

## RECOMMENDATIONS FOR MINIMIZING MITE TRANSMISSION IN GOLDEN EAGLES

Wildlife Investigations Laboratory, California Department of Fish and Wildlife  
School of Veterinary Medicine, University of California, Davis

\*FEDERAL AND STATE PERMITS ARE REQUIRED FOR HANDLING WILD BIRDS\*

Mange was first reported in California's golden eagles in 2013 and has been subsequently reported in eagles in both California and Nevada, though not all confirmed. Subclinical infections may go unnoticed while severe infections may result in feather loss on the head, neck, legs, and abdomen (1). Infected golden eagles likely suffer from impaired thermoregulation, decreased ability to feed, and secondary infections (1).

Very little is known about the mite, which morphologically resembles a *Micnemidocoptes* spp., in the family Knemidocoptinae. Several species of skin-burrowing Knemidocoptic mites have been described in domestic birds (*Knemidocoptes mutans*, or "scaly leg" in domestic fowl) (2), captive wild birds (*K. pilae*, or "scaly face" in captive psittacines) (3), and free-ranging wild birds (*K. jamaicensis*, or "scaly leg" in wild passerines) (4). In contrast to the golden eagle mite, most of these previously documented mites affect only the non-feathered skin of the bill or legs and feet and rarely result in fatal epizootics. Because the golden eagle mite is likely a novel species, recommendations for limiting transmission are based upon better known Knemidocoptic mites. These mites live entirely within the epidermis and are unable to live for prolonged periods of time off the avian host so transmission likely occurs through direct contact between individuals, or in the nest (3). The duration and intensity of contact necessary for transmission is unknown. Mites may be present on eagles without mange, as such it is recommended to disinfect all equipment that comes into direct contact with potential sources of mites.

Pyrethroids, including permethrin, are effective neurotoxins used to control a large variety of invertebrates, including Knemidocoptic mites. They are commonly used in management of *K. mutans* in poultry as dusts and liquid sprays (2). Permethrin is a common ingredient in pet bird cage mite and lice sprays. Additionally, it is used as an insect repellent treatment for clothes and has the potential to remain effective for up to a month and despite multiple washes in water and detergent (5). Because of its relative safety to humans and birds as well as its efficacy at killing and repelling insects, it is recommended for use on porous objects such as cloth that come into contact with possible sites of infection and may inadvertently carry mites between nest sites. Care should be taken when spraying permethrin near aquatic habitats and cats as it is acutely toxic to fish, amphibians, and cats and is only approved for topical application, clothes and area sprays.

The following recommendations are only for items that have come into direct contact with the inside surface of the nest or the skin of a bird. If the object does not come into direct contact with potential sources of mites, normal cleaning protocol can be followed. **DO NOT apply these products directly to the birds, prey, or nest material.**

## **Cleaning Protocol for Standard Raptor Nest Entry Equipment**

### **Banding Equipment**

- **Gloves:** Use nitrile (or similar) gloves and change between handling of individual chicks.
- **All cloth equipment** (e.g. canvas chick bag/box and cloth aba): Do not re-use on more than one bird. Wash with hot, soapy water and, if possible, dry on the “hot” drier cycle.
- **Leather equipment** (e.g. leather hood): Wipe with soapy water or leather cleaner between uses (note: may not be effective for killing mites; if bird has obvious mange, reusing the leather hood is not recommended even after cleaning)
- **All metal or plastic equipment** (ex. rivet gun, vice-grip pliers, USGS/WID bands, rivets, leg gauge, banding box, blood kit, telemetry transmitter and Teflon attachment harness): Wipe with alcohol or dilute bleach solution (typically 1:10).

### **Climbing Equipment**

#### **All cloth equipment:**

Option 1: Spray where contact occurred with a permethrin or pyrethrin bird mite and lice spray (or equivalent) that has a concentration of 0.04% (not recommended for clothing).

Option 2: Pre-treat cloth equipment with a permethrin or pyrethrin 0.5% solution (such as Sawyer Clothes/Gear Spray or dilution to 0.5% of a horse/cattle/swine/dog multi-insect repellent such as Permethrin II). The treatment is effective through 30 days.

**All non-porous equipment:** Wipe with alcohol or dilute bleach solution (typically 1:10).

### **References**

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- (5) Schreck, CE, Mount, GA, Carlson, DA. 1982. Wear and wash persistence of permethrin used as a clothing treatment for personal protection against the lone star tick (Acari: Ixodidae). *Journal of Medical Entomology* 19: 143-146.