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## Insect hypersensitivity / allergies

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Insect hypersensitivity is the most common cause of pruritus in horses. A hypersensitivity reaction to bites by various *Culicoides* spp. is the best documented cause of the syndrome, but allergic reactions to bites by black flies, mosquitoes and other flies are also recognized. Equine insect hypersensitivity is a problem with a worldwide distribution as is reflected by the many different names for the syndrome. Nearly a 1000 *Culicoides* spp. are found worldwide and common names for these insects include gnats, no-see-ums, biting midges, sand flies, and punkies. They are tiny winged insects 1-2 mm in length that breed in standing water (ponds, lakes, irrigation canals, marshes, swamps, and watering troughs). Their numbers are greatest under warm and humid conditions.

**Clinical signs** of insect hypersensitivity can be observed in any breed or age of horse but several breeds appear to have a hereditary predisposition: Icelandic, German Shire, Arabian, Connemara, Swiss Warmblood, Quarter Horse, and ponies. Signs may start between 2 and 4 years of age and often become more severe as horses age. Typically, pruritus starts in the spring, becomes worse in the summer, and regresses in the fall in temperate regions or is year round in tropical regions. Pruritus frequently becomes more severe and of longer duration each subsequent year, especially when concurrent environmental allergies (atopic dermatitis) are present. With hypersensitivity to *Culicoides* spp. pruritus is most commonly observed along the dorsum including small papules and secondary excoriation along the mane, rump and tail base. With progression, lesions may extend to the neck and shoulder regions, ears, and face. Less commonly, a more ventral distribution of skin lesions develops, dependant on the feeding sites of the offending insects. With chronicity and continued self-trauma, “buzzed-off manes” and “rat tails” may develop along with lichenification and in severe cases, skin folds or rugae in the base of the mane and tail, behavior changes (e.g., restlessness and irritability making the horse unsuitable for riding) and even weight loss.

Hypersensitivity to other fly bites other than from *Culicoides* spp. tends to produce pruritus and multiple papules starting over the neck and shoulders. The mane and tail are often unaffected with fly bite hypersensitivity but lesions can extend to the head and may even become generalized. More severely affected horses can also develop secondary bacterial infection of the skin (folliculitis): signs of pyoderma range from erected hairs over small papules, with or without crusts, to deeper lesions with nodules and draining tracts. Urticaria is an uncommon manifestation of insect hypersensitivity but common with Atopy.

**The diagnosis** of insect hypersensitivity is established by recognition of a warm-weather seasonal occurrence of mane and tail pruritus and by ruling out other causes (e.g., other ectoparasites such as ticks and mites or atopic dermatitis). Improvement with insect control provides additional support for a diagnosis. Intradermal testing with insect antigen preparations is also available at many referral practices but interpretation of the results requires experience because clinically normal horses frequently have positive reactions. For these reasons, intradermal testing with insect allergens should not primarily be pursued to establish the diagnosis but rather to confirm the clinical diagnosis and to select extracts for immunotherapy. Skin testing requires clipping the hair, usually in the upper neck region, and possible sedation.

Withdrawal period from antihistamine and corticosteroid medications in horses can be short (7 days) prior to intradermal testing. Serum samples can also be submitted to commercial laboratories for ELISA measurement of IgE concentrations against various insect allergens. The test is costly and results appear to be less reliable than intradermal testing results. Nevertheless, when referral for skin testing is not possible and serological testing results appear to compare well with the patient's history, the results can be used to pursue immunotherapy.

Histopathologic findings in biopsy samples collected from affected skin are usually non-specific and include superficial to deep perivascular dermatitis with infiltration of eosinophils and lymphocytes into the dermis which can also be observed with other pruritic skin problems including atopic dermatitis, food allergy, and ectoparasites. Skin biopsies are usually not necessary to pursue, however, when the clinical diagnosis remains uncertain, collection of multiple skin biopsies can help either rule out or identify other disease processes other than allergic skin diseases.

**Treatment** of equine insect hypersensitivity includes decreasing exposure to insects as well as management practices and medications to limit pruritus. Twice daily application of a 2% permethrin fly spray is fairly effective at repelling *Culicoides* spp., flies, and mosquitoes spraying at dawn and dusk. Because fly repellant sprays that can be purchased at feed and tack stores can vary in both active ingredient and concentration, it is important to have clients read the product label and select sprays with greatest concentration of pyrethroid/ permethrin. Pyrethrum is a botanical insecticide produced by grinding up flower heads of certain *Chrysanthemum* spp. grown mostly in Kenya. Species grown in the United States do not produce the insecticidal compounds. Pyrethrins are the actual insecticidal compounds in pyrethrum and work as neurotoxins to provide a quick "knockdown" effect. However, pyrethrins degrade quickly when exposed to sunlight and therefore provide a short period of activity after application. Pyrethroids are "pyrethrin-like" synthetic compounds that provide greater insect control and longer residual activity. Permethrin is one of several synthetic pyrethroid insecticides currently available. There are also anecdotal reports of weekly application of fipronil spray (Frontline® spray by Merial) as an insect repellent but this is an off-label use of this product marketed for flea and tick control for dogs and cats. Also the use of cattle ear tags impregnated with pyrethroids or organophosphates attached to halters or braided into mane and tail hair may be effective. Use of topical insect repellents marketed for human use that contain varying concentrations of N, N-diethyl-meta-toluamide (DEET) is not recommended in horses as profuse sweating, irritation, and exfoliation has been reported following repeated application of DEET at concentrations of 50% or greater to horses. Repeated application to the skin of a 15% DEET solution also produced hypersteatosis, an excessive activity of the sebaceous glands in horses.

Because all topically applied insect repellents have only limited efficacy, additional management practices can often be helpful in decreasing both exposure and overall insect burden in the stable environment. Stabling horses at dawn and dusk hours, peak feeding times for *Culicoides* spp. and mosquitoes, can limit exposure. *Culicoides* spp. are able to pass through regular screens and mosquito netting and extra fine mesh screening can be challenging to keep clean in a barn environment. Use of powerful hallway and stall front fans may be a more practical approach because *Culicoides* spp. and mosquitoes are rather weak fliers. In addition to these management practices, use of fly masks and body sheets can also reduce exposure and these can be used both in the stall and at pasture.

Insect burden in the environment can be reduced in several ways: 1.minimizing sites where water can accumulate and draining marshy areas adjacent to stables. 2 Frequent dumping and cleaning of water buckets and troughs.

3. Products containing the bacterium Bacillus *thuringiensis* subspecies *israeliensis* (mosquito dunks) kill mosquito and black fly larvae in water sources for 30 days or longer. 4. Because many fly larvae develop in manure piles and other accumulations of organic debris, frequent manure removal or dragging pastures to break up manure piles are also recommended for both insect and internal parasite control. 5. To decrease insect burden in the stable, overhead spray or mist insecticide systems can be installed and programmed to discharge repellent multiple times a day. 6. To further reduce fly burden, feed-through fly control products can be used. These products are top dressed on grain and are passed unchanged in the feces. The feed-through chemicals work by preventing development of fly larvae into adult flies within manure piles. Newer feed-through products are organophosphate-free: Methoprene is an insect growth regulator that interferes with function of a fly growth hormone that regulates progression through the different life stages. Two other compounds, diflubenzuron and cryomazine, are chitin synthesis inhibitors that interfere with production of chitin, the major component of the cuticle. Because mammals do not have insect growth hormone or chitin, these compounds are very safe to use. Although limiting insect exposure is critical for managing horses, management practices alone may not be effective in controlling pruritus. Thus, concurrent use of anti-pruritic medications is often necessary: Prednisolone, 1 mg/kg, orally, q 24 h as tablets mixed in grain or dexamethasone, 0.05-0.1 mg/kg, orally, q 24 h (the liquid injectable formulation is 60-70% bioavailable when squirted in the mouth) can be used until pruritus and self-trauma are controlled, then the dose is tapered to the lowest every other day amount that controls pruritus. Adverse effects of corticosteroids in the horse can include laminitis and altered mentation (e.g., hyperexcitability or placidity) but these are rare. Antihistamines appear to be largely ineffective as a primary treatment for equine insect hypersensitivity. However, hydroxyzine, 1-2 mg/kg, orally, q 8-12 h or doxepin, (a tricyclic antidepressant with strong antihistaminic effect) 0.5–0.75 mg/kg, orally, q 12 h can be used to decrease the dose of corticosteroids needed to control pruritus. Dietary supplementation with an omega-6/omega-3 fatty acid product may also allow the dosage of corticosteroids to be decreased. In horses with concurrent pyoderma/folliculitis, treatment with a trimethoprim-sulfonamide combination (30 mg/kg, orally, q 12-24 h) for the initial 2-4 weeks of therapy may also be indicated. Efficacy of allergen-specific immunotherapy (hyposensitization) in the management of insect hypersensitivity has been reported to range from 0 to 90%. The author has successfully used immunotherapy to treat horses with insect hypersensitivity, specifically in cases of fly bite hypersensitivity.

**Atopic dermatitis (environmental allergies)** is a common problem with insect hypersensitivity. Clinical signs are similar and diagnosis is made with a compatible history and by ruling out other causes of pruritus. Treatment with antihistamines and corticosteroids are identical to the treatment of insect hypersensitivity and immunotherapy an effective treatment for environmental allergies, with about 80% efficacy reported. Allergen-specific immunotherapy appears to be safe in horses, is not cost prohibitive, and the horse owner or barn personal can easily administer injections of the extract mixture. Immunotherapy should be considered strongly when the following criteria are met: 1) clinical signs for more than 4 months of the year; 2) lack of a satisfactory response to management changes and use of anti-pruritic drugs; 3) higher risk of adverse drug effects (e.g., use of corticosteroids in a horse with pre-existing laminitis); and 4) concurrent environmental allergies. Finally, because there is limited evidence that there may be a hereditary predisposition to allergic dermatitis, owners of affected horses should be counseled about the risks of using affected horses for breeding.