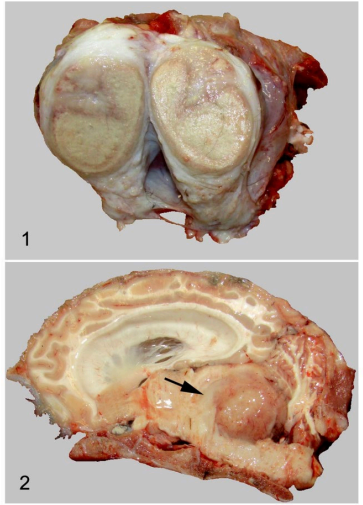
Coccidioidomycosis in alpacas in the southwestern United States

Christine D. Butkiewicz | Lisa F. Shubitz

Valley Fever Center for Excellence, The University of Arizona, Tucson, Arizona

Correspondence
Christine D. Butkiewicz, Valley Fever Center for Excellence, The University of Arizona, Tucson, AZ.
Email: cbutkiew@email.arizona.edu

Abstract
An anonymous web-based survey of alpaca owners was used to learn more about the clinical presentation, diagnosis, and treatment of coccidioidomycosis in alpacas in the United States. Thirty-seven owners, with 1,117 alpacas, completed the survey. Over 4% of alpacas included in the study were diagnosed with coccidioidomycosis between 2005 and 2016 (5 post mortem, 46 clinically). Immunodiffusion titers ranged from 1:4 to ≥1:256 in sick animals. Alpacas residing in Arizona counties with a high incidence of human disease were 5.8 times more likely to contract coccidioidomycosis than animals residing in other areas of the state. Treatment was



Brief Report

AAVLD

Systemic coccidioidomycosis in a llama cria native to Missouri

Journal of Veterinary Diagnostic Investigation
2021, Vol. 33(3) 587–590

DOI: 10.1177/1040638721994615
jvdi.sagepub.com

Brett M. Havis, Kelsey E. Walker, Pamela R. F. Adkins, Zhenyu Shen, John R. Middleton, Tamara Gull, Dusty Nagy, Dae Young Kim[1]

Refs 2-4

Coccidioidomycosis
Horses

Journal of Veterinary Diagnostic Investigation
Volume 34, Issue 6, November 2022, Pages 995-999

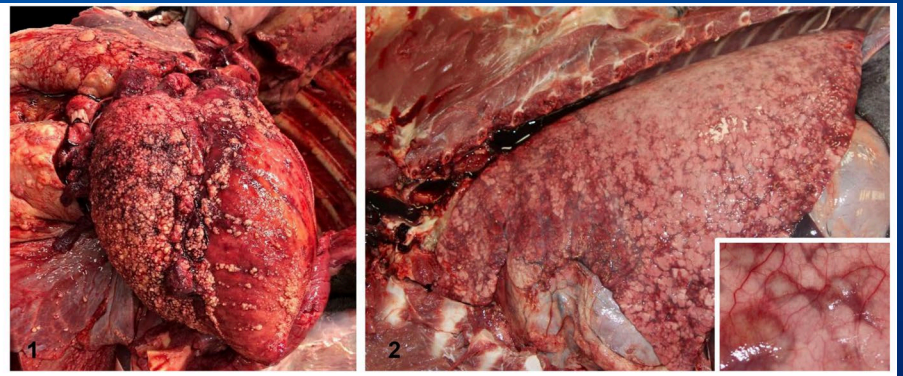
https://doi.org/10.1177/10406387221114622

SAGE journals

Brief Reports

Coccidioidomycosis in 26 horses in California, USA: case series and review of the literature

Melissa Macías-Rioseco[1,*], Matthew Sheley[2,*], Jennine Ochoa[3], Francisco R. Carvallo-Chaigneau[4], and Francisco A. Uzal[5,1]



Figures 1, 2. Coccidioidomycotic lesions in horses. **Figure 1.** The epicardium is covered by tan, round, firm nodules that tend to coalesce. Similar nodules also cover the surrounding pleura. **Figure 2.** The pulmonary parenchyma has 0.2–1-cm, pale, firm nodules throughout all lobes. Inset: higher magnification of the pale pleural nodules.

Screenshot

- 1990 to 2020, necropsies at CAHFS
- 26/19,054 (0.14%) necropsies
- Disseminated disease in 27%
- Cause of death in 11/26 (42%)

Refs 5,6

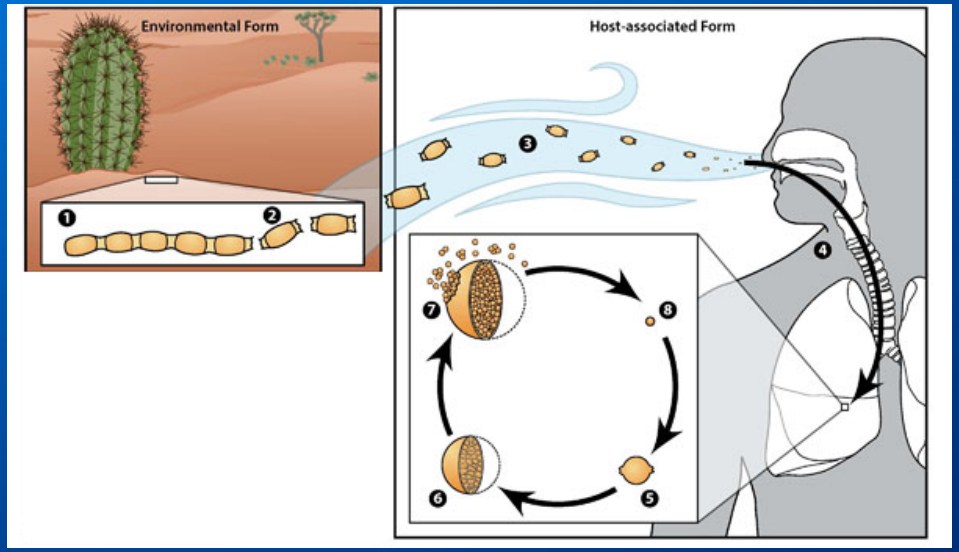
DIAGN MICROBIOL INFECT DIS
1992;15:527–530

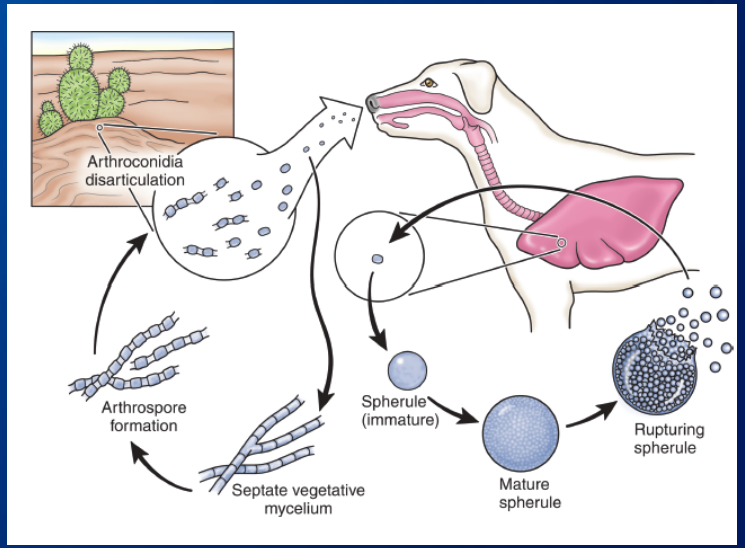
Acquisition of Coccidioidomycosis at Necropsy by Inhalation of Coccidioidal Endospores

Gerald J. Kohn, Stuart R. Linné,
Christopher M. Smith,* and Paul D. Hoeprich

Coccidioidomycosis is accepted as being noncontagious because the infectious arthroconidial form of Coccidioides immitis *is not produced in humans and other mammalian hosts. However, disseminated coccidioidomycosis developed in a veterinarian who autopsied a horse with disseminated disease but without draining lesions or productive cough. We postulate transmission occurred by inhalation of tissue-phase endospores aerosolized in the course of dissection.*

Coccidioidomycosis
Dogs





Ref 7

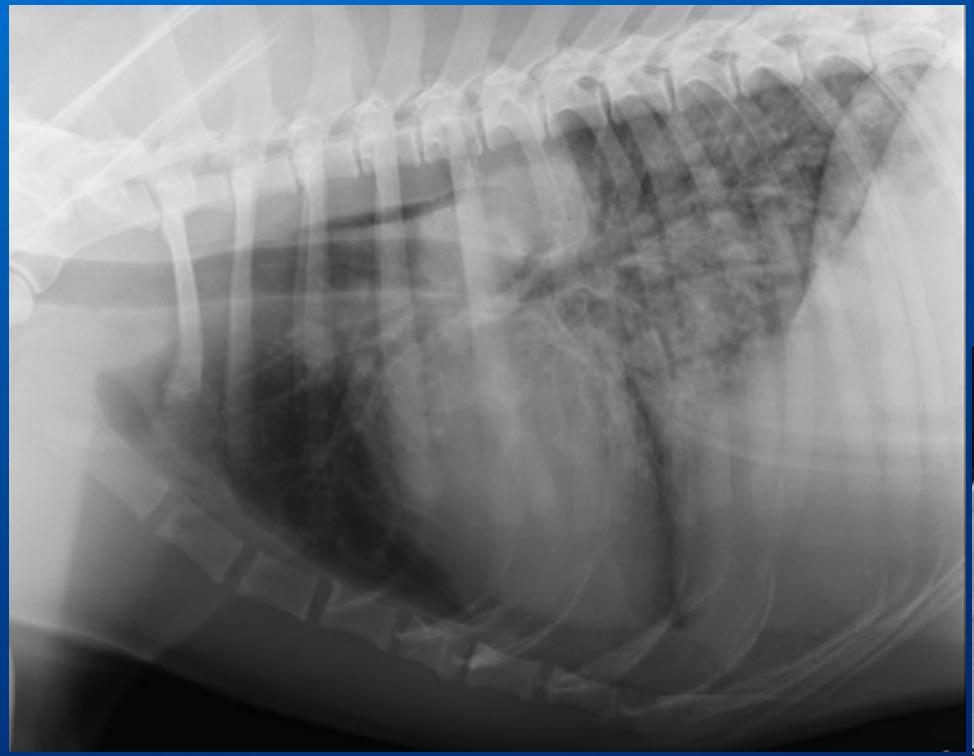
- 40% of infected humans and 30% of infected dogs in Arizona develop disease[8]
- Majority of human and canine cases are from Arizona

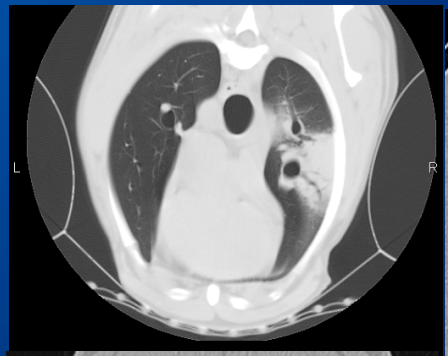
Coccidioidomycosis
Dogs: Pulmonary Coccidioidomycosis

	Human	Canine
Prevalence	Most common form	Probably most common form
Lobar pneumonia with mediastinal lymphadenopathy	Most common	Most common; tracheobronchial lymphadenopathy in 10/19 dogs in CA[9]
Pleural effusion	5 to 15% of primary pulmonary cases[10]	Rare in isolation, more commonly associated with pericarditis
Cavitary lesions, bronchopleural fistulae, and pneumothorax	Yes	Rare
Acute respiratory failure, miliary disease, ARDS	Yes, HIV and immunosuppressive therapy, massive exposure	Yes, rare

Coccidioidomycosis

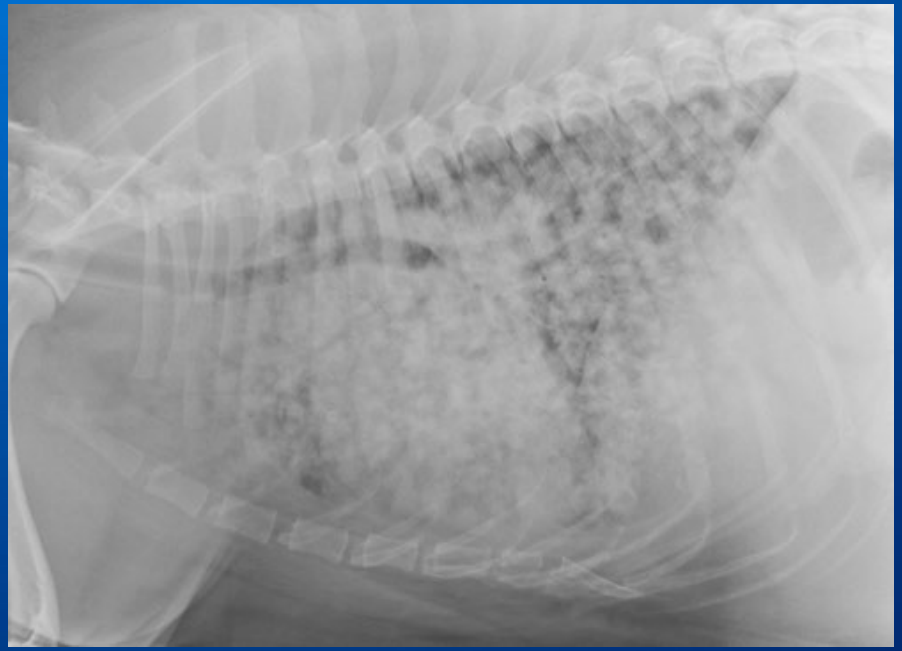
Dogs: Pulmonary Coccidioidomycosis

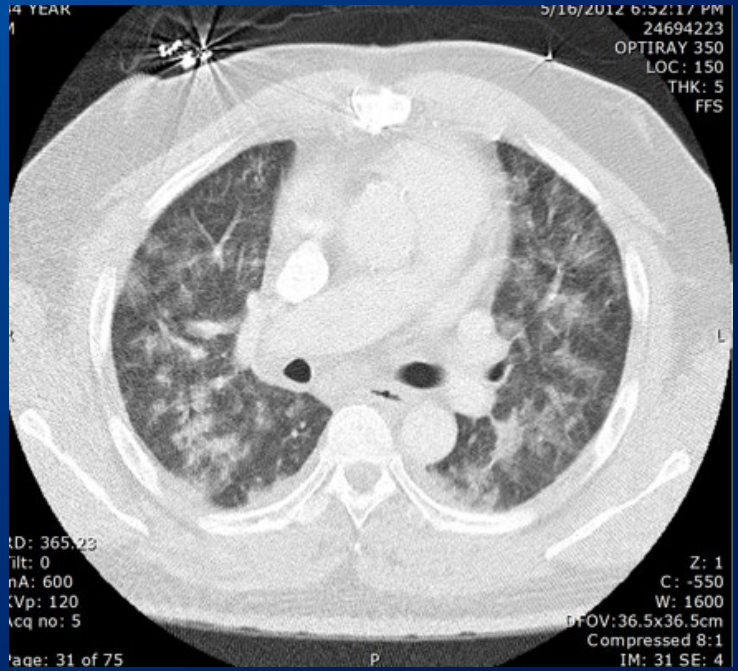




Coccidioidomycosis

Dogs: Pulmonary Coccidioidomycosis





3 yo F Rottweiler with cough, anorexia, respiratory distress

Ref 11

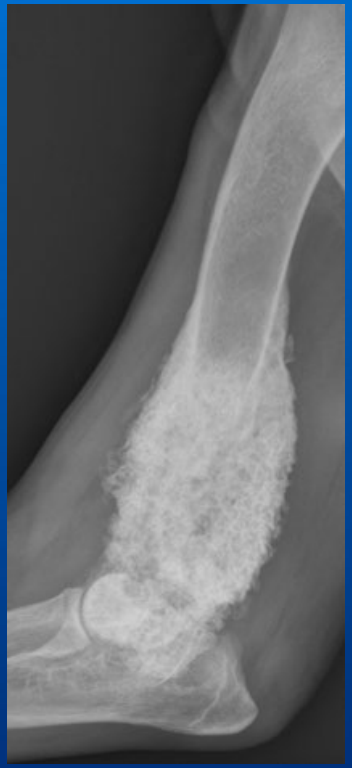
Coccidioidomycosis

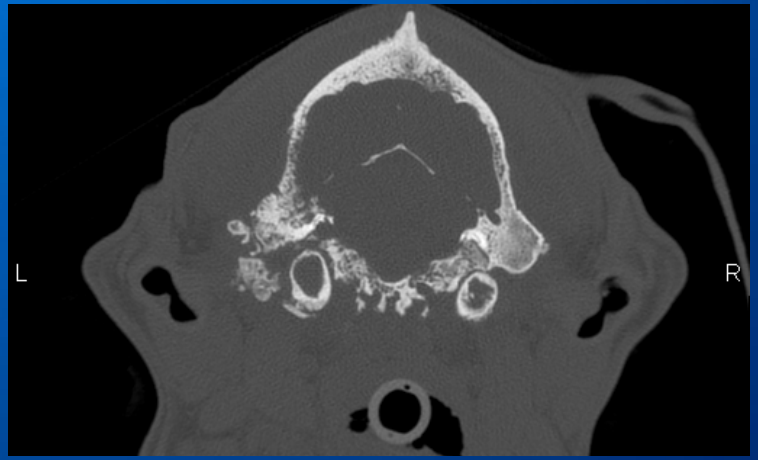
Dogs: Disseminated Coccidioidomycosis

Site	Humans	Dogs
Pericardium	Yes, but uncommonly described	Common, requires surgery[12]
Skin	Draining skin lesions	Subcutaneous nodules, draining tracts[13]
Bones, joints, vertebral column	Common	Common
Peripheral lymph nodes	Common	Uncommon
CNS	Common, meningitis	Uncommon in California, mass lesions, meningitis
Other organs (pancreas, liver, peritoneum, spleen, kidney, bladder, reproductive organs)	Rare	Rare

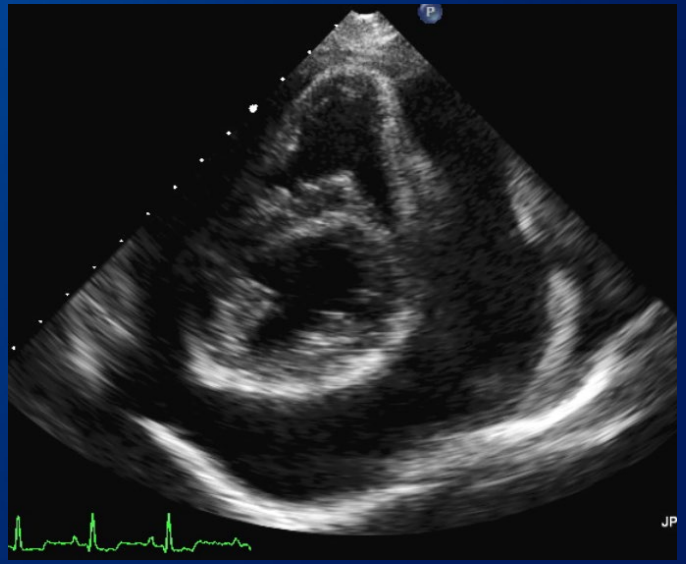
Coccidioidomycosis

Dogs: Disseminated Coccidioidomycosis





Osteoproliferative or osteolytic lesions in dogs



Restrictive pericarditis

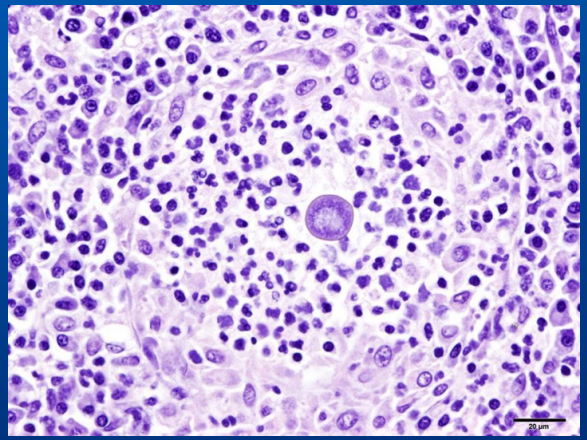
Coccidioidomycosis
Dogs: Renal Involvement

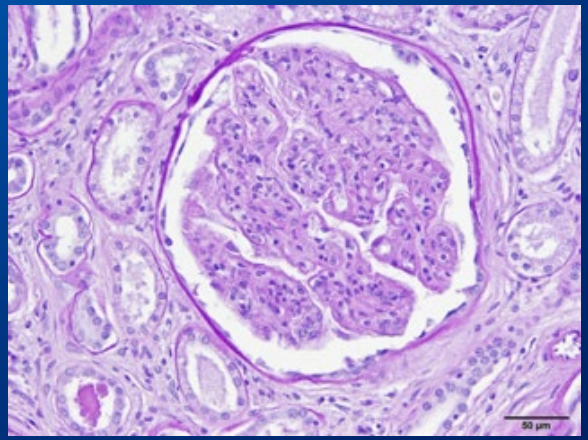
Journal of Veterinary Internal Medicine
Open Access
ACVIM
Standard Article
J Vet Intern Med 2016;30:1667–1671

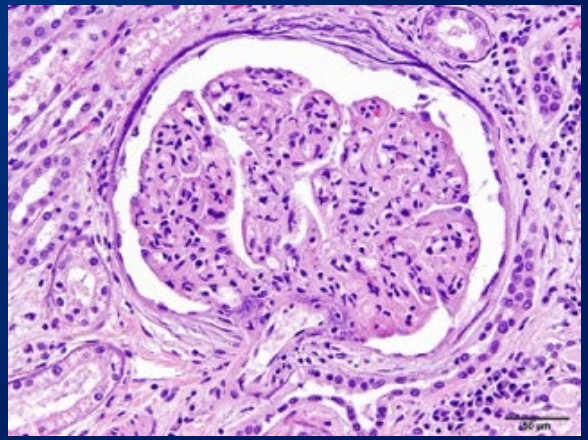
Clinicopathologic and Histopathologic Renal Abnormalities in Dogs with Coccidioidomycosis

L.R. Mehrkens, F.C. Mohr, and J.E. Sykes

- 87 dogs with SBP/UA, 17 UPC
- 24 with renal histopath
- 13% azotemic
- 63% proteinuric, 25% with clinically relevant proteinuria
- 13/24 dogs had ICGN lesions

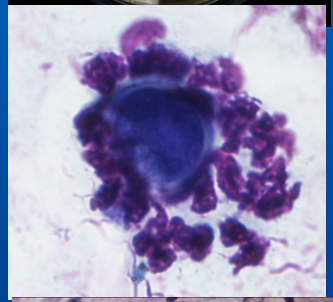


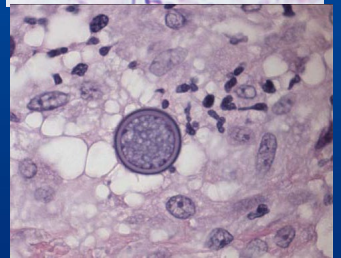




Ref 14

Coccidioidomycosis
Dogs: Diagnosis





Received: 30 November 2020 | Accepted: 19 February 2021
DOI: 10.1111/jvim.16087

STANDARD ARTICLE

Journal of Veterinary Internal Medicine
Open Access
ACVIM
American College of Veterinary Internal Medicine

Clinical performance of a point-of-care *Coccidioides* antibody test in dogs

Krystle L. Reagan[1] | Ian McHardy[2] | George R. Thompson III[3] | Jane E. Sykes[1]

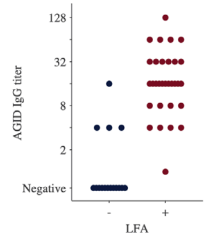


FIGURE 1 Results of lateral flow assay (LFA) and agar gel immunodiffusion (AGID). Scatterplot indicating results of LFA and corresponding AGID titer for all dogs with an available immunoglobulin G titer (n = 47). The serum AGID titer is represented in a logarithmic scale on the *y*-axis. Results of the LFA are represented on the *x*-axis and stratified into negative (–, blue dots) and positive (+, red dots)

Open Access | Article

Comparison of Immunodiagnostic Assays for the Rapid Diagnosis of Coccidioidomycosis in Dogs

by Diego H. Caceres [1,2,3,*] and Mark D. Lindsley [1,*]

[1] Mycotic Diseases Branch, Centers for Disease Control and Prevention (CDC), Atlanta, GA 30333, USA
[2] Center of Expertise in Mycology Radboudumc/CWZ, 6525GA Nijmegen, The Netherlands
[3] Studies in Translational Microbiology and Emerging Diseases (MICROS) Research Group, School of Medicine and Health Sciences, Universidad del Rosario, Bogotá 1653, Colombia
[*] Authors to whom correspondence should be addressed.

Academic Editor: David S. Perlin

J. Fungi **2022**, *8*(7), 728; https://doi.org/10.3390/jof8070728

American Society for Microbiology
Clinical and Vaccine Immunology
Volume 19, Issue 3, March 2012, Pages 343-345
https://doi.org/10.1128/CVI.05631-11

Diagnostic Laboratory Immunology

Evaluation of Coccidioides Antigen Detection in Dogs with Coccidioidomycosis

Emily J. Kirsch[a], Russell T. Greene[b], Annalisa Prahl[c], Stanley I. Rubin[c], Jane E. Sykes[d], Michelle M. Durkin[a], and Lawrence J. Wheat[a]

Refs 15-17

Coccidioidomycosis
Dogs as Sentinels

Transboundary and Emerging Diseases

Transboundary a

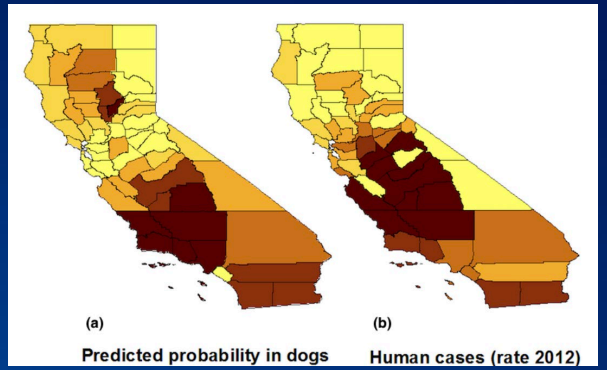
ORIGINAL ARTICLE

Risk Factors and Spatial Distribution of Canine Coccidioidomycosis in California, 2005–2013

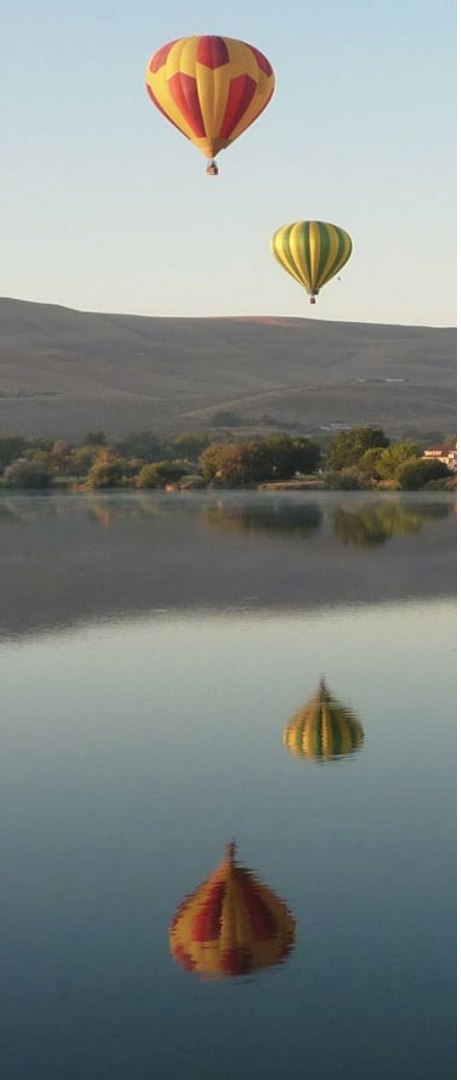
S. E. Grayzel[1], B. Martínez-López[2] and J. E. Sykes[2]

Table 1. Association between dog demographic and environmental variables and coccidioidomycosis occurrence in dogs in California as a result of a multivariable logistic regression model

Variable	Descriptive statistics		Odds ratio (95% confidence interval)	*P* value[a]
	Cases	Controls		
Age in months (mean ± SD)[b]	64 ± 36	99 ± 44	0.3 (0.16–0.56)	<0.001
Digging behavior				
No[c]	16	59	6.68 (2.47–18.06)	<0.001
Yes	25	20		
Travel to Arizona or California central valley				
No[c]	14	39	4.42 (1.46–13.38)	0.005
Yes	27	40		



Ref 18



Coccidioidomycosis
Dogs as Sentinels

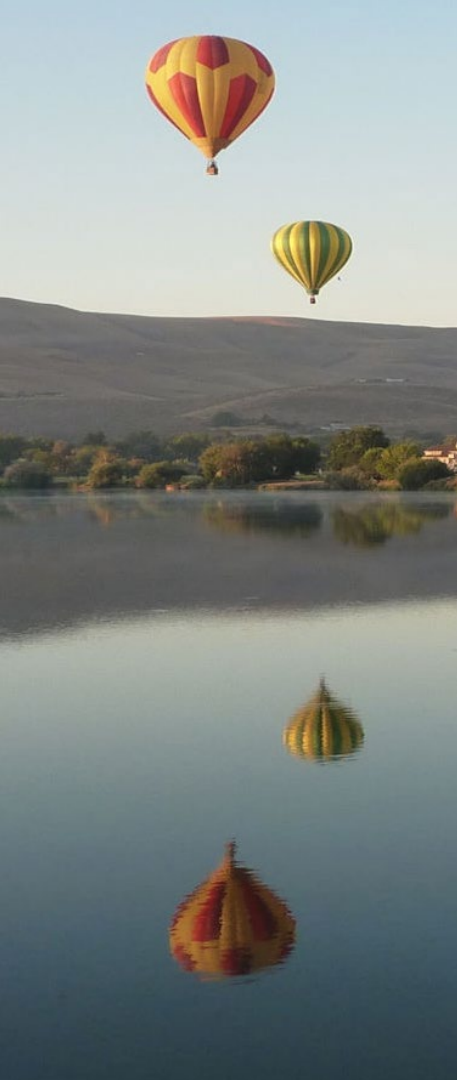
Coccidioidomycosis Acquired in Washington State

Nicola Marsden-Haug,[1] Marcia Goldoft,[1] Cindy Ralston,[2] Ajit P. Limaye,[4] Jimmy Chua,[3] Heather Hill,[2] Larry Jecha,[2] George R. Thompson III,[5] and Tom Chiller[6]

[1]Office of Communicable Disease Epidemiology, Washington State Department of Health, Shoreline, [2]Communicable Disease Program, Benton-Franklin Health District, and [3]Infectious Diseases Department, Kennewick General Hospital, Kennewick, and [4]Division of Allergy and Infectious Diseases, University of Washington, Seattle, Washington; [5]Coccidioidomycosis Serology Laboratory, University of California, Davis; and [6]Mycotic Diseases Branch, Centers for Disease Control and Prevention, Atlanta, Georgia

and limited serology. During 1997–2012 the Washington Animal Disease Diagnostic Laboratory diagnosed culture-confirmed coccidioidomycosis in 2 dogs living only in the area and a local horse that only traveled within the Pacific Northwest (T. E. Besser and M. A. Davis, personal communication, March 2012), further supporting our hypothesis.

Ref 19

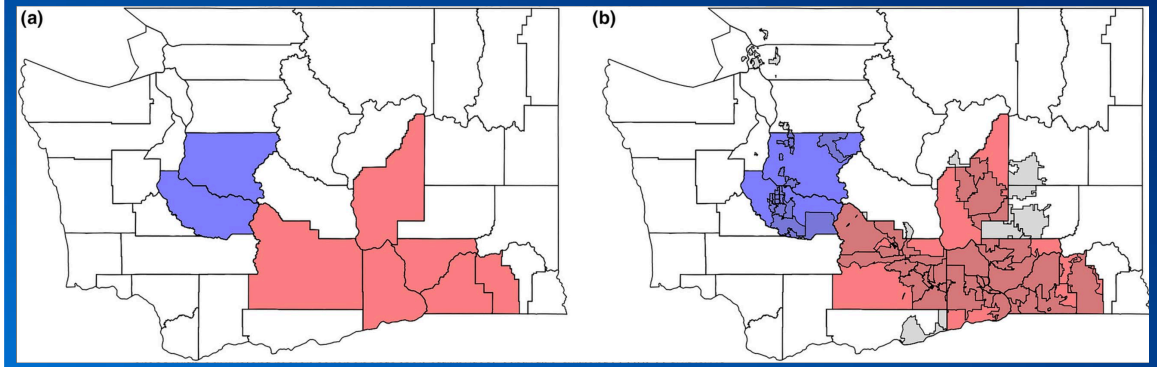


Transboundary and Emerging Diseases

ORIGINAL ARTICLE | Full Access

Soil and climactic predictors of canine coccidioidomycosis seroprevalence in Washington State: An ecological cross-sectional study

Julianne Meisner, Wayne R. Clifford, Ron D. Wohrle, Dave Kangiser, Peter Rabinowitz



Ref 20

Coccidioidomycosis in Animals
Conclusions

- Increased exposure to *Coccidioides* spp. represents a threat to companion animals, production animals, wildlife
- Many infections undetected
- Improved surveillance needed, reporting
- Animal owner education in endemic regions
- Opportunities: sentinel effect, animals as models for treatment, prevention

Ref 17

References/Acknowledgements

1. Huckabone SE, et al. *J Wildl Dis* 2015;51:295
2. Grayzel SE, et al. *Med Mycol* 2021;59:571
3. Havis BM, et al. *J Vet Diagn Invest* 2021;33:587
4. Butkiewicz C, Shubitz LF. *Transbound Emerg Dis* 2019;66:807
5. Macías-Rioseco M, et al. *J Vet Diagn Invest* 2022;34:995
6. Kohn GJ, et al. *Diagn Microbiol Infect Dis* 1992;15:527
7. Vishkautsan P, Sykes JE. In: Sykes JE, ed. *Greene's Infectious Diseases of the Dog and Cat.* Philadelphia, PA: Elsevier 2022.
8. Shubitz LF, et al. *JAVMA* 2005;226:1846
9. Johnson LR, et al. *JAVMA* 2003;222:461.
10. Lonky et al. *Am Rev Respir Dis*. 1976;114:681
11. http://vfce.arizona.edu/education/educational-clinical-images
12. Heinritz CK, et al. *JAVMA* 2005;227:435-440
13. Simoes DM, et al. *Vet Dermatol* 2016;27:346
14. Mehrkens LR, et al. *J Vet Intern Med* 2016;30:1667
15. Reagan KL, et al. *J Vet Intern Med* 2021;35:965
16. Caceres DH, Lindsley MD. *J Fungi* 2022;8:728
17. Kirsch EJ, et al. *Clin Vaccine Immunol* 2012;19:343
18. Grayzel SE, et al. *Transbound Emerg Dis* 2017;64:1110
18. Marsden-Haug N, et al. *Clin Infect Dis* 2013;56:847
19. Meisner J, et al. *Transboundary Emerg Dis* 2019;66:2134-2142