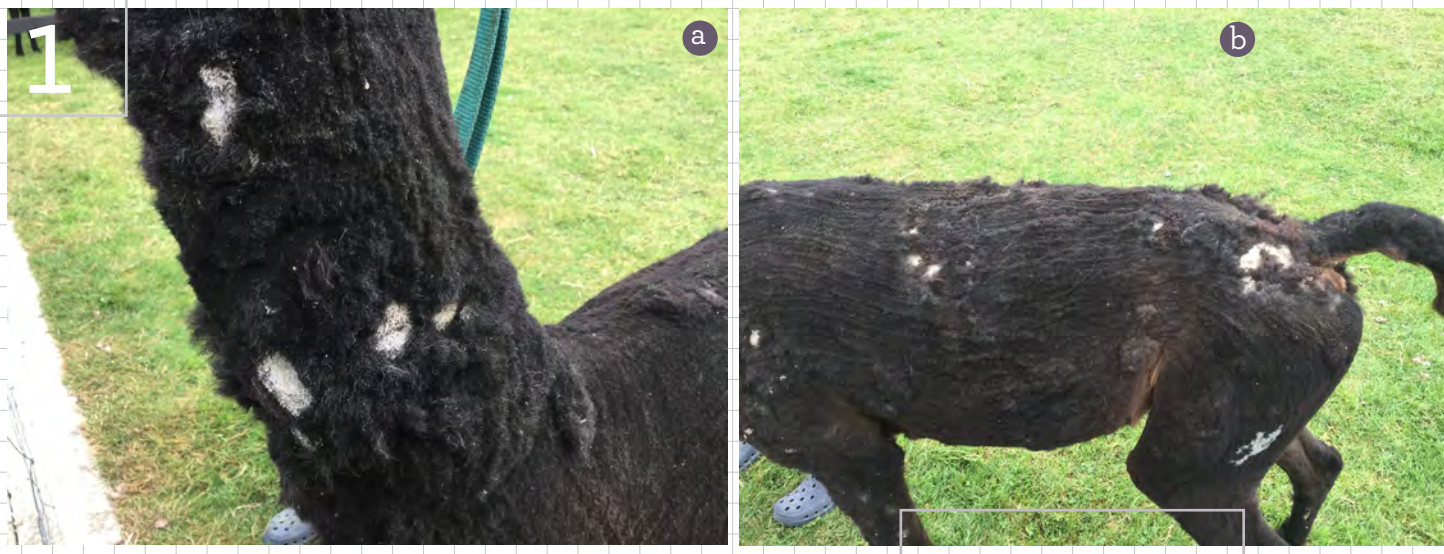

FIGURE 1: The alpaca's neck (a) and flank (b) showing the lumps that varied in size and contained black, waxy material. Over time the lesions would rupture, resolve and result in fibrosis (scars) on the neck and body. (Images credit: Don Moore, Bay Vets)

The case of the lumpy lamoid

By Lisa Schmidt

Pathologists help determine the cause of lumps covering the body of a young alpaca.

History

A six-year-old male alpaca was covered in lumps that ranged from 0.5 centimetres to 5 centimetres in diameter (Figure 1). Centrally, the lesions contained black, waxy material. Over time the lesions became indurate, formed a serocellular crust and resolved, leaving scars over the body and neck.

Cytology

To investigate the lesions, some of the black, waxy material from the centre of a cystic lesion was submitted for cytology and culture. Cytologically, the smears had numerous angular, blue, anuclear, mature keratinocytes (Figure 2). Regularly, keratinocytes had variable amounts of black pigment (melanin presumed). Differential diagnoses of the lesions based on cytology included follicular cysts, cystic follicular tumours and dilated hair follicles/comedones. Culture was unrewarding.

Histopathology

To further investigate the lesion, two 8-millimetre-diameter punch biopsies from the lesions were submitted in fixative. The biopsies contained portions

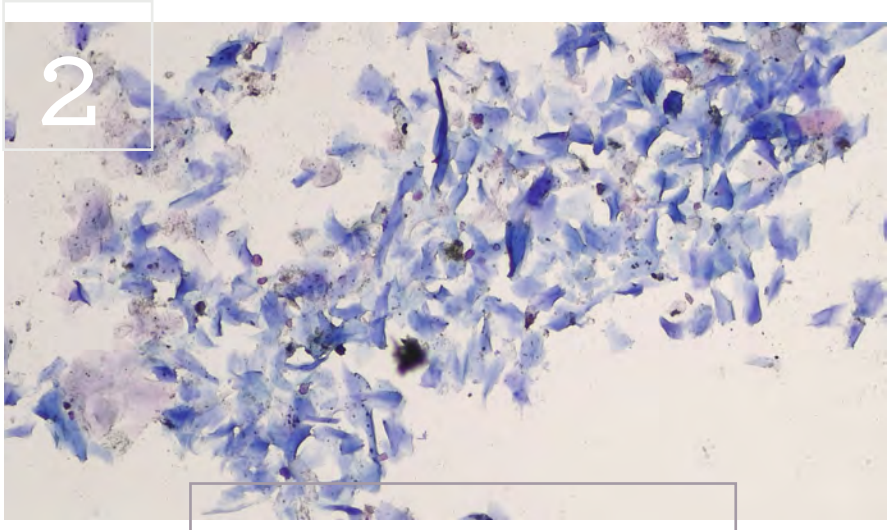

FIGURE 2: Cytology of alpaca skin nodules. The lesions contained mostly mature, anuclear, angular keratinocytes with variable amounts of black pigment (melanin).

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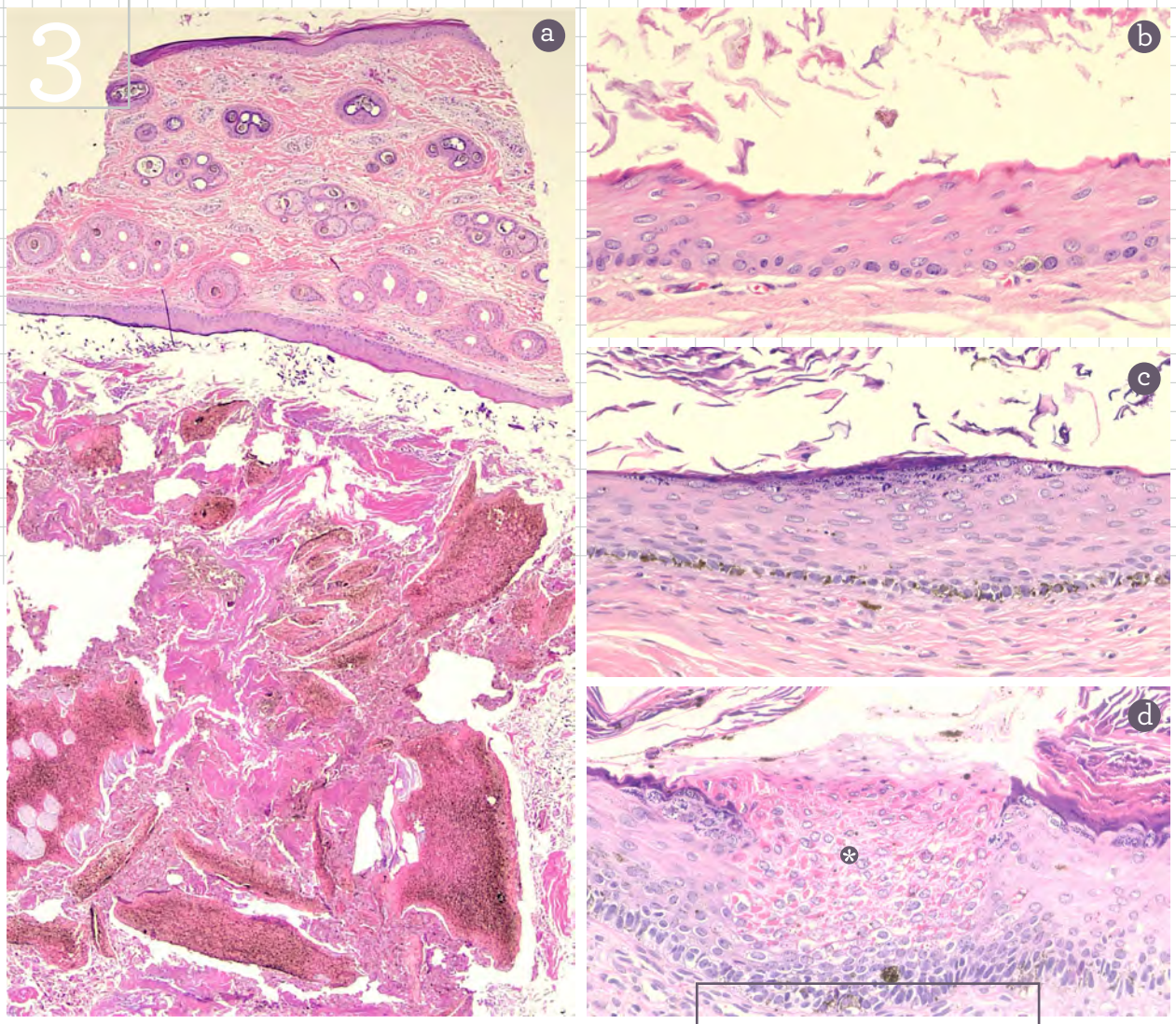

FIGURE 3: Histology of alpaca skin nodules. (a) Part of a follicular cyst present in the dermis with central keratin and pigmented ghost cells. (b–d) Features of the follicular cyst walls. (b) Stratified squamous epithelium without a granular cell layer (isthmus-type epithelium). (c) Stratified squamous epithelium with a granular cell layer (infundibular-type epithelium). (d) Stratified squamous epithelium with a focus of cells that contain trichohyalin granules (*inner-root sheath differentiation).

of cystic hair follicles that expanded the dermis and deep dermis (Figure 3). The cysts were lined with squamous epithelium. The epithelium recapitulated various aspects of the hair follicles and had gradual and abrupt keratinisation; some areas had a granular cell layer and others did not; and infrequently, a focus of epithelial cells had trichohyalin granules. Regularly, basal cells were pigmented. Centrally, the cysts contained lamellar eosinophilic keratin and ghost cells with melanin, which was consistent with cytology. A previous biopsy, which consisted of only a serocellular crust, was unrewarding.

Final diagnosis

Multiple follicular cysts.

TABLE 1. **Common skin diseases in alpacas** (adapted from Scott et al., 2011)

BACTERIAL DISEASES	
Corynebacterium pseudotuberculosis	• Solitary or multiple subcutaneous nodules or abscesses • Head, submandibular and ventral cervical regions are commonly affected • Pyogranulomatous inflammation
Tooth root abscesses	• Mandibular swellings (more common) with or without draining tracts • *Actinomyces* and various anaerobes are common isolates
Dermatophilus congolensis	• Usually present as thick crusts on the pinnae
Bacterial folliculitis	• Erythematous papules, pustules, brown-to-yellow crusts, epidermal collarettes and annular areas of alopecia and scaling • Muzzle, back, ventrum and distal hindlegs are commonly affected
Intertrigo (skin-fold dermatitis)	• Typically has secondary bacterial infections • Cytology: degenerate neutrophils and phagocytosed cocci
Botryomycosis	• *Staphylococcus aureus* • Multiple abscesses and granulomas 0.5-4cm diameter on the medial thigh • Diagnosis is based on culture and histology
FUNGAL DISEASE	
Dermatophytosis	• Anecdotal reports
VIRAL DISEASE	
Contagious viral pustular dermatitis ('orf' or 'contagious ecthyma')	• Affects cria 2–4 months of age • Crusts on lips and nostrils, and teats of dams • Zoonotic
ECTOPARASITIC DISEASES	
Mange, mites and lice (see Table 2 for more information)	• A common cause of skin diseases of alpacas • *Sarcoptes scabiei* • Psoroptic and chorioptic mange • Lice (eg, *Bovicola breviceps*) • Miscellaneous • Fleas, Demodex (Hill et al., 2008), mosquitos, black flies, ticks etc
NEOPLASIA AND NON-NEOPLASTIC TUMOURS	
Fibropapillomas or fibromas	
Mucocutaneous fibropapillomas	• Caused by camelid papillomavirus
Trichoepitheliomas	• 1–4cm diameter on the neck, thorax and rump
Hybrid follicular cysts	• 1–3cm, spontaneous caseous black discharge
Collagenous hamartomas	• Most common on the eyelid, neck and feet
ENVIRONMENTAL DISEASES	
Traumatic wounds	• From fencing, dog bites etc
Contact dermatitis	
MISCELLANEOUS DISEASES	
Non-inflammatory alopecia	• Shedding can be patchy and mistaken for disease in some animals
Immunologic diseases	• Pemphigus-like diseases (anecdotal reports) • Drug reactions (vasculitis) • Insect bite hypersensitivity reactions • Idiopathic urticaria
Congenital diseases	• Ichthyosis • Bilateral aural haematomas and chondritis
Zinc-responsive dermatitis	
Focal sterile eosinophilic and neutrophilic folliculitis and furunculosis	
Idiopathic nasal/perioral hyperkeratosis dermatosis	

TABLE 2. **Ectoparasitic diseases of alpacas** (adapted from Scott et al., 2011)

DISEASE	CLINICAL PRESENTATION
Sarcoptic mange	• Alopecia and severe pruritus • Early lesions: erythema, papules and yellow-to-grey crusts • Chronic changes: lichenification and hyperpigmentation • Begins on the ventral abdomen and chest, axilla and groin, with gradual extension to the medial thighs, prepuce, perineum, legs, interdigital spaces, face and pinnae • Secondary bacterial infection can complicate the situation • Potentially zoonotic • Skin scrapings (negative scrapings do not rule out disease)
Psoroptic mange	• Psoroptes cuniculi reported to infect new world camelids (Anon., 2002) • Only the ear canals are affected +/- purulent discharge due to secondary bacterial infection • Lesions include papules, crusts, exudation, alopecia and pruritus • Skin scrapings
Chorioptic mange	• Most common mite infestation of alpacas • Scale, crusts and alopecia on the ventral tail, perineal region, ventral abdomen and medial thighs. Lesions then spread to the axillae, tips and lateral surface of the pinnae, interdigital spaces and distal limbs up to the fetlocks • Skin scrapings • Histology: eosinophilic epidermal microabscesses and pustules
Pediculosis (lice)	• Heavy infestations cause biting, rubbing, and kicking that leads to traumatic alopecia, excoriation and secondary bacterial infections • Diagnose by looking at skin for lice and at fibre for attached nits

Multiple follicular cysts are a cause of nodular skin disease in the alpaca and may be more common than suggested in the literature (Newkirk and Frank, 2011).

Discussion

Differential diagnoses for skin nodules in alpacas include fibromas, fibropapillomas, melanocytomas, trichoepitheliomas, lymphomas, and collagenous and hair follicle hamartomas (Newkirk and Frank, 2011). Other common skin lesions seen in alpacas are listed in Table 1, with ectoparasitic diseases described in Table 2.

In this case the lesions were consistent with multiple follicular cysts. These are non-neoplastic skin masses that are lined with follicular epithelium, which recapitulate different aspects of hair follicle epithelium (Gross et al., 2006; Newkirk and Frank, 2011). Cysts can be further classified by the type of epithelium lining the cyst walls. Multiple follicular cysts are common in sheep and occur sporadically in dogs, horses and humans. The pathogenesis of multiple follicular cysts is unclear. However, some have suggested that fibre type or repeated shearing may contribute to the development of these lesions. In Merino sheep there may be a genetic predisposition to develop follicular cysts (Newkirk and Frank, 2011).

Multiple follicular cysts are a cause of nodular skin disease in the alpaca and may be more common than suggested in the literature (Newkirk and Frank, 2011). While this lesion is common in alpacas, biopsies should be performed to confirm the diagnosis. VS

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REFERENCES:

Anonymous. Recently introduced exotic animals and their parasites: What risk to New Zealand's biosecurity? *Surveillance* 29(4), 15–7, 2002

Gross TL, Ihrke PJ, Walder EJ, Affolter VK. Follicular tumors. *Skin Diseases of the Dog and Cat: Clinical and Histopathologic Diagnosis*. 2nd Edtn. Pp 604–40. Blackwell Science, Oxford, UK, 2006

Hill FI, McKenna PB, Miram CH. Demodex spp. infestation and suspected demodicosis of alpacas (*Vicugna pacos*) in New Zealand. *New Zealand Veterinary Journal* 56(3), 148, 2008

Newkirk KM, Frank LA. Multiple follicular cysts in four alpacas (*Vicugna pacos*). *Veterinary Dermatology* 22(3), 275–8, 2011

Scott DW, Vogel JW, Fleis RI, Miller WH Jr, Smith MC. Skin diseases in the alpaca (*Vicugna pacos*): A literature review and retrospective analysis of 68 cases (Cornell University 1997–2006). *Veterinary Dermatology* 22(1), 2–16, 2011