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"The diagnosis of a cutaneous fibropapilloma (sarcoid) should be considered when raised, proliferative lesions are seen on the head, legs and digits of young cats, especially in those cases with exposure to cattle."

SARCOIDS: PAPILLOMAVIRUS INFECTIONS IN THE HORSE AND CAT

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Papillomaviruses (PV) are double-stranded DNA viruses. There are hundreds of papillomavirus types infecting a wide variety of mammals as well as birds, snakes, and turtles.

Papillomaviruses are epitheliotropic viruses, introduced to the host by microtrauma to the surface of the skin or mucus membrane. The virus replicates exclusively in keratinocytes of the skin and mucosal surfaces. Viral oncogenes promote cell growth while down regulating growth inhibition factors. The virus can be maintained in the basal keratinocyte layer for an undetermined amount of time and is shed with exfoliated cells of the cornified layer. Papillomaviruses are commonly found in normal skin of many animals which makes definite proof of a causal relationship between the presence of PV sequences and skin lesions difficult.

Papillomaviruses infect a variety of species and result in a variety of different cutaneous manifestations. The majority infect either the skin or mucous membranes and are associated with the formation of papillomas to fibropapillomas. These viruses are species-specific with a few, notable exceptions. There are no known papillomaviruses that infect laboratory mice which hinders research on the virus and lesions caused by infection.

Cottontail rabbit papillomavirus (CRPV) causes protuberant warts in its natural host. It is hypothesized these projecting, cutaneous warts were the basis of the legends of antlered rabbits and "jackalopes". (Figure 1, left)

Figure 1. "Jackalope"

Bovine papillomaviruses (BPV) cause a variety of lesions in the bovine species. BPV Type I causes

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wart like lesions on the nose, teats, and penis and are typically seen in young cattle. Type II also causes warts in young cattle that are found on the skin of the head and neck. Both warts/papillomas related to infection with BPV types I and II usually regress over time. BPV type III causes atypical warts mainly on the teats and udders of older cows. These lesions are typically smooth and white in appearance. BPV type IV causes papillomas in the rumen, urinary bladder, and eye. The systemic form of this infection is referred to as papillomatosis. Papillomas caused by this strain can undergo malignant transformation to carcinomas. Transformation is typically associated with concurrent exposure to a co-carcinogen (e.g., bracken fern) or immunosuppression. BPV type IV infection of the eye can transform to squamous cell carcinoma where sunlight acts as a co-carcinogen. Bovine papillomavirus type V causes small warts on the teat.

Figure 2. Equine Sarcoid

In the case of equine papillomavirus infections (Figure 2) it is hypothesized that two different types of equine papillomaviruses (EPVs) cause viral papillomatosis (warts) and ear papillomas (aural plaques). A third EPV may be associated with penile papillomas.

Figure 3. Feline Sarcoid

In the feline species (Figure 3), papillomaviruses have been associated with multiple skin lesions. Cutaneous hyperkeratotic plaques are more commonly seen in older and frequently immunosuppressed cats. These plaques can also be seen with a functional immune system. The plaques can progress to carcinoma in-situ as well as invasive squamous cell carcinoma. Exposure to sunlight plays a role in the induction and development of these tumors. Feline papillomaviruses have also been associated with simple benign, cutaneous papillomas.

Although the majority of the papillomaviruses are species specific, bovine papillomavirus (BPV) has shown the ability to cross infect both the horse and the cat with similar cutaneous lesions. These lesions are commonly referred to as cutaneous sarcoids in both species. In the horse, infection with bovine papillomaviruses types I and II are associated with the formation of sarcoids. In the cat, although apparently a distinct

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papillomavirus type, it is most closely associated with bovine papillomavirus type I. Additional fibropapillomas caused by papillomavirus infection with similarities to bovine papillomavirus have been reported in the donkey, white tailed deer, mule deer, African lion, llama, and others.

The lesions in both the cat and the horse exhibit multiple similarities. These lesions are most commonly identified in younger animals. In the horse, lesions are most often seen at 3-6 years of age and in the cat at less than two years of age. These lesions are more commonly found on the head, neck, ventral abdomen and limbs in the equine species. The majority of feline sarcoids are also found in a similar anatomical distribution. Both lesions exhibit a high incidence of recurrence with no evidence of metastatic disease.

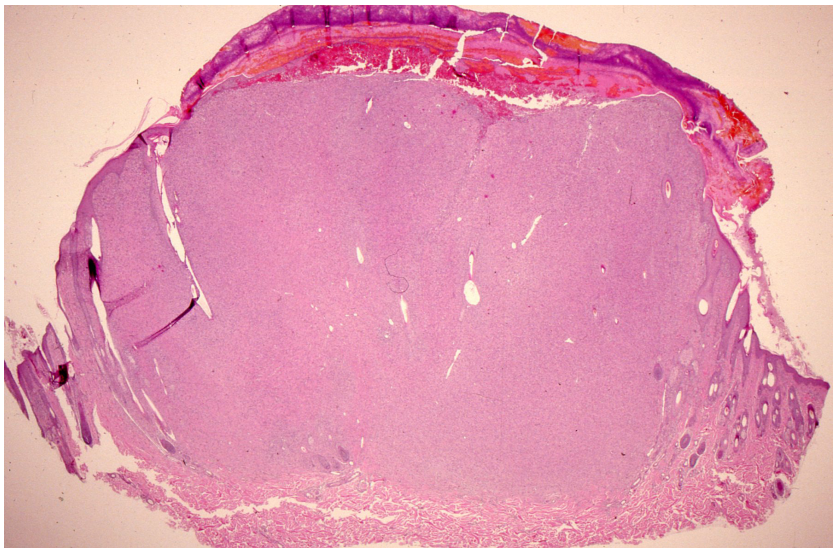

Figure 4. Feline Sarcoid 24x

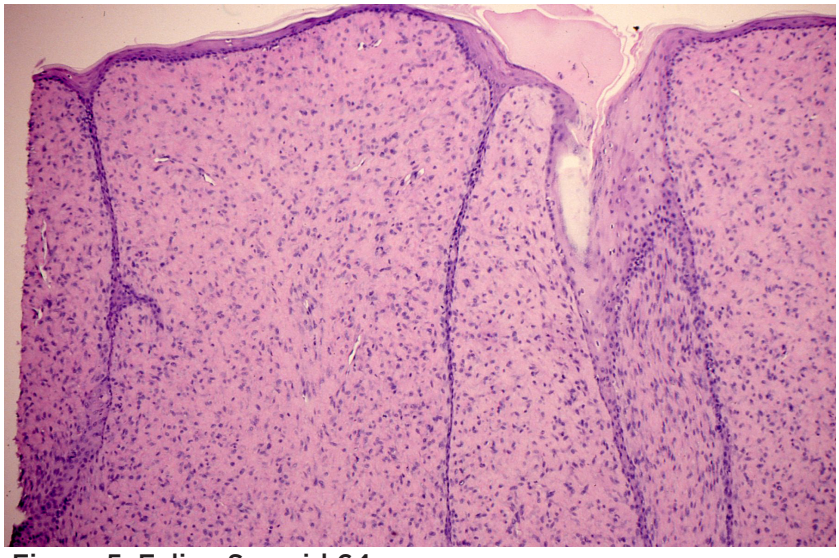

Figure 5. Feline Sarcoid 64x

Lesions also present similar histopathological findings. By definition, these tumors will exhibit both an epithelial and stromal component, and are raised, firm and frequently ulcerated. Microscopically, they are characterized by a proliferation of spindle to stellate cells which partially efface normal dermal and subcutaneous architecture. Adjacent adnexa are either effaced or widely separated. The spindle cells are arranged in a random pattern occasionally forming indistinct fascicles. The cells are separated by varying amounts of a collagenous stroma. Nuclei are relatively indistinct with a varied mitotic rate. In the study by Schulman, the mitotic index range was 1-5/10 HPF. The mitotic rate was higher in more cellular regions of the tumor. Characteristically in both the horse and the cat, overlying epidermis is mild to moderately hyperplastic with frequent, infiltrating rete pegs. These tumors are frequently ulcerated. Feline sarcoid are typically raised, firm and ulcerated mass lesions (Figure 4). Sarcoids are typified by a random proliferation of spindle cells with overlying hyperplastic epidermis forming thin, invaginating rete pegs (Figure 5).

Surgical excision is the recommended treatment of sarcoids in both the horse and the cat.

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Sarcoids in both the equine and feline species are benign; however, they can be locally invasive with a high rate of recurrence. There is no evidence of metastatic disease reported in either the cat or the horse. Interestingly, in a study published in 2001 by Schulman et al., there was a high association with the development of feline sarcoids in those cats that had exposure to cattle. Due to the high number of cattle in the Midwest, feline sarcoid should be considered in the differential when protuberant lesions on the face, head, neck, and legs are presented in a young cat.

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IMAGE CREDITS

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- Figure 2. Equine Sarcoid
  Image courtesy of Jennifer Beth Proctor, DVM.
- Figure 3. Feline Sarcoid
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- Figure 4. Feline Sarcoid 24x
  Image courtesy of F.Y. Schulman, DVM, Marshfield Labs Veterinary Services.
- Figure 5. Feline Sarcoid 64x
  Image courtesy of F.Y. Schulman, DVM, Marshfield Labs Veterinary Services.