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When mites ain't mites: A new species of *Knemidocoptes* in Australian Finches

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Introduction

Genus *Knemidocoptes* is one of six genera within the subfamily Knemidocoptinae within the family Epidermoptidae, a group of mites responsible for causing skin, feather and facial lesions on many different species of wild and domestic birds (Mironov et al., 2005). Within the genus *Knemidocoptes* there are five species: *K. mutans*, *K. pilae*, *K. jamaicensis*, *K. intermedius* and *K. fossor*. All life stages of mites within the family Epidermoptidae are found on the host, and spread is via direct contact between infected and uninfected individuals (Dabert et al., 2011).

Four of the five known species of *Knemidoptes* have been identified in captive and wild Australian birds (Domrow, 1992). *Knemidocoptes. mutans* has been recognized on poultry (Domrow, 1992), *K. pilae* on captive budgerigars (Newton and O'Sullivan, 1956), *K. intermedius* on forest ravens, wild pied currawongs and superb lyrebirds (Mason and Fain, 1988; Jaensch et al., 2003; Holz et al., 2005) and *K. jamaicensis* on captive goldfinches and canaries (Mines, 1967; Domrow, 1992).

Several microhabitats on the host's body are typically inhabited by mites belonging to the genus *Knemidocoptes*. "Face mites" such as *K. pilae* invade the feather follicles and stratum corneum of the face and cere, while "Scaly leg" mites such as *K. mutans* and *K. intermedius* invade under the scales on the legs and feet of the host (Dabert, et al., 2011). While the different *Knemidocoptes* mites may have a preference for one or the other region in most hosts, they are not however limited to their preferred microhabitats. *K. pilae* has been found on the vent, legs and back of psittacine birds, and *K. mutans* on the neck and comb of poultry (Wall and Shearer, 2001).

Knemidocoptes mites burrow into the epithelium resulting in hyperkeratosis which is visible macroscopically as a crusty lesion. Histologically, the stratum corneum appears thicker and honeycombed with mites present in the cavities (Mainka et al., 1994). Inflammatory cells have been observed in lesions, ranging from a mild mononuclear infiltration (Mason and Fain, 1988) to severe heterophilic foci associated with secondary bacterial infection (Jaensch, et al., 2003). Infection with *Knemidocoptes spp*. can result in clinical disease ranging from mild keratosis (Mason and Fain, 1988) and irritation and restlessness (Mines, 1967), to more severe local lesions including breaks in the epithelium which expose underlying tissues and result in subsequent bacterial infection (Jaensch, et al., 2003), deformation of beaks, toes and limbs and inappetence and death (Wall and Shearer, 2001).

Case Report

A flock of 20 zebra finches (*Taeniopygia guttata*) was purchased from a pet store, which sold a range of passerine and psittacine species. At the new owner's property, the finches were housed in a galvanized steel aviary, with a concrete floor adjacent to an aviary of approximately 30 cockatiels and budgerigars. The birds were fed a diet of finch seed mix and a mixture of different vegetables. The feed and water bowls were cleaned daily and the aviary itself cleaned weekly. The aviary had been cleaned and left free of birds for approximately five months prior to the arrival of this group of finches.

Two months after purchase, one male zebra finch was noticed to have a crust on its beak and it was presented to the University of Melbourne, Faculty of Veterinary and Agricultural Sciences. The yellow-white crust was distributed along the culmen of its upper beak and extended along the margin where the rhinotheca meets the epithelium of the face (Figure 1). On the lower beak, a similar white crusting was present on the ventral surface of the gnathotheca. No crust was observed on other parts of the bird and the bird was otherwise in good body condition. Scraping of the lesion on the upper beak was performed, and a number of *Knemidocoptes spp.* mites were detected. The bird was treated with topical 400µg/kg moxidectin (Moxidectin, Vetafarm).

Because the distribution of the crusting solely on the beak was considered unusual for *Knemidocoptes spp*. infection on a passerine bird, the mites were submitted for parasitological identification at the Faculty of Veterinary and Agricultural Sciences. Male, female and larval mites were identified from the scraping. Using the key for Astigmata

by Domrow (Domrow, 1992), the mites were confirmed to belong to the family Knemidocoptidae, but could not be identified as belonging to any of the known species. It most closely resembled *K. fossor*, however setae on tarsus 3 were of different lengths to *K. fossor*. In the female mite, the setae on L5 were only half the size of those of *K. fossor*, and the number of striations on the ventral surface were only about 15 compared to 40 in *K. fossor, K. intermedius* and *K. pilae*. The larvae also lacked striations on the dorsal surface, which is a feature of *K. fossor*. It was therefore concluded that these mites belonged to an undescribed species of *Knemidocoptes*.

The male zebra finch was found dead on the floor of the aviary early in the morning one week after the initial presentation. The owner had not seen the bird behaving any differently in the preceding days and elected to submit the bird for post mortem. At post mortem, the bird was found to be in good body condition with the scale still present on the upper and lower beak. No other gross abnormalities were detected. Histopathology found *Macrorhabdus*-like organisms in the proventricular glands and pseudohyphae of fungal organisms in the koilin of the gizzard, presumed to be *Candida spp.*. On the upper beak, mites were found in tunnels in the stratum corneum, and the outer keratin was disorganized over the same region (Figure 2).

Figure 1: The scaly crust visible on the upper beak of the infected finch.

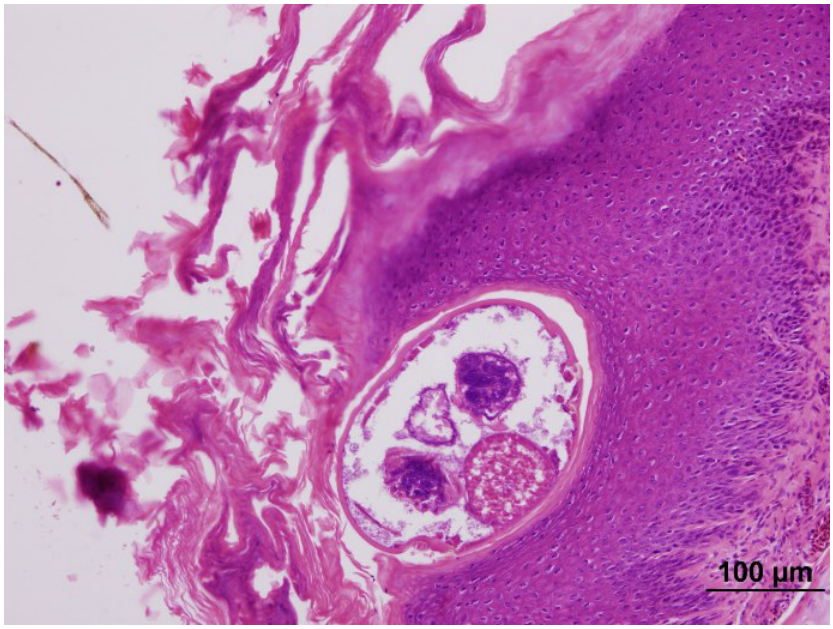

Figure 2: A mite present in a tunnel in the epithelium of the upper beak. Note the irregular layers of keratin over the mite and tunnel.

The remainder of the aviary was treated with Amphotericin B (Fungilin, Aspen Pharma) via the feed at 25-50mg/kg for 14 days (Doneley, 2011; Phalen, 2014). The ratio of drug to feed was calculated by measuring the seed consumption of the aviary over 24 hours, working out the grams of feed consumed per finch, crushing the lozenge in a mortar and pestle, and mixing the calculated weight of powdered lozenge in the daily seed allocation. Multivitamins (Soluvet, Vetafarm) were added to the water.

Despite treatment, another two finches died over the course of the following month, and histopathology revealed fungal organisms consistent with *Macrorhabdus spp*. in the proventicular glands. One of the dead finches also had budding fungal organisms present in the koilin of the ventriculus. To reduce any concurrent stresses on the flock, the owner decided to shelter them in hospital cages for the remaining part of the Melbourne winter (late July/early August) and no more mortalities were noted after this decision. The birds' diet was also modified to include more sprouted seeds and an increased vegetable component. No more scaly face/leg lesions have been observed in the flock.

Discussion

This is the first report of this new species of *Knemidocoptes* mite from an avian host. The mite remains yet unnamed and is awaiting full parasitological description and cataloguing. The mite was able to cause a moderate amount of tunneling and hyperkeratotic proliferation on the beak of its host, but had not caused any deformation of the beak nor reduced the ability of its host to maintain its body condition. Despite the only known host passing away one week after the detection of the parasite, it was thought that the mite was not the cause of the bird's death. The presence of the fungi in the proventriculus and ventriculus was considered to be the more significant finding, but given the good body condition of the host, it is possible the cause of death was another, yet unidentified cause.

Given the unknown movement history of the finches prior to their arrival at the pet store, the origin of this mite is unclear. It is possible that the mite is a natural parasite of zebra finches, brought into captivity from wild-caught finches, and has been present in captive birds for some time but not previously detected due to the mild nature of the infection. It may also be the case that the presentation on the beak described here is not the typical clinical presentation for this mite. If the mite is more typically a "scaly leg" mite, then the disease caused by it would be grossly indistinguishable from that caused by the other *Knemidocoptes* species (*K. intermedius*, *K. jamaicensis*) which commonly infect passerine birds. However no evidence of the mite was found on the legs of this particular host.

Given that other species of *Knemidocoptes* are not specific to any one species of bird, this mite may have been transmitted to this zebra finch from another avian species. These finches were purchased from a local bird store which purchased them from an unknown aviary and it is therefore possible that they had contact with many different types of native and exotic birds and may have picked the parasite up from them.

Finally, it is worth considering that given the multiple infections found in this bird, that an underlying immunosuppression may have been present which facilitated the development of clinical disease. Immunosuppression and genetic factors have been proposed to be important in the development of clinical Scaly Face/Leg (Doneley, 2011). *Candida spp.* infection of the gizzard has been associated with underlying polyomavirus infection, as has death without previous clinical signs (Macwhirter, 1994). Malnutrition can predispose passerine birds to infection with other fungal organisms such as *Aspergillus spp.* (Macwhirter, 1994). The mortalities in this aviary were associated with the coldest period in the winter in Melbourne and this may have been an additional stress on the birds. In this case, mortalities no longer occurred after modifications to housing and diet were made.

References

Dabert, J., Mihalca, A. D., and Sandor, A. D. 2011. The first report of *Knemidocoptes intermedius* Fain et Macfarlane, 1967 (Acari: Astigmata) in naturally infected European birds. Parasitology Research 1, 237.

Domrow, R. 1992. Acari Astigmata (excluding feather mites) parasitic on Australian vertebrates: an annotated checklist, keys and bibliography. Invertebrate taxonomy 6, 1459-1606.

Doneley, R. 2011. Avian Medicine and Surgery in Practice: Companion and Aviary Birds. Boca Raton: CRC Press.

Holz, P. H., Beveridge, I., and Ross, T. 2005. *Knemidocoptes intermedius* in wild superb lyrebirds *(Menura novaehallandiae*). Australian Veterinary Journal 83, 374-375.

Jaensch, S. M., Raidal, S. R., and Hobbs, R. 2003. *Knemidocoptes intermedius* in a wild currawong (*Strepera graculina*). Australian Veterinary Journal 81, 411-411.

Macwhirter, P. 1994. Passerines. In B. W. Ritchie, G. J. Harrison and L. R. Harrison (Eds.). Avian Medicine: Principles and Applications. Lake Worth, Florida: Wingers Publishing.

Mainka, S. A., Melville, D. S., Galsworthy, A., and Black, S. R. 1994. Knemidocoptes sp. on wild passerines at the Mai Po Nature Reserve, Hong Kong. Journal Of Wildlife Diseases 30, 254-256.

Mason, R. W., and Fain, A. 1988. Knemidocoptes intermedius identified in forest ravens (*Corvus tasmanicus*). Australian Veterinary Journal 65, 260.

Mines, J. J. 1967. *Cnemidocoptes jamaicensis* in goldfinches in Queensland. Australian Veterinary Journal 43, 597-597.

Mironov, S. V., Bochkov, A. V., and Fain, A. 2005. Phylogeny and evolution of parasitism in feather mites of the families Epidermoptidae and Dermationidae (Acari: Analgoidea). Zoologischer Anzeiger - A Journal of Comparative Zoology 243, 155-179.

Newton, L. G., and O'Sullivan, P. J. 1956 . A note on the occurrence of the mite *Cnemidocoptes pilae* on budgerigars in Queensland. Australian Veterinary Journal 32, 89-90.

Phalen, D.N. 2014. Update on the diagnosis and management of *Macrorhabdus ornithogaster* (formerly megabacteria) in avian patients. Veterinary Clinics of North America: Exotic Animal Practice 17, 203-210.

Wall, R., and Shearer, D. 2001. Veterinary Ectoparasites (2nd ed.). Oxford: Blackwell Science.