Control of lice in alpacas

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Background

Lice infestation of alpacas is widespread in Australia, albeit at low levels, and its presence is usually detected in herds at shearing time. Lice are species specific, meaning that camelid lice only infect camelids, cattle lice only infect cattle and sheep lice only infect sheep.

There are two genuses of camelid lice, namely the biting or chewing louse, *Bovicola* spp. (Figure 1), and the sucking louse, *Microthoracius* spp. The former genus of lice feed superficially on the skin, the latter penetrate the skin and feed on tissue fluids. The former genus was brought into Australia on imported alpacas, the latter species was eradicated prior to importation as injectable parasitacides were administered in pre-export quarantine thus removing *Microthoracius* spp., however topical parasitacides were not administered, thus allowing entry of *Bovicola* spp. into Australia. *Bovicola breviceps* was first diagnosed in South Australia in 1996 (I Carmichael, personal communication) and has subsequently been diagnosed in camelids in Western Australia, Victoria, New South Wales, Queensland and Tasmania.

Figure 1. *Bovicola* spp lice (source: www.agric.wa.gov.au).

The parasite

Bovicola breviceps is a biting (chewing) louse, which has been recorded from the alpaca, llama and guanaco. As already stated, lice are very host specific parasites. Those found on the alpaca or llama are different from those found on cattle, sheep or goats. There has been no recorded transmission of lice to or from camelids and ruminant livestock.

Biting lice are found at the base of hair shafts, close to or on the surface of the skin. On alpacas they may be found on any part of the body but are more common around the base of the tail, along the sides of the thorax and abdomen, on the upper part of the limbs, and in the flank. Shearers tend to initially find lice and their white eggs, particularly in brown and black animals, when shearing around the flank and lateral thorax behind the elbow (Figure 2).

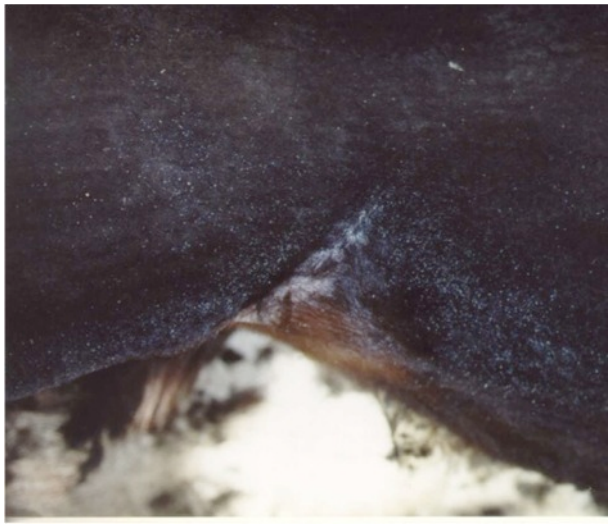

Figure 2. Lice eggs are most easily seen in the flank area and on the lateral thorax behind the elbow of brown and black alpacas at shearing time.

Biting lice do not in fact bite their host or directly damage the skin. They feed by chewing on scurf which is sloughed off from the skin, hence the alternative name “chewing lice”.

Life cycle and survival

As with other *Bovicola* species, the life cycle of *B. breviceps* is simple (Figure 3) and may be completed on a single animal. The life cycle details given by Fowler (2010) and extrapolated from local and overseas data referring to related louse species provides some general lifecycle details which might be expected in the Australian environment. Adult lice copulate, then the female deposits fertilised eggs onto hair fibres. The eggs hatch within 1-2 weeks to give rise to a first stage nymph. The nymph undergoes 3 moults as it matures to adult size. Maturation takes 2-3 weeks. The life cycle can be completed in as little as 3-5 weeks. Adults may live on average for 30-50 days.

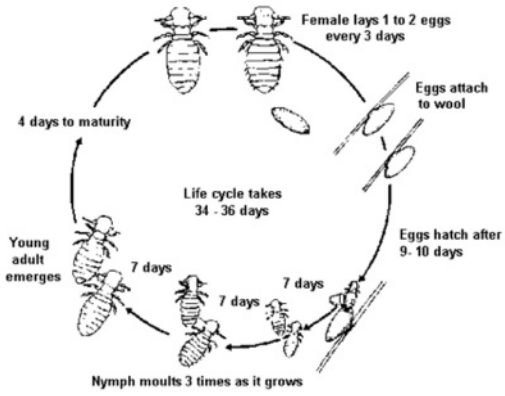

Figure 3. *Bovicola* spp. life cycle (source: http://informedfarmers.com/sheep-lice-facts).

In most associations of lice with their host there is a seasonality in the natural levels of infestation, with lice numbers increasing over winter and declining in hot weather. The earlier reports of *B. breviceps* on alpacas in Australia were in winter, but most current reports are of lice detected at shearing in late spring or early summer. This is probably due to a build up in lice numbers in the cooler months preceding shearing. The infestations would probably have been even heavier a few months earlier, whereas lice may not have been detectable on the same animals in summer after shearing.

It is generally thought that lice do not survive for more than a few days off the host, however, Dr Chris Mayberry (WA Department of Agriculture) has observed live camelid biting lice in alpaca fibre that had been removed from alpacas two weeks previously (R Dixon, personal communication). Dr Peter James (SARDI, South Australia) confirms that sheep lice can also persist for a similar time in shorn fleece.

The survival of lice, which are freed from their host on inanimate objects or shed into the environment, and thereby starved, is another matter. Longevity of starved arthropods is governed to a large degree by their metabolic rate and this is, in turn, dependent upon temperature. Over a limited range, metabolic rate is directly proportional to environmental temperature, which means that lice off the animal will live longer at lower temperatures, but they cannot survive for extended periods. Studies in New Zealand (Heath, 1973) on cattle and goat lice showed that at least half of the adult female lice were dead within 2½ days of being removed from their host and all were dead within 5 days. Nymphs survived for 4 - 6 days. Some eggs hatched in 8 - 12 days, but the unfed newly emerged first stage nymphs lived no longer than 12 hours.

Transmission

On the basis of these findings the chance of transfer of lice via inanimate objects such as common grooming utensils, shearing gear, blankets or harnesses which are in constant use may be quite high and owners and shearers should be aware of this and disinfect them accordingly. In the case of housing, bedding or pasture, a 14 day period based on the incubation of the egg, or 7 days if only adult or nymphal lice are considered, would be sufficient to ensure absolute protection in the absence of any additional control by chemical or physical means.

Louse eggs are firmly attached to whole hair fibres. Alpacas are unlikely to shed whole hairs when rolling and even if they happen to do so and a small percentage of attached eggs survive and hatch, the newly emerged nymphs are likely to perish within hours. Spread of lice amongst alpacas via communal rolling areas is one of the least likely mechanisms of transmission.

The major source of transmission of lice from animal to animal is most probably associated with situations where close body contact occurs. There are numerous such occasions, which owners will readily recognise (eg mating, lactating hembra with cria at foot, communal transport, shows or shared stables). In addition, as mentioned above, the use of contaminated shearing, grooming and harness equipment on multiple animals could be very important.

Diagnosis

Adult *B. breviceps* are 1-1.5 mm long, white or light tan (Fowler 2010; I Carmichael, personal communication). They are smaller than adult sheep or cattle lice, and are thus harder to see with the naked eye. Alpacas should be examined for lice in good light, preferably outdoors in sunlight. A hand lens may be useful to differentiate lice from detritus in the fleece. The base of the hair fibres in several of the favoured sites (see above) should be carefully

observed for lice or attached eggs (Figure 4). Lice tend to move away from the light as the fleece is opened so it is necessary to make numerous partings in the favoured sites. Some individuals are much more adept at detecting lice than others, hence it is unwise to assume that a single negative examination of a herd or a few animals in a herd guarantees that they are completely free from lice. Another factor is that lice numbers are likely to be at their lowest, perhaps even undetectable levels, in summer; failure to find lice at that time of the year is not conclusive evidence that all animals are negative. Because of the direct animal to animal transmission of lice, the variation in susceptibility of individuals and the difficulty in detecting very low numbers of lice on animals, a single infected animal on a property suggests that all animals on that property are potentially exposed.

Figure 4. Lice eggs attached to the base of recently-shorn alpaca fleece.

Adverse effects on alpacas

In most animal hosts, heavy infestations of biting lice cause irritation, which leads to rubbing and scratching. In sheep and goats this can lead to severe fleece derangement with loss in fleece value. Fowler (2010) reports that in heavy infestations in llamas the coat lacks lustre and has a ragged appearance and the animal may bite and rub itself. This has been observed in some but not all alpacas infested with biting lice in Australia (Figure 5). Some heavily infested alpacas have been detected only at shearing and had given no indication through extra rolling, rubbing or scratching that they were irritated by the infestation. Furthermore, obvious detrimental effects were not present in the fleeces of these infested animals.

Figure 5. Australian alpaca showing areas of damaged fleece secondary to self-mutilation from lice infestation.

Owners need to be aware, therefore, that infestations of lice in alpacas may or may not cause clinical signs or noticeable fleece damage and may only be detected at shearing or during a specific search for them. Moreover, only certain stressed animals in the herd (eg debilitated animals or those with concurrent disease, lactating hembras, working machos), or genetically susceptible or immuno-compromised individuals are likely to develop heavy infestations; the remaining animals may harbour only small residual infestations (eg at the base of the neck), or no detectable infestation at all.

Control and eradication

Alpaca and llama owners and breeders need to understand the following:

- Lice are host-specific, therefore infected animals could only have caught lice from other alpacas or llamas.
- Lice are eradicable. If the herd is treated correctly, the louse population can be removed permanently.
- Fleece quality in heavily infested alpacas could be compromised.

The major reasons why louse eradication fails in sheep are:

- Mismustering – This is less of a problem in alpaca and llama herds as numbers within herds are much lower than sheep flocks.
- Recontamination by wandering stock – Alpacas and llamas rarely have an opportunity to wander and most camelid farms are non-adjacent.
- Poor boundary fencing – Again, most camelid farms do not share common boundary fences. In cases that do, it is important to communicate with the neighbouring camelid farm about lice infestation and control measures being undertaken.
- Incorrect application of lousicide.

Eradication on a property is achievable given a determined approach, but is a waste of effort unless *steps to prevent reinfestation are instituted*. Alpacas and llamas have easy access to other camelid herds through mobile matings, shows, sales and agistment. Because of the mobility of animals, owners must be aware of possible re-infestation at outside sites or from visiting animals, even after initial eradication on their property. Mobile matings in particular provide an excellent means of reinfection of camelids by lice because of their prolonged close contact whilst mating.

Treatment

Bovicola breviceps is a biting or chewing louse and is not affected by injectable parasiticides, so topical treatment must be applied to remove lice infestations. Liquid preparations are recommended over powdered products. There are many topical lousicidal preparations registered for use in sheep, cattle, goats, horses and small animals in Australia, however, alpaca farmers must remember that no chemicals are registered for use in alpacas and as such any use is off-label and should be performed with caution (Table 1).

Pesticide residues in wool and meat are a major issue in the Australian sheep and cattle industries. Cattle and sheep lousicides list meat and wool withholding periods (WHP), which must also be considered by alpaca farmers as they are also produced for their fleece and meat in Australia. Withholding periods shown for sheep and cattle may not be the appropriate withholding period for camelids as testing of residues in camelid wool and meat has not been performed by pharmaceutical companies that make these products. Note that products registered for use in cattle only do not take into account wool withholding periods.

Synthetic pyrethroids such as deltamethrin (eg Clout-S®) need to be applied within 24 hours of shearing to cleanly shorn sheep unless explicitly a long-wool product. Alpacas and llamas do not usually have their head or lower legs cleanly shorn, and often have more fibre left along the dorsal midline to prevent sunburn. The distribution of synthetic pyrethroids following backline treatment is very uneven. Synthetic pyrethroids are therefore unsuitable for lice eradication in camelids.

Pour-on organophosphates such as fenthion (eg Tiguvon Spot-On Cattle Lice Insecticide®), although used successfully to treat the first infested alpaca in Western Australia involve risk of overdosing. There have been two anecdotal reports that alpaca fibre is stained/becomes greasy at the point of application, and is only removed at shearing time (R Dixon, G Jackson, personal communication). Pour-on applications are easy to use but they will not kill all lice, hence are unsuited for a concentrated attempt at lice eradication on a property. Pour-on and dipping organophosphates may be toxic in stressed or overheated animals. Treat only on a cool day and avoid stirring up animals when mustering and handling them in yards. It is recommended that alpacas are observed for 8-12 hours after organophosphate treatment and your veterinarian contacted immediately if any animals appear ill (eg staggery, excessive salivation).

Insect growth regulators such as triflumuron (eg Command®, Exilice® and Zapp Pour-On®) and diflubenzuron (eg Fleececare® and Strike®) work by inhibiting chitin synthesis, thus killing nymphs which need to synthesise chitin to moult successfully. These products do not kill adult lice, but rely on them dying naturally over several weeks. The period of persistence of these products in alpaca fleece has not been determined and it should not be assumed that it is similar to that in sheep wool. Although these products are possibly suitable for lice control in camelids they do not necessarily guarantee eradication and are therefore not recommended for this purpose.

Treatment of choice

Use of **spinosad** (Extinosad Lice and Fly Eliminator®) in a plunge or shower dip, with two applications 2-3 weeks apart, has been shown to eradicate lice from an alpaca herd (Vaughan 2004). Alpaca farmers must ensure that the alpacas are thoroughly wetted to the skin all over so the active ingredient reaches the lice; this is achieved by *adding a wetting agent (such as alcohol alkoxylate) to the dipping solution*. Dilute spinosad in water according to the on-label recommended rate for sheep. No lousicide products are registered for use in camelids and owners using these chemicals need to be aware that use in camelids is off-label. However, this treatment has already been used on many alpacas across Australia without adverse effects.

Spinosad will kill adult lice and nymphs but not unhatched eggs. Two weeks should be allowed to pass after shearing (to allow shearing cuts to heal) and animals should be treated as soon as possible thereafter. Because alpacas and llamas have little lanolin on their fibre, residual concentrations of spinosad are unknown and may be inadequate to kill nymphs emerging from eggs present on the hair fibres at the time of the initial treatment.

Table 1. Sheep and cattle lousacides available in Australia. None are registered for use in alpacas or llamas.

Active ingredient	Commercial name	Species registered	Method of application	WHP for registered species*
Synthetic pyrethroids				
Deltamethrin	Arrest Easy-Dose® Bombard Pour-On® Coopers Easy-Dose®	cattle	pour-on	meat: nil
Deltamethrin	Clout-S®	sheep	pour-on < 24 h off shears	meat: 3 days
α-Cypermethrin	Vanquish Long Wool®	sheep	pour-on < 10 months off shears	meat: nil; wool: 2 months
Organophosphates				
Diazinon	Diazinon® Eureka Gold®	sheep, cattle	dip, jetting fluid or dressing < 24 h off shears	meat: 14-21 days
Temephos	Assassin Sheep Dip®	sheep	plunge or shower dip 14-42 d off shears	meat: 14 days; wool: 6 months
Fenthion	Tiguvon Spot-On Cattle Lice Insecticide®	cattle	spot-on	meat: 10 days
Insect growth regulators & other chemicals				
Dicylcanil/diflubenzuron	CLiK Spray-On Fly/Lice®	sheep	spray-on	meat: 21 days; wool: 6 months
Diflubenzuron	Fleececare® Strike®	sheep	dipping and jetting 10-42d off shears	meat: nil; wool: 6 months
Diflubenzuron	Magnum IGR Pour-On® Stampede Pour-On®	sheep	pour-on < 24 h off shears	meat: 0-7 days; wool: 6 months
Triflumuron	Command® Exilice® Zapp Pour-On®	sheep	pour-on < 7 d off shears	meat: 14 days; wool: 2 months
Imidacloprid	Avenge Pour-On®	sheep	pour-on < 24 h off shears	meat: 21 days; wool: 6 months
Spinosad	Extinosad Lice & Fly Eliminator®	sheep	plunge or shower dip, short or long wool	meat: nil; wool: nil
Spinosad	Extinosad Pour-On®	sheep	pour-on off shears or long wool	meat off shears: 14 days; wool: nil
Ivermectin	Coopers Blowfly & Lice Jetting Fluid®	sheep	hand jetting in long wool only	meat: 7 days

* Products registered for use in cattle do not take into account wool withholding periods (WHP). Withholding periods shown for sheep and cattle may not be applicable to camelids.

Therefore, a second application of spinosad should be applied 14-21 days after the first application, before these nymphs can develop to become mature egg-laying adult lice. Under most circumstances all lice eggs from the initial infestation should have hatched by the time that the second treatment is given and all nymphs from them will be killed by this treatment.

Treat all alpacas on the same day, including visiting or sick animals and new born crias. It is vitally important that the entire animal is wet to the skin. Mechanical and chemical stripping of spinosad from recycled dipping/jetting fluid is minimal in alpacas (Vaughan 2004), possibly because of the lower lanolin content of camelid fibre, so top up dip levels using the same dilution rate as the original solution.

Spinosad breaks down in ultraviolet light so applications on wool leave no residues on wool or in meat of slaughtered sheep. Consequently there are nil withholding periods for this product in sheep and it is not a scheduled poison.

Procedures and cautions

Eradication of lice is a labour intensive and costly exercise, but continued use of more convenient pour-on treatments may be a less effective means of control and may cause a build-up of pesticide residues in the fibre and place the alpaca fleece industry at risk. Eradication is preferable, but may prove difficult if the herd cannot remain "closed" and separated from all other camelids that could act as a source of re-infestation. Use of pour-on treatments applied only to visibly infested animals may be the only treatment option for farmers who cannot maintain a closed herd because of show attendance and/or has a reliance on mobile matings.

It is essential that alpaca and llama farmers read instructions for use and handling of pesticides carefully before use. None of the above-mentioned chemicals are registered for use in camelids. It is recommended that breeders consider hiring a sheep-contractor with a high-pressure hand-spray unit or mobile plunge dip to treat their animals correctly when attempting lice eradication. Alpacas may aspirate the dipping fluid into their lungs, leading to pneumonia and death.

After dipping, place the animals on paddocks that have not had stock on them for at least seven days. Any sheds or shelters should be rested from animal contact for at least 7 days prior to dipping the animals.

This paper has been modified from the paper "Control of the camelid biting louse in Australia" that appeared in the winter edition of Alpacas Australia in 1999. The author does not specifically endorse any commercial product mentioned in this article.

References

- Foreyt WJ. Veterinary Parasitology Reference Manual. 5th edition. Blackwell Publishing, Ames, 2001; pp 115-120.
- Fowler ME. Medicine and Surgery of Camelids. 3rd edition. Wiley-Blackwell, Ames, 2010; pp 231-235.
- Heath ACG. The biology and survival of starved cattle and goat biting lice (Mallophaga spp) at different temperatures and relative humidities. New Zealand Entomologist 1973; 5:330-334.
- Vaughan JL. Eradication of the camelid biting louse, *Bovicola breviceps*. *Australian Veterinary Journal* 2004; 82:216-217.
- Vaughan JL, Carmichael IJ. Control of the camelid biting louse, *Bovicola breviceps*, in Australia. *Alpacas Australia* 1999; 27:24-28.

USE GOOD HUSBANDRY TECHNIQUES. KEEP GOOD RECORDS. WRITE DOWN TREATMENTS/MATING DATES/MEAT WITHHOLDING TIMES.

NO PRODUCTS ARE REGISTERED FOR USE IN ALPACAS. CONSULT YOUR VETERINARIAN AND ALWAYS READ THE LABEL BEFORE USING ANY OF THE PRODUCTS MENTIONED. *NEVER* USE ANY PRODUCT IN ALPACAS THAT IS NOT REGISTERED FOR USE IN FOOD PRODUCING ANIMALS.

FOR ANY SIGNS OF UNUSUAL OR SERIOUS ANIMAL DISEASE, RING THE DISEASE WATCH HOTLINE: 1800 675 888.