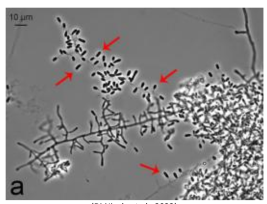
Slide 1

Snake Fungal Disease: Medical Management and Husbandry

Olivia Schiermeyer, DVM, CWR
Wildlife Center of Virginia

Slide 2

Etiology

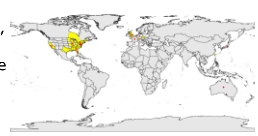


(Di Nicola et al., 2022)

Slide 3

Ophidiomyces ophidiicola

- Emerging infectious disease in the US, Europe, and Australia
- Originated in the pet trade
- Environmental saprobe
  - Suspect opportunistic infection of snakes
- Highly tolerant of a wide range of environments



(Di Nicola et al., 2022)

Slide 4

Host Species

Viperidae

- Northern Copperhead
- Eastern Diamond-backed Rattlesnake
- Timber Rattlesnake
- Massasauga Rattlesnake
- Dusky Pygmy Rattlesnake

Colubridae

- Black Racer*
- Red-bellied Mudsnake
- Eastern Black Kingsnake
- Eastern Milksnake*
- Broad-banded watersnake
- Common Watersnake
- Brown Watersnake
- Central Ratsnake*
- Eastern Foxsnake
- Bullsnake
- Louisiana Pinesnake
- Queensnake
- Western Ribbonsnake
- Plains Gartersnake
- Common Gartersnake*
- Smooth Earthsnake
- Ring-necked snake

*species WCV has treated for SFD

WILDLIFE CENTER OF VIRGINIA

Slide 5

Clinical Signs

WILDLIFE CENTER OF VIRGINIA

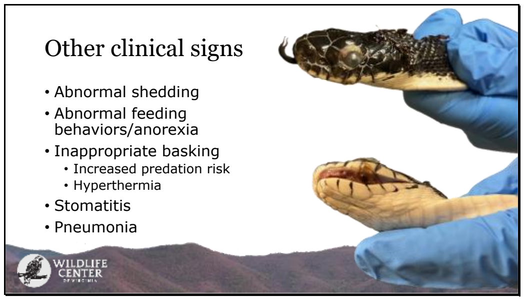
Slide 6

Lesions

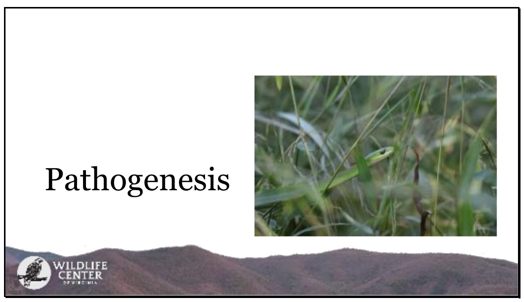
- Scabbed or crusted scales
- Scale edema and discoloration
- Subcutaneous nodules
- Dermal granulomas around the face
- Cloudy spectacles
- Epithelial ulcers

WILDLIFE CENTER OF VIRGINIA

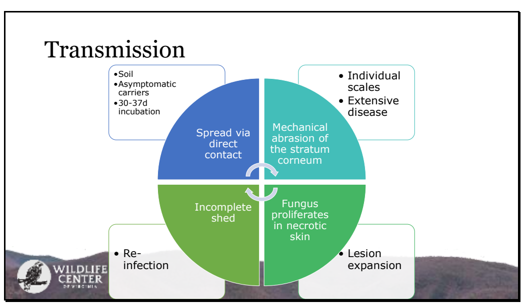
Slide 7



Slide 8



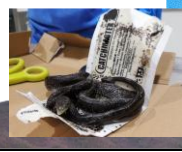
Slide 9



Slide 10

Risk Factors

- Netting entanglement
- Glue traps
- Stress of captivity



WILDLIFE CENTER

Slide 11

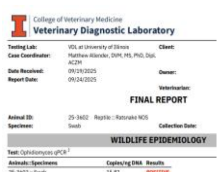
Diagnosis

WILDLIFE CENTER

Slide 12

Diagnostic Options

- Real time or quantitative PCR
- Fungal culture
- Skin biopsy



College of Veterinary Medicine
Veterinary Diagnostic Laboratory

Testing Lab: VDL at University of Illinois
Client:
Case Coordinator: Matthew Allender, DVM, MS, PhD, Dipl. ACZM
Date Received: 09/19/2025
Owner:
Report Date: 09/24/2025
Veterinarian:

FINAL REPORT

Animal ID: 25-3602 Reptile :: Ratsnake NOS
Specimen: Swab
Collection Date:

WILDLIFE EPIDEMIOLOGY

Test: Ophidiomyces qPCR [1]

Animals::Specimens	Copies/ng DNA	Results
25-3602 :: Swab	15.82	POSITIVE

WILDLIFE CENTER

Slide 13

Treatment

Slide 14

Terbinafine

From Melatek, L.L.C.

Implant
- + 1 SQ implant q5-6 weeks
- + Minimal Handling
- − $$$
- − Too large for tiny snakes

Nebulization
- − Nebulize daily for 3-5 weeks
- − Intensive Handling
- + $
- + Reusable setup

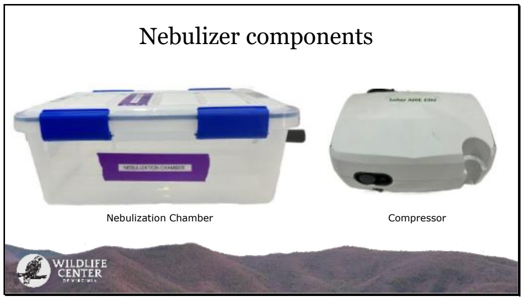
Slide 15

Terbinafine Pharmacokinetics (Kane et al., 2021)

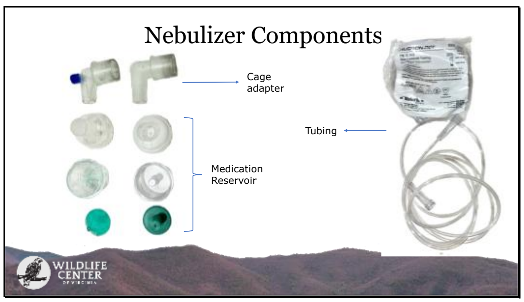
Implanted
- 24.5mg implant SQ cranial to mid-body
- Absorbed SQ
- Therapeutic concentrations maintained for >5 weeks
- Peak concentration ~3 weeks

Nebulized
- 2mg/ml concentration over 30 minutes
- Systemic absorption through lung inhalation and topically on skin
- Therapeutic concentrations maintained for ~12 hours

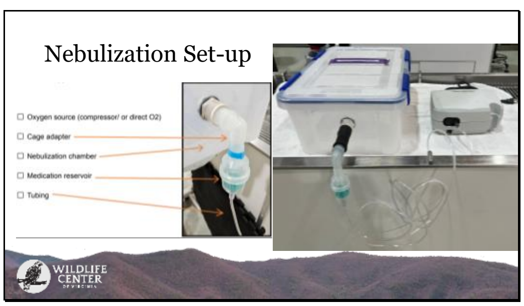
Slide 16



Slide 17



Slide 18



Slide 19

Nebulization Protocol

- 2mg/mL terbinafine
  - 1 250mg tablet + 125mL sterile saline
- 30 minutes/treatment
- Once per day for 3-5 weeks or until clinical signs resolve

Slide 20

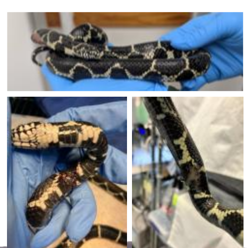
Supportive Care

- Clean snake with chlorhexidine when handled
- Antibiotics if open wounds are present
- Fluid therapy

Slide 21

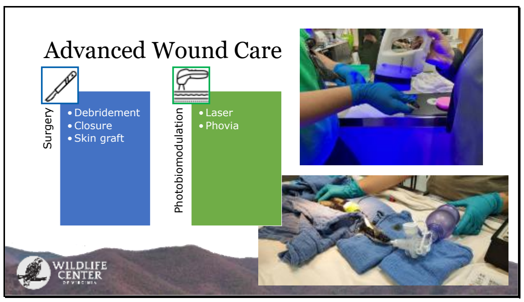
Wounds

- Reptiles heal slowly compared to mammals and birds
- Healing occurs more rapidly at higher temperatures



Slide 22

Slide 23



Slide 24

Slide 25

Housing

- Vision cage
  OR
- Plastic tubs with locking lids
  - 2 tubs set up per snake
- Appropriate thermal gradient
- No water dish/soaking if lesions are present
  - Supplement with SQ fluids

WILDLIFE CENTER OF VIRGINIA

Slide 26

Cleaning

- Shift tubs daily
- Remove gross debris from enclosure
- Replace newspaper
- Replace damp towel in humid hide
- Follow with disinfection

WILDLIFE CENTER OF VIRGINIA

Slide 27

Disinfection

Disinfection is crucial for environments, enclosures, and equipment

Chlorhexidine: Reduces fungal growth but doesn't prevent it	**Bleach**: 2 min exposure to 3% solution effective	**Rescue**: Ready-to-Use spray effective with 1 minute contact time	**Other Disinfectants**: Roccal (0.16%), Lysol, NPD, CLR, 409 (10 min exposure)

Slide 28

Housing

- Can return to ideal set-up once clinical signs have resolved
- Monitor closely for return of lesions
  - If noted, change back to dry dock set-up

WILDLIFE CENTER

Slide 29

PPE

- Gown
- Nitrile Gloves
- Handling Gloves

WILDLIFE CENTER

Slide 30

SFD prevalence at the WCV

- Previously tested all snakes on admission for SFD to investigate prevalence
- Many snakes with no clinicals signs tested positive for Ophidiomyces at low levels on PCR
- As a result, WCV treats all snakes as 'contagious' assuming possible low level contamination without clinical signs

ID	SPECIES	RESULT	CLINICAL SIGNS
19-0155	Eastern Ratsnake	POSITIVE	yes
19-0333	Black Racer	POSITIVE	no
19-0342	Black Racer	POSITIVE	no
20-0418	Eastern Ratsnake	POSITIVE	no
20-0556	Eastern Ratsnake	POSITIVE	no
20-0735	Eastern Ratsnake	POSITIVE	no
20-1615	Eastern Ratsnake	POSITIVE	no

WILDLIFE CENTER

Slide 31

Release

AND

Clinical signs have resolved

SFD test is negative

WILDLIFE CENTER OF VIRGINIA

Slide 32

Case: Central Ratsnake 24-2811

WILDLIFE CENTER OF VIRGINIA

Slide 33

Central Ratsnake 24-2811

- Signalment & History
  - Adult male Central Ratsnake (*elaphe alleghaniensis)*
  - Presented July 16, 2024 after being found in an attic wrapped in netting for unknown amount of time
  - Patient freed from netting at presentation to WCV

WILDLIFE CENTER OF VIRGINIA

Slide 34

Physical Exam

Weight: 314 g
Body Condition Score (BCS): 2/5

Injury: Circumferential constriction injury, dry, uneven scales where netting was

Mild dehydration

Spectacles: In blue

Remainder of the physical exam was within normal limits.

Slide 35

Initial Treatment

- Meloxicam 0.2mg/kg IM q24h for 5 days
- Ceftazidime 22mg/kg IM q72h for 7 doses
- Reptile Ringers 30mg/kg SQ q24h for 5 doses
- Wound monitoring and flushing
- Weekly Evaluation & Weight

Slide 36

Patient Progression

July 18

Mild discharge from wound.

Started shedding

July 21

Wound appears deeper.

White lesions starting to develop on scales

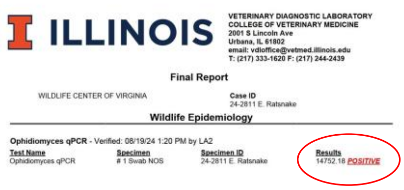
July 23

Necrosis noted over wound.

Scale necrosis noted at original lesions.

Slide 37

Slide 38



ILLINOIS

VETERINARY DIAGNOSTIC LABORATORY
COLLEGE OF VETERINARY MEDICINE
2001 S Lincoln Ave
Urbana, IL 61802
email: vdloffice@vetmed.illinois.edu
T: (217) 333-1620 F: (217) 244-2439

Final Report

WILDLIFE CENTER OF VIRGINIA

Case ID
24-2811 E. Ratsnake

Wildlife Epidemiology

Ophidiomyces qPCR - Verified: 08/19/24 1:20 PM by LA2

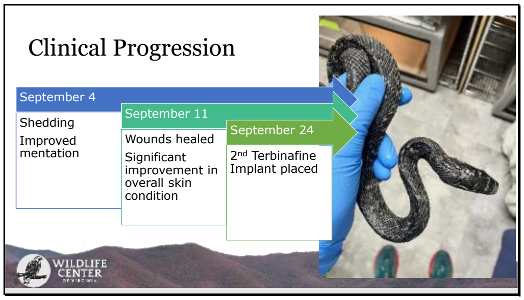
Test Name	Specimen	Specimen ID	Results
Ophidiomyces qPCR	# 1 Swab NOS	24-2811 E. Ratsnake	14752.18 POSITIVE

Slide 39

Updated Treatment Plan

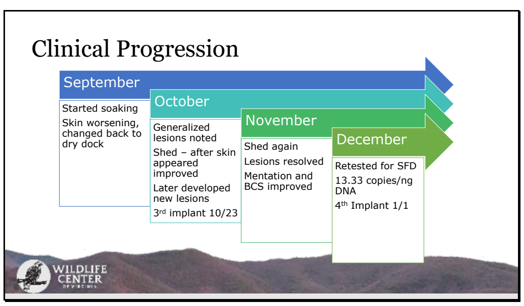
- 1st Terbinafine Implant Placed 8/19
- Gently cleaning entire snake with chlorohex & apply SSD to wounds q24h
- Enrofloxacin 10mg/kg SQ q48h for 5 doses
- Gavage feeding due to anorexia
- Overwinter

Slide 40



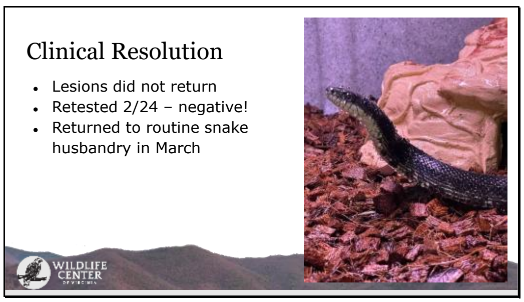
Slide 41

Slide 42

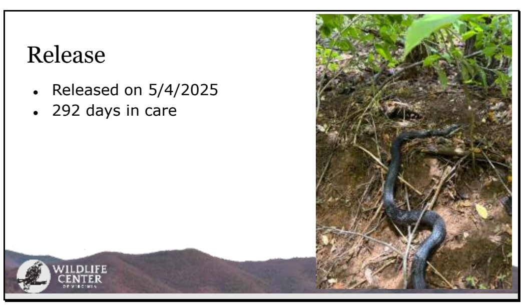


Slide 43

Slide 44



Slide 45



Slide 46

References

- Davy, C. M., Shirose, L., Campbell, D., Dillon, R., McKenzie, C., Nemeth, N., Braithwaite, T., Cai, H., Degazio, T., Dobbie, T., Egan, S., Fotherby, H., Litzgus, J. D., Manorome, P., Marks, S., Paterson, J. E., Sigler, L., Slavic, D., Slavik, E., … Jardine, C. (2021). Revisiting ophidiomycosis (snake fungal disease) after a decade of targeted research. *Frontiers in Veterinary Science*, *8*. https://doi.org/10.3389/fvets.2021.665805
- Di Nicola, M. R., Coppari, L., Notomista, T., & Marini, D. (2022). Ophidiomyces ophidiicola detection and infection: A global review on a potential threat to the world's snake populations. *European Journal of Wildlife Research*, *68*(5). https://doi.org/10.1007/s10344-022-01612-8
- Kane, L. P., Allender, M. C., Archer, G., Leister, K., Rzadkowska, M., Boers, K., Souza, M., & Cox, S. (2017). Pharmacokinetics of nebulized and subcutaneously implanted terbinafine in cottonmouths (*agkistrodon piscivorus*). *Journal of Veterinary Pharmacology and Therapeutics*, *40*(5), 575–579. https://doi.org/10.1111/jvp.12406
- Ladner, J. T., Palmer, J. M., Ettinger, C. L., Stajich, J. E., Farrell, T. M., Glorioso, B. M., Lawson, B., Price, S. J., Stengle, A. G., Grear, D. A., & Lorch, J. M. (2022). The population genetics of the causative agent of snake fungal disease indicate recent introductions to the USA. *PLOS Biology*, *20*(6). https://doi.org/10.1371/journal.pbio.3001676
- Lorch, J. M., Knowles, S., Lankton, J. S., Michell, K., Edwards, J. L., Kapfer, J. M., Staffen, R. A., Wild, E. R., Schmidt, K. Z., Ballmann, A. E., Blodgett, D., Farrell, T. M., Glorioso, B. M., Last, L. A., Price, S. J., Schuler, K. L., Smith, C. E., Wellehan, J. F., & Blehert, D. S. (2016). Snake fungal disease: An emerging threat to wild snakes. *Philosophical Transactions of the Royal Society B: Biological Sciences*, *371*(1709), 20150457. https://doi.org/10.1098/rstb.2015.0457
- NYS Wildlife Health Program. (2017, January 5). *Snake fungal disease*. Cornell Wildlife Health Lab. https://cwhl.vet.cornell.edu/disease/snake-fungal-disease#collapse19
- Thompson, N. E., Lankau, E. W., & Moede Rogall, G. (2018). Snake fungal disease in North America: U.S. geological survey updates. *Fact Sheet*. https://doi.org/10.3133/fs20173064

WILDLIFE CENTER

Slide 47

Questions?

- oschiermeyer@wildlifecenter.org

WILDLIFE CENTER