LABOKLIN
LABOR FÜR KLINISCHE DIAGNOSTIK GMBH & CO. KG

Bacterial diseases of reptiles

Rachel E. Marschang

LABOKLIN GmbH & Co. KG, Bad Kissingen, Germany

Bacteria

- Often secondary
- Normal bacterial microbiome of reptiles includes many Gram negative genera, e.g.
  - *Aeromonas*, *Pseudomonas*, *Salmonella*, *Proteus*, *Serratia*, *Enterbacter* spp.....
- Relatively few primary pathogens described
  - Mycoplasma
  - Chlamydia
  - *Devriesea agamarum*
  - Mycobacteria

Mycoplasmas

- Mycoplasmas commonly found in chelonians
- *Mycoplasmopsis agassizii* and *M. testudinea* associated with URTD

LABOKLIN
LABOR FÜR KLINISCHE DIAGNOSTIK GMBH & CO. KG

Taxonomy

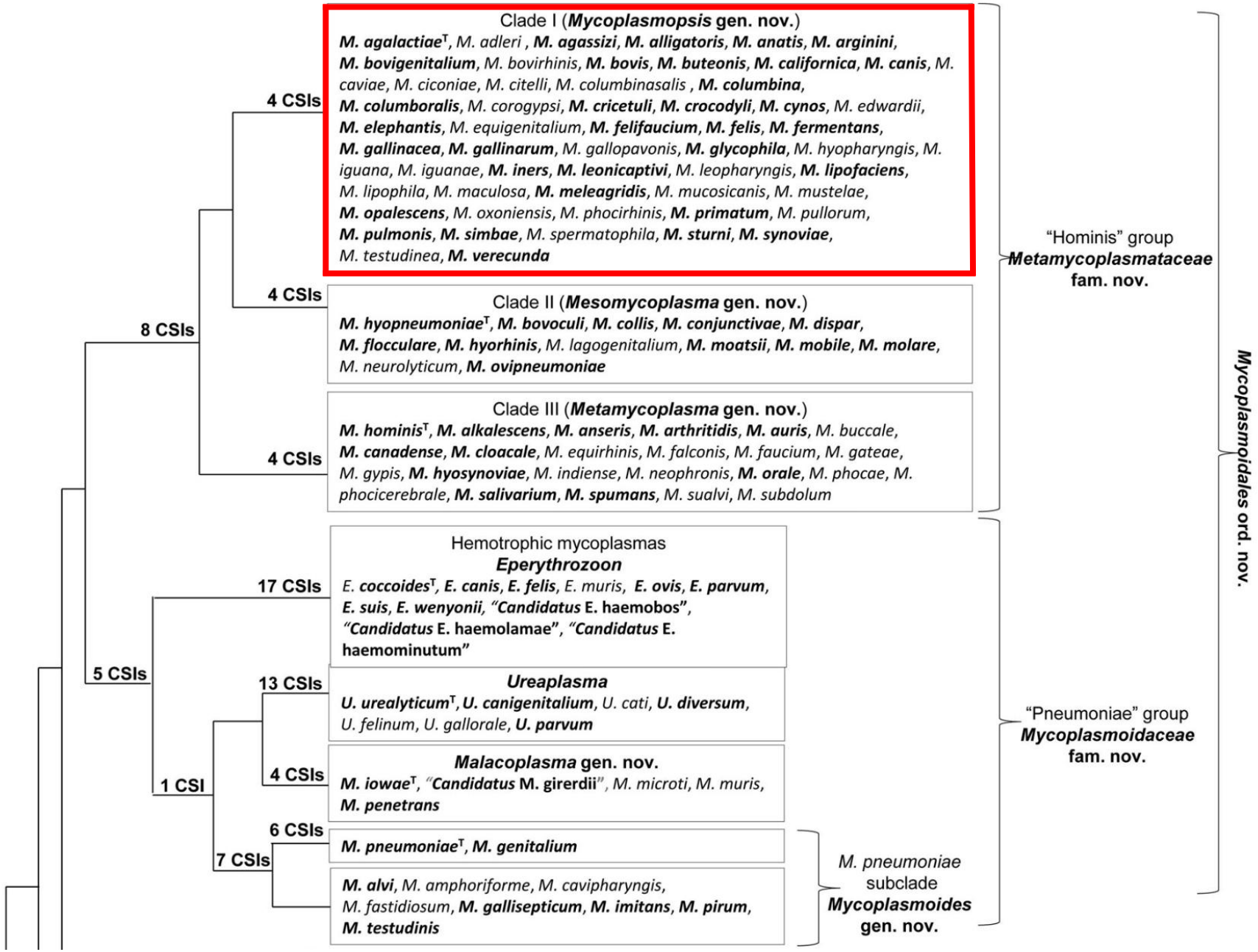
- Class *Mollicutes*
  - Order *Mycoplasmoidales* ord. nov.
  - 2 Families *Mycoplasmoidaceae* fam. nov. and *Metamycoplasmataceae* fam. nov.
    - Eperythrozoon, Ureaplasma und 5 new „Mykoplasmas“ genera

Phylogenetic framework for the phylum Tenericutes based on genome sequence data: proposal for the creation of a new order *Mycoplasmoidales* ord. nov., containing two new families *Mycoplasmoidaceae* fam. nov. and *Metamycoplasmataceae* fam. nov. harbouring *Eperythrozoon*, *Ureaplasma* and five novel genera

Radhey S. Gupta · Sahil Sawnani · Mobolaji Adeolu · Seema Alnajar · Aharon Oren

10.1007/s10482-018-1047-3

LABOKLIN
LABOR FÜR KLINISCHE DIAGNOSTIK GMBH & CO. KG



Gupta et al. 2018. doi: 10.1007/s10482-018-1047-3

Mycoplasma: Tortoises

- Cause upper respiratory disease (URTD)
  - Nasal sinus and choanal epithelium
  - Inflammation, loss of ciliated epithelium
  - Ulceration, dysplasia, necrosis
- Also found in clinically healthy animals
- Recurrent disease outbreaks
- Often involved in multi-factorial disease processes

LABOKLIN
LABOR FÜR KLINISCHE DIAGNOSTIK GMBH & CO. KG

Mycoplasma: Tortoises

- Disease development and pathogen shedding likely dependent on multiple factors:
  - Host species
  - Environment
  - Immune response
  - Co-infections
- Changes in disease dynamics over time
- Can influence diagnostic accuracy

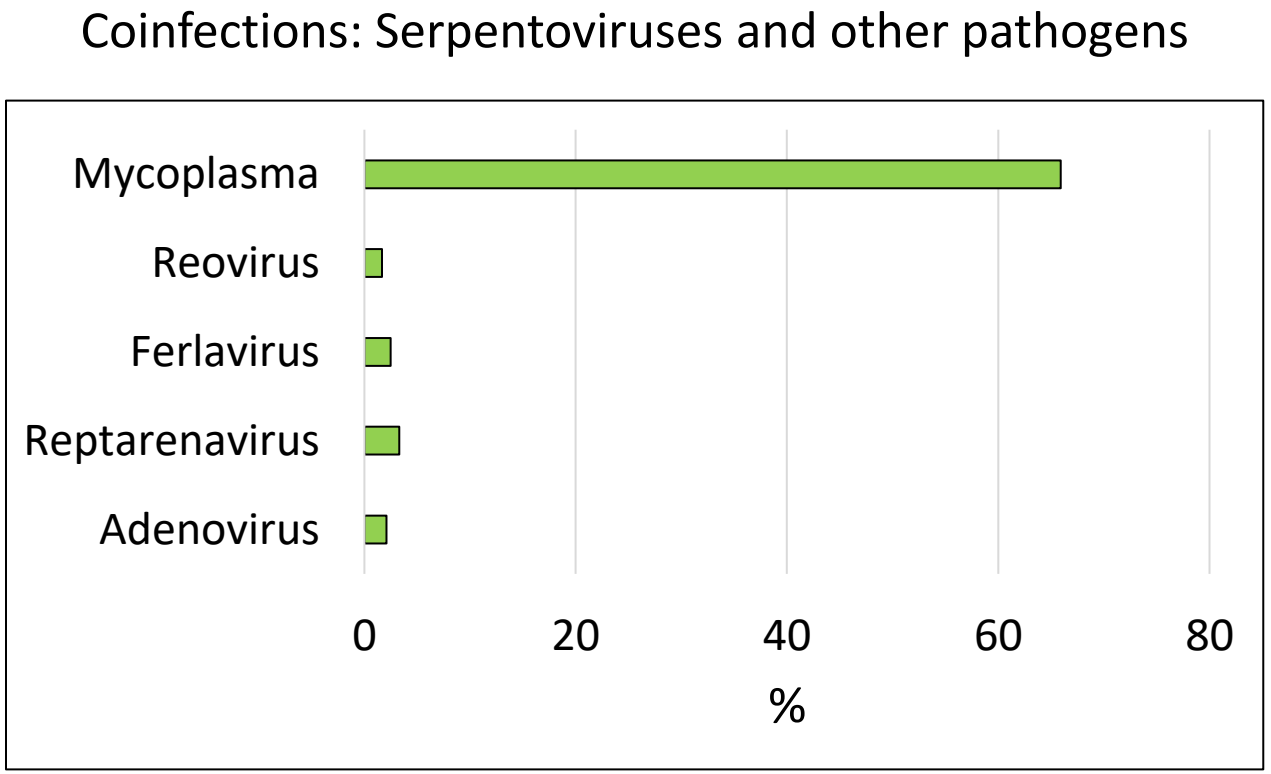
LABOKLIN
LABOR FÜR KLINISCHE DIAGNOSTIK GMBH & CO. KG

Mycoplasma: Turtles

- Mycoplasmas related to *M. agassizii* found in many freshwater turtle species
- Respiratory disease described in some cases
- In many cases no clinical disease
- In wild turtles and in managed care

Mycoplasma: Snakes

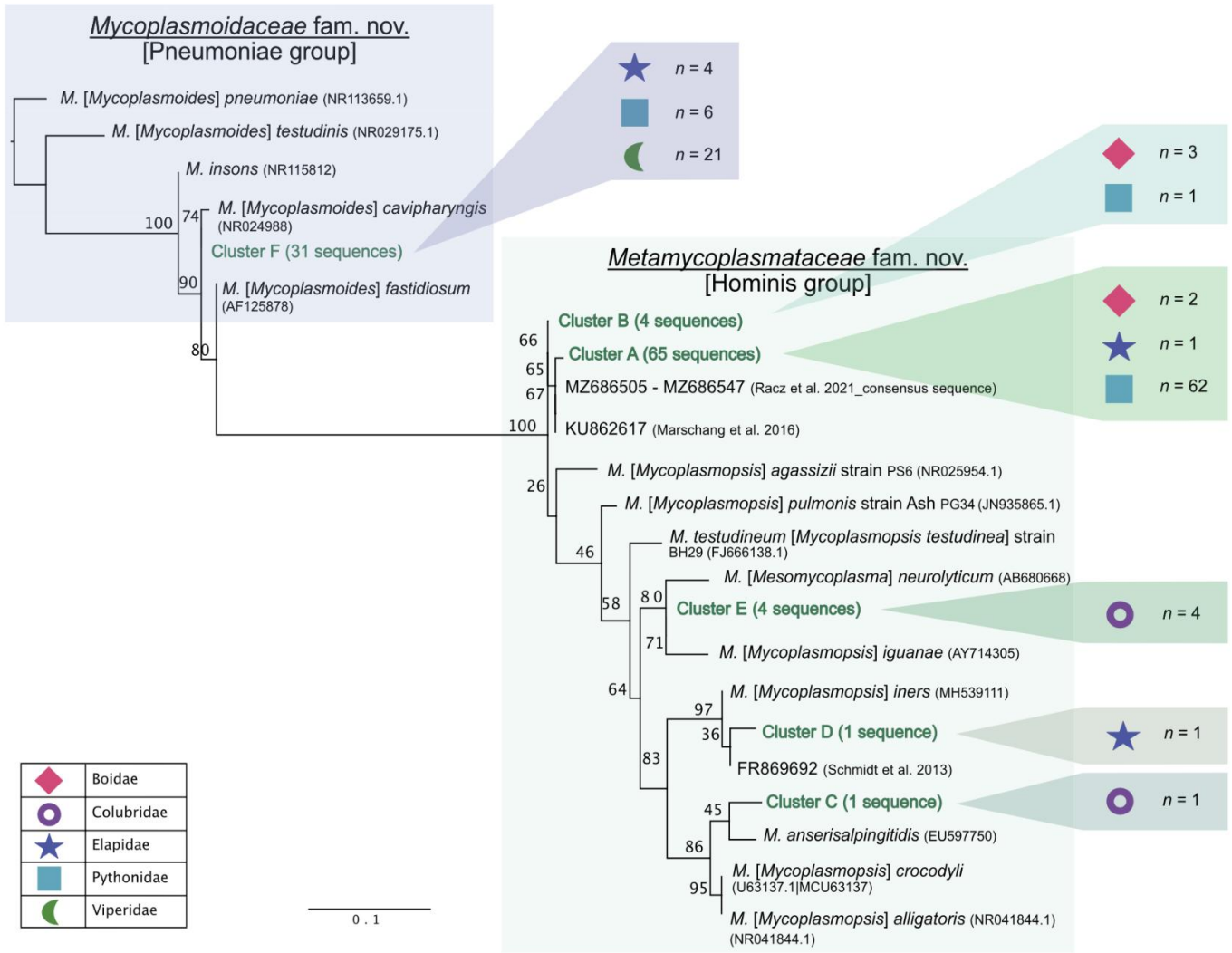
- Individual reports of infections in pythons associated with tracheitis and pneumonia from 1997 on
- Diagnostic testing select samples from snakes in Europe (Racz et al., 2021):
  - 163/271 (60.2%) pythons tested positive
  - Odds ratio for co-infection with mycoplasma and nidovirus: 3.3 (95% CI 1.79-6.03)



LABOKLIN
LABOR FÜR KLINISCHE DIAGNOSTIK GMBH & CO. KG

Mycoplasma: Snakes

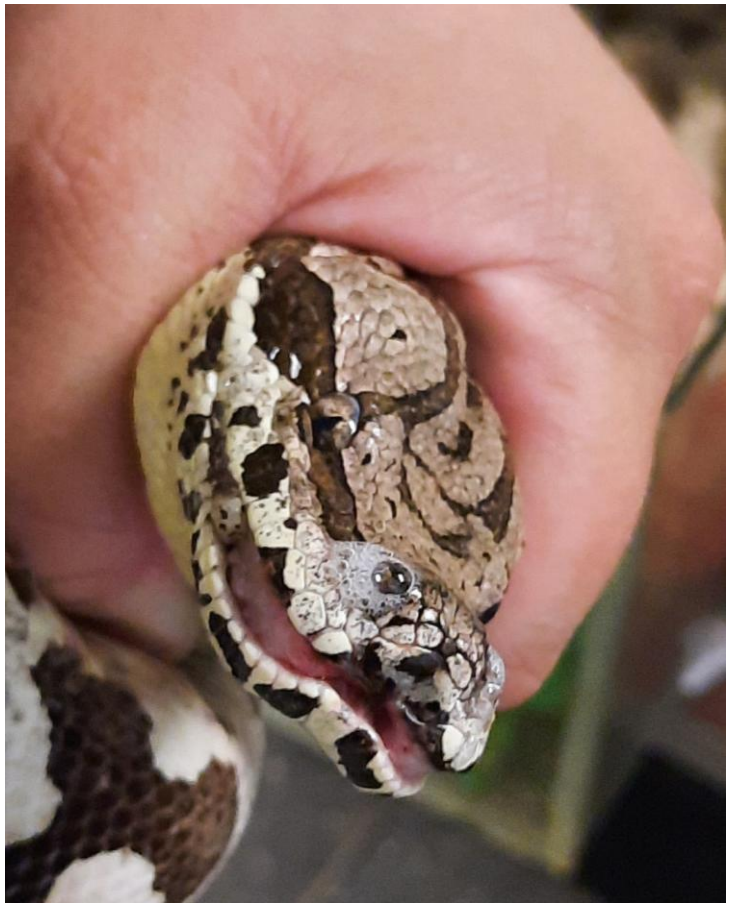
- Detected in ca. 10% of boas tested
- New detections in other snake families:
  - Elapidae, Viperidae, Colubridae
- Genetically diverse mycoplasmas



LABOKLIN
LABOR FÜR KLINISCHE DIAGNOSTIK GMBH & CO. KG

Mycoplasma: Snakes

- Clinical importance in respiratory disease
  - Not yet understood
  - Possibly produces chronic low-grade inflammation
  - Possibly increases pathogenicity of other infections e.g. „makes serpentovirus infections worse“



Mycoplasma: crocodilians

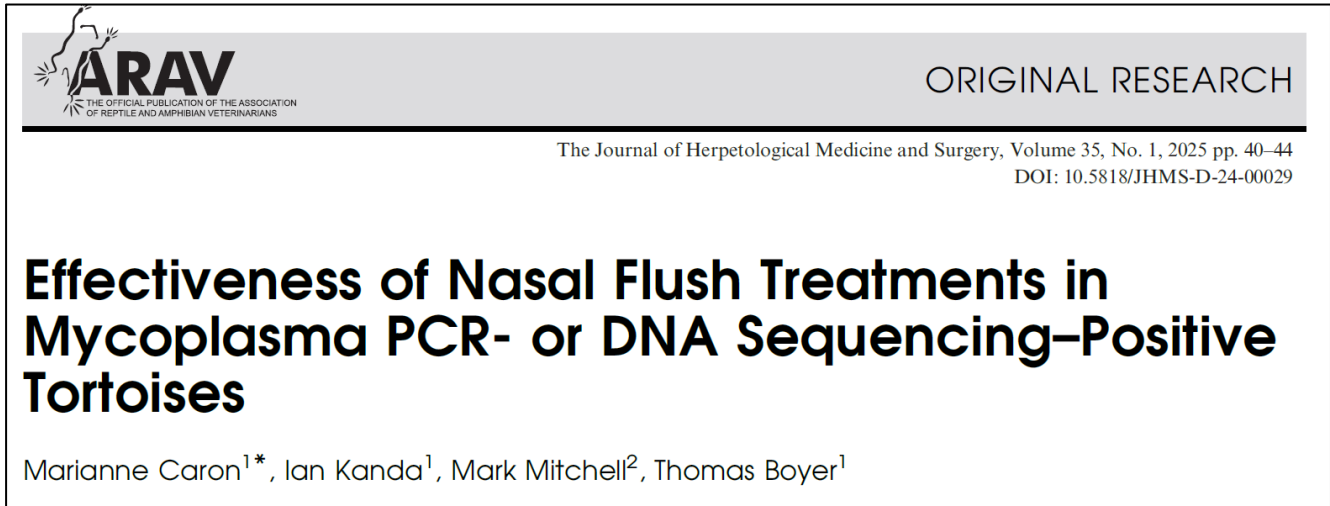
- Associated with mild polyarthritis and pneumonia in farmed Nile crocodiles in Zimbabwe
  - *Mycoplasmopsis crocodylii*
- Lethal invasive disease described in alligators and caimans
  - *Mycoplasmopsis alligatoris*
  - Pneumonia, pericarditis, myocarditis, nephritis, hepatitis, meningitis, synovitis
- Associated with varying disease severity

Mycoplasma: diagnosis

- Pathogen detection:
  - Most commonly via PCR
  - Turtles and tortoises: Nasal flush, oral swab
  - Snakes: Oral swabs
  - Shedding inconsistent
- Serology
  - ELISA in tortoises
  - Differences in immune response described between animals

Mycoplasma: treatment

- Clarithromycin
  - 20 mg/kg every 2-3 days for 90 days: did not suppress shedding (Rettenmund et al., 2017)
- Nasal flushing (Caron et al., 2025)
  - Enrofloxacin, dexamethasone, and saline:
    - 0.4 ml enrofloxacin (22.7 mg/ml), 0.2 ml dexamethasone (0.2 mg/ml), 2.4 ml 0.9% saline (final volume 3 ml)
    - 0.5 ml in each nostril and 1 ml in each choanal slit
    - Plus 10 mg/kg enrofloxacin IM
    - 5 times every 48-72 hours under sedation
    - 12 of 15 tortoises mycoplasma negative 1 month after final treatment, none showed respiratory signs



ARAV
THE OFFICIAL PUBLICATION OF THE ASSOCIATION OF REPTILE AND AMPHIBIAN VETERINARIANS

ORIGINAL RESEARCH

The Journal of Herpetological Medicine and Surgery, Volume 35, No. 1, 2025 pp. 40–44
DOI: 10.5818/JHMS-D-24-00029

Effectiveness of Nasal Flush Treatments in Mycoplasma PCR- or DNA Sequencing–Positive Tortoises

Marianne Caron[1]*, Ian Kanda[1], Mark Mitchell[2], Thomas Boyer[1]

Chlamydia

- Multiple species described in reptiles
- *Chlamydia pneumoniae* most common
- Associated with various lesions:
  - Granulomas
  - Myocarditis, splenitis, hepatitis, enteritis, pneumonia, blepharitis
- Diagnosis:
  - PCR
  - Material from lesions, choanal and cloacal swabs

Bacteria: Actinobacteria

- Actinobacteria reported to cause primary dermatological disease
- *Dermatophilus congolensis*
  - Ulceration, hyperkeratosis, necrosis, subcutaneus abscesses
  - Lizards, snakes, saltwater crocodiles
- *Austwickia chelonae* (formerly *D. chelonae*)
  - Granulomatous skin lesions in chelonians and other reptiles. Can spread to deeper tissues
- *Devriesea agamarum*
- Mycobacteria

African spurred tortoise (*Centrochelys sulcata*) with *Austwickia chelonae* infection. Ossiboff. 2025. Diagnostic challenge. J Herpetol Med Surg. 35(4):252-253.

Devriesea agamarum

- Gram-positive bacterium
- Causes dermatitis and cheilitis
  - Esp. in *Uromastyx* spp.
- Inapparent carriers
  - e.g. bearded dragons (*Pogona* spp.) (Hellebuyck et al., 2009)
- Systemic infection, disease, and mortalities
  - e.g. lesser Antillean iguanas (*Iguana delicatissima*) (Hellebuyck et al., 2017)

Photo source: Jutta Wiechert

Devriesea agamarum: Diagnosis

- Culture:
  - Relatively easy in acute cases
  - Duration: ca. 3 days
  - Problem: *D. agamarum* is not always recognized by standard MALDI-TOF MS databases
- PCR

Devriesea agamarum: Diagnosis

- Good samples for the detection of *D. agamarum*:
  - Affected tissue below or within crusts
  - Internal organs in septicemic animals
  - Subcutaneous granulomas
- Samples that are difficult for bacterial culture:
  - Oral swabs
  - Gastro-intestinal tract
  - Healthy skin

Devriesea agamarum: Treatment

- Antibiotic treatment (Hellebuyck et al., 2009):
  - Ceftiofur 5 mg/kg IM once daily for ca. 12 days
  - Enrofloxacin not successful in treating infected bearded dragons
- Autovaccine trialed (Hellebuyck et al., 2014)

Veterinary Microbiology 139 (2009) 189–192

Contents lists available at ScienceDirect

Veterinary Microbiology

journal homepage: www.elsevier.com/locate/vetmic

Short communication

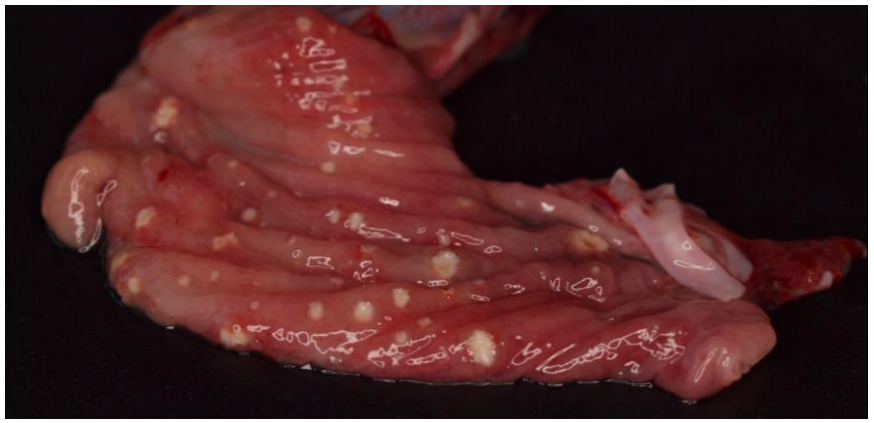
Designing a successful antimicrobial treatment against *Devriesea agamarum* infections in lizards

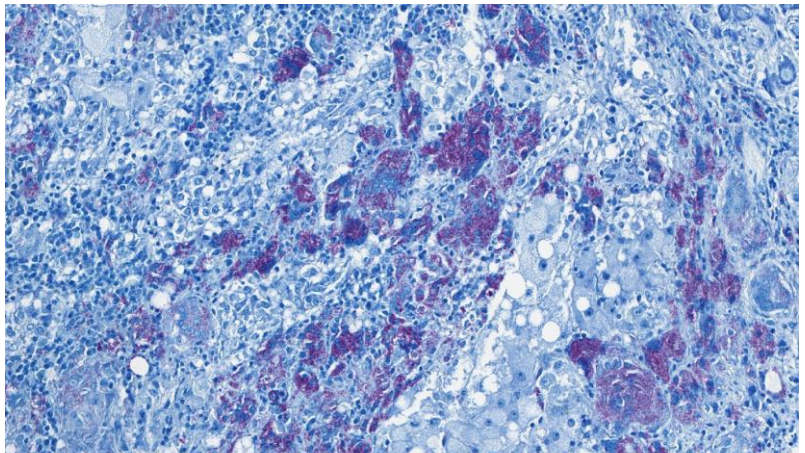
Tom Hellebuyck *, Frank Pasmans, Freddy Haesebrouck, An Martel

Department of Pathology, Bacteriology and Avian Diseases, Faculty of Veterinary Medicine, Ghent University, Salisburylaan 133, B-9820 Merelbeke, Belgium

Mycobacteria

- Multiple species described in reptiles
  - *M. agri, M. avium, M. chelonae, M. confluentis, M. fortuitum, M. haemophilum, M. hiberniae, M. intracellulare, M. kansasii, M. marinum, M. neoaurum, M. nonchromogenicum, M. phlei, M. smegmatis, M. szulgai, M. ulcerans*
  - Many found in biofilms in aquatic environments
- Most often associated with granaulomas, unspecific clinical signs
- Stain acid-fast, difficult to culture, difficult to treat, difficult to disinfect
- Some zoonotic!





LABOKLIN
LABOR FÜR KLINISCHE DIAGNOSTIK GMBH & CO. KG

LABOKLIN
LABOR FÜR KLINISCHE DIAGNOSTIK GMBH & CO. KG

Thank you for your attention!

ecvm European College of Veterinary Microbiology

ECZM EUROPEAN COLLEGE OF ZOOLOGICAL MEDICINE

ARAV ASSOCIATION OF REPTILIAN AND AMPHIBIAN VETERINARIANS