Equine practitioners commonly encounter horses with various forms of cutaneous neoplasia. The clinical characteristics of the more common equine skin tumors are often similar; therefore, a definitive diagnosis must be based on histopathology. The specific tumor type, size, location, duration, and response to previous treatment dictate the optimal method of treatment. For small, well-circumscribed tumors wide surgical excision with at least a 2-cm tumor-free margin, or a treatment course of intra-lesional chemotherapy may be curative. For larger, less-well defined tumors, surgical excision combined with ancillary therapies such as cryotherapy, radiation, or hyperthermia are necessary to minimize recurrence. Regardless of the treatment protocol chosen, continued careful observation of the patient by the owner and regularly scheduled re-examinations by the veterinarian should be performed to assess the possibility of recurrence. The clinical appearance, diagnosis, and treatment of some of the more common skin tumors of horses will be presented here.

**Sarcoid**

Sarcoids are the most common neoplasm of horses, donkeys, and mules. Although sarcoids do not metastasize, they are locally aggressive and have a high rate of recurrence. Sarcoids have been reported in all breeds and usually first develop in horses younger than 7 years of age. The etiology of equine sarcoid had been thoroughly investigated. Bovine papilloma virus-type DNA has been isolated from sarcoids using molecular hybridization and polymerase chain reaction (PCR) techniques. However, Koch postulates for these particles have not been fulfilled. Genetic studies have demonstrated an association between tumor susceptibility and the major histocompatibility complexes, which may explain the increased prevalence of sarcoids in some family lines and breeds (Appaloosa and Arabians).

Four clinical forms of sarcoid have been reported, verrucous, fibroblastic, mixed, and occult. Verrucous lesions are wart-like in appearance and have a dry, keratotic surface. Fibroblastic lesions are the most aggressive form and may appear as subdermal or intradermal mass with an intact epithelium and completely covered by hair (eg, periocular sarcoids) or as single or multiple large, ulcerated or proliferative masses (Figure 1). These lesions may be often mistaken for exuberant granulation tissue. Mixed sarcoids are a combination of verrucous and fibroblastic lesions. Occult sarcoids appear as flat, smooth hyperkeratotic areas that are devoid of hair. Sarcoids may be single or multiple and occur anywhere on the body, however, the limbs, ventral abdomen, periocular area, and ears are most commonly affected.
Although, the clinical presentation of sarcoid is rather characteristic, the definitive diagnosis is made on histologic evaluation of the lesion. An exception to this is the suspected occult sarcoid. These lesions are very slow growing and may remain static, never progressing to one of the more aggressive forms. **Biopsy of suspected occult sarcoids should not be performed, because biopsy of these lesions have been reported to increase their rate of growth and predispose their development to a more aggressive fibroblastic form.** A unique histologic characteristic of a sarcoid is immature dermal fibroblasts at the dermal-epidermal junction arranged perpendicular to the basement membrane in a “picket-fence” pattern. The deeper dermal fibroblasts are often arranged in a whorled pattern. It is important that the biopsy specimen be sent to a veterinary clinical pathologist, because tissue sent to a human laboratory not familiar with equine sarcoids may report the tumor as a fibroma or fibrosarcoma. Other rule-out for this tumor include excessive granulation tissue, papilloma, squamous cell carcinoma, fibroma/fibrosarcoma, habronemiasis, and phycomycosis.

The optimal treatment protocol for sarcoid removal depends on the size and location of the tumor, equipment available, and economic considerations. Regardless Treatment options include surgical excision, cryotherapy, laser excision, immunotherapy, radiation therapy, and intra-lesional or topical chemotherapy.

**Surgical excision** - alone should only be performed if a wide surgical margin of tumor free tissue (at least 2-cm) can be resected. Even with wide excision, approximately **50% of sarcoids treated by surgical excision alone recur within 6 months.** Therefore, surgical excision is usually combined with ancillary treatment modalities.  

**Cryotherapy** – using liquid nitrogen as a spray of on copper contact probes is a useful adjunct too surgical excision. The high water content of the tumor cells makes them more susceptible to freezing than the cells of normal tissue. Adequate control of hemostasis following excision is mandatory to maximize the success of cryotherapy. If the procedure is performed standing, sedation and local analgesia are administered, and then a series of 3 freeze (–20°C)–thaw cycles are performed. A single perioperative dose of antimicrobials is often administered and tetanus prophylaxis assured. The cryotherapy site is monitored closely and kept clean and free of flies, and allowed to heal by second intention. **The site usually becomes necrotic and purulent for 4-7 days and then should begin to granulate in with healthy tissue.** The site should be evaluated for normal healing at 3-4 weeks. If any abnormal tissue is apparent, the cryotherapy should be repeated. Two to three treatments at 3-week intervals may be necessary for complete remission.

**Laser excision** – of sarcoids using a CO2 or Nd:YAG laser has been reported to be 50 –80% successful for the treatment of sarcoids. The laser is used to excise the tumor and then used in a defocused mode to ablate the remaining tissue bed. Advantages of laser excision over scalpel excision include decreased swelling, hemorrhage, and pain attributed to, lymphatic, vessel, and nerve sealing abilities of the laser. For most tumors, cryotherapy is performed after laser excision, similar to that of scalpel excision.

**Immunotherapy** – has been used successfully to stimulate cell-mediated immunity against sarcoids and cause tumor regression. An emulsion of mycobacterial cell wall fractions, Bacille Calmette Guerin (BCG, Regressin®) was used most commonly for treatment of periocular equine sarcoids, however, this product is no longer commercially available. The tumor is aseptically prepared and depending on size, 3 –10 ml of solution is infiltrated directly into the
tumor. A 22-g needle is directed into the tumor for its entire length, and the solution slowly injected while withdrawing the needle (Figure 2). This is repeated until the tumor is completely infiltrated. After the first injection, the tumor site usually swells and softens. Between 7-14 days after the first injection an **intense granulomatous reaction ensues** and the tumor site usually abscess with purulent discharge. The injections are repeated 3–5 times, at 3-week intervals. Tumor regression occurs in 3–6 months. For reasons unknown, BCG therapy is extremely successful for periocular sarcoids, with success rates of 87-100%, however, much less successful for sarcoid in other anatomic locations. This is the author’s treatment of choice for periocular sarcoids of the dorsal orbital rim. Initial BCG solutions contained live organisms and were associated with an unacceptably high incidence of severe, and sometimes, fatal anaphylactic reactions. The newer commercially available solutions contain cell wall fractions only and are associated with very few reactions. Nevertheless, owners should be advised of this complication before initiating treatment.

**Intra-lesional chemotherapy** – of sarcoids and squamous cell carcinoma tumors with cisplatin in sesame seed oil is an effective method for treating single or multiple tumors. Most patients are treated standing under sedation and local analgesia. The tumor is aseptically prepared and cisplatin (1 mg/cm³ of tumor tissue) infiltrated directly into the tumor. A 22-g needle is directed into the tumor for its entire length, and the cisplatin slowly injected while withdrawing the needle. This is repeated until the tumor is completely infiltrated. The injections are repeated at 2-week intervals for a total of 4 treatments. Broad spectrum antimicrobials and NSAIDS are administered at each treatment. Cisplatin therapy may also be used to augment surgical excision of tumors. Intra-lesional cisplatin does not significantly inhibit healing of open or surgically closed wounds. Hair growth and color also appear to be unaffected by treatment, allowing for favorable cosmetic results. Because cisplatin is a potent chemotherapeutic and carcinogen, gloves and safety glasses should be worn during administration to minimize accidental exposure. Implantation of bioresorbable cisplatin beads has also been used successfully to treat sarcoids and squamous cell carcinoma in horses. The tumor may be treated insitu or after surgical debulking. The beads are about 3mm in diameter and are impregnated with a 7% cisplatin solution for a total amount of approximately 2 mg cisplatin/bead. Beads are implanted deep into the base of the tumor using stab incisions at 1.5-2.0 cm intervals. Surgical gloves and mosquito forceps should be used to minimize human contact with the cisplatin. Surgical gloves and mosquito The site is evaluated at 30 days, and if residual tumor is present, new beads are implanted. Most tumors require 2-4 treatments at 30-day intervals. This treatment has been associated with an 80% success and relapse free rate for 2 yrs.

**Topical chemotherapy** – with 5-fluorouracil, and inhibitor of nucleic acid (DNA) synthesis has been reported to be successful for early, small tumors. The need for daily application for a treatment period of 30-90 days often makes this treatment option less desirable for the owner. Erythema and pain can occur at the treatment site.

**Imiquimod** (Aldara®): A recent study showed that the 5% cream (applied topically 3 times a week to the sarcoids until the tumors regressed or 32 weeks, whichever occurred first) resulted in 75% reduction (or more) in 80% of the sarcoids treated; 60% of the tumors completely resolved. Exudation, erythema and depigmentation were noted as adverse effects. Aldara® is expensive, but is useful as a primary treatment for sarcoids, as well as a useful treatment to prevent transformation to a more aggressive form after biopsy.

**XXTerra®** – (Larson Laboratories, Inc, Fort Collins, CO) is a caustic mixture that contains zinc chloride and bloodroot extract. Anecdotal reports of success abound, but there are no controlled
efficacy studies. XXTerra® presumably alters tumor antigenicity, which activates an immune response. The paste is applied daily to wounds that are not easily bandaged, or placed under a distal limb bandage for 3-4 days at a time and then reapplied. Reportedly, the tumor tissue sloughs and the wounds heal by second intention in 4-6 weeks. The authors have not had experience with this product.

Radiation therapy – is one of the most effective treatment modalities for the treatment of sarcoïds and other more aggressive cutaneous neoplasias in horses. Currently, two choices exist for radiation therapy in horses. External beam radiation therapy involves a focused beam of radiation directed at the tumor. The amount of radiation delivered to the tissue is calculated based on the tumor type and surface area and depth of the tumor. The main advantage of this therapy is that a large tumor that extends deep into the tissue may be treated effectively. Additionally, multiple sites can be treated simultaneously, or in the case of metastatic neoplasia, the regional lymph nodes may also be treated. The disadvantages include the necessity for multiple general anesthesia episodes (4-5 treatments at 7 day intervals), hair depigmentation, and cost.

Squamous Cell Carcinoma (SCC)
Squamous cell carcinoma is the second most common neoplasm of horses. These malignant tumors most commonly arise at the mucocutaneous junctions of the head and genitalia, however, they may occur at any epithelial surface. Approximately 50% of the SCC reported involves the head, eye, or adnexa. Cutaneous SCC most often develops in non-pigmented areas, with 70% of ocular cases occurring in horses lacking periocular pigmentation (Figure 4). In these cases, solar radiation has been identified as a predisposing factor to tumor development. The male genitalia and female vaginal and perineal area are the second most commonly affected sites. Squamous cell carcinoma is the most common tumor affecting the equine penis and prepuce. Persistent phimosis and smegma accumulation are believed to predispose to SCC in these locations. Chronic irritation, burns, and wounds have also been associated with the development of SCC. Clinically, SCC presents as proliferative or erosive areas of raw epithelium. Proliferative lesion may be become traumatized, resulting in intermittent hemorrhage or secondary infection. Erosive lesions initially present as epithelia plaques or nodules, and with time, become ulcerated. Often these lesions appear as chronic, non-healing wounds and are mistaken for granulation tissue. This is especially true with in lesions in which an initial wound preceded the lesion. Early lesions of the genitalia may appear as a rough or cobblestone intact and exudative epithelium. Quite often the owner reports an excessive amount of smegma or a foul odor originating from the penis or prepuce. Intermittent hemorrhage from the end of the penis or prepuce may also be the first symptom the owner reports. Squamous cell carcinoma is locally aggressive and has a high rate of recurrence. It is relatively slow to metastasize, however, when it does it is usually to the regional lymph nodes. With lesions of extended duration, lung metastasis may be present. These horses usually exhibit signs of progressive weight loss, anorexia, and intermittent fever. If distant metastasis is suspected thoracic radiographs should be obtained before initiating local therapy. A definitive diagnosis is based on histopathology. The tumor exfoliates easily and a tentative diagnosis may be made on fine-needle aspirates or impression smears.

Treatment options for SCC are similar to those for sarcoïd, however, the more aggressive nature of the tumor and tendency to metastasize to the regional lymph make the incidence of recurrence
higher than those for sarcoids. As with any malignant neoplasia, early diagnosis and treatment are essential for optimal results. The authors always follow surgical excision with ancillary therapy such as cryotherapy, intra-lesional cisplatin, or radiation therapy. Success for combined surgical excision and ancillary therapy range from 75-100%. A series of 4 intra-lesional treatments of SCC with cisplatin (at 2-week intervals) was associated with a 65% success rate. When intra-lesional cisplatin was performed after surgical excision, an 89% success rate was reported. If thoracic metastasis is present, the prognosis is poor.

**Melanoma**

Equine melanocytic tumors are common skin tumors of the melanin producing cells and have a reported incidence rate of 3.8% to 15% of diagnosed skin tumors in horses. Melanomas may occur anywhere on the body and although they can arise in horses and mules with any coat color, they are generally most frequently reported in gray and white horses. At least 80% of gray horses older than 15 years of age develop melanomas. It has been reported that approximately 95% of melanomas are benign and that at least 66% eventually develop malignant behavior. The most common locations at which these tumors originate include the skin underneath the tail and around the rectum, the perineal area, and the external genitalia. Melanomas commonly initially develop as firm, flat, solitary lesions then develop into multiple, non-ulcerated spherical or discrete masses underneath the skin. Most melanomas (95%) remain completely benign, growing slowly over many years. However, with time, nearly 66% will eventually metastasize via the lymphatics.

Melanomas seldom cause the horse any serious problems, so in many cases they are just left alone. Another reason why they are often left untreated is because they tend to occur in places where surgical removal is difficult, hazardous, or may create more problems than the melanoma itself. Medical management of equine melanoma involves the use of the H2 antagonist anti-ulcer drug cimetidine (2.5 mg/kg of body weight, q 8 hr, orally for a minimum of three months). The down side of this treatment is the frequency of administration and the expense associated with prolonged treatment. Complete regression of the melanomas is rare with a 50% -66% reduction in tumor size or growth most often reported. Tumor regrowth is often seen once treatment is stopped. The use of vaccines in the treatment of equine melanomas is also being evaluated. The vaccine must be administered by a board certified oncologist, cost approximately $500 per vaccine and requires 3-4 vaccinations.

**Summary Points**

1. Surgical biopsy and histologic evaluation are necessary for formulating a proper treatment plan and establishing an accurate prognosis.
2. Treatment most often involves local resection and follow-up ancillary therapy to minimize recurrence.
3. Long-term regular, close observation of the tumor site is necessary to monitoring for recurrence and direct early aggressive follow-up treatment.
4. Recurrence is the most common complication and is dependent on the method of treatment and specific type of tumor.
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