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lost creek llamas

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Basic Llama Care

Some tenets of llama care are the same
no matter what kind of llamas you own or for what purpose.

basic feeding **supplemental feeding** **vitamins and minerals** **water**

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Basic feeding

Llamas evolved to consume poor-quality forage. For much of the year in South America, llamas survive (though not thrive) on foodstuffs with an average protein content of 2-4%. In North America, pasture quality ranges from somewhat to significantly better, and thus llamas tend to get fat. Because llamas are not naturally selected for maximum metabolic efficiency in this country, the less-efficient members of the llama population have survived, and in fact are better suited to the available pasture. Still, it is often necessary to restrict llamas' access to pasture for weight control for part or even all of the year, particularly in the spring when forage is lush or when only a few animals will be grazing a large area.

Some areas of the country cannot support adequate pasture year-round. Others may have continual pasture, but during some seasons, the quality of forage is extremely poor -- winter pasture in the Pacific Northwest is largely devoid of nutrients, for example. In these situations, llamas require additional feed. Winter snows may cover pasture for days to months at a time. At such times, llamas must have all of their feed provided. Both situations are best addressed by feeding hay. A high-quality grass hay is the best choice. Oat hay has excellent qualities on paper, but some llamas don't care for it, and there is some suspicion that the mature oat seeds, with their pointed ends and size that matches llamas' third compartment sacules perfectly, contribute to mechanical ulcers. Alfalfa (including alfalfa-grass mix) is too rich for a llama's digestive system and should only be fed to llamas that require more intense supplemental feeding for medical reasons (see below).

A normal, nonworking adult llama needs to consume about 1.2% *in dry matter* of his or her bodyweight for maintenance. This figure will vary considerably when weather, quality of foodstuffs, water content of the feed, and other factors enter the equation. Whether you weigh the hay you feed or not, provide only what will be cleaned up. If your llamas are leaving hay, you are feeding too much. If they clean it up, try feeding a bit more until you find right amount. Remember that "the right amount" will change dramatically with the seasons.

*** * * Important * * ***

Whenever you purchase a llama, be sure to find out what kind of hay s/he has been eating, and buy a bale if possible so that you can make the feed transition a gradual one. Changing abruptly from alfalfa to grass or vice-versa (or even two different grass hays) can actually kill

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Supplemental feeding

Some llamas do require supplemental feed. Growing animals, pregnant and lactating females, studs during breeding season, llamas performing hard physical work, and some elderly llamas all frequently need a nutritional boost. Rescued llamas almost always require nutritional support tailored to correct previous dietary deficiencies. Supplementation is best accomplished with pelleted formulas or grain mixes.

Pelleted feeds have the advantages of being highly digestible (good for geriatric llamas with few or no teeth), very consistent composition (any added fortification doesn't end up at the top or bottom of the bag), and a longer storage life than grains. The disadvantages of pelleted feeds are that they all swell with the addition of water (llamas may choke if pellets are eaten too rapidly, or they may bloat if a large quantity of pellets are consumed followed by a lot of water) and that the heated processes commonly used to manufacture pellets do destroy some of the natural nutrients of the foodstuffs used. Pelleted feed *supplements* should never be the sole form of food for a llama -- these pellets do not contain enough roughage for the digestive tract to operate properly, nor are they a properly balanced diet. However, some pellets, such as those formulated as the exclusive feed source for senior horses (*complete feeds*), do contain adequate roughage and a proper nutrient balance.

Grain mixes come in many forms; the most common mix is called COB (which stands for corn-oats-barley). Rolled, crimped, or steamed grains break down more easily both in the llama's gut and in storage. Whole grains store better, but may pass right through those llamas with dental problems. Llamas with problem teeth and/or bad gums also find grains are more difficult or painful to chew. Grain mixes tend to have significantly lower protein and fewer nutrients than pelleted formulas. "Wet" COB has molasses added, which is not nutritionally necessary, but some llamas find it much more desirable.

Some grain mixes have their nutritional content boosted with pelleted or loose additives. Pellets are preferable as a vehicle for fortification because the loose matter in grain mixes tends to sift to the bottom of the bag, and also to be left in the bottom of the feed bowl. Llamas' digestive systems did not evolve the ability to handle large quantities of grain or pellets, so even the most nutritionally needy should not receive grain as more than 25% of their daily ration.

Purina Athlete, a high-fat extruded feed, is a useful energy source for hard-working llamas. A very small amount will do (1/2 cup twice a day) -- too much quickly becomes obvious through increased urine and fecal odor and also "hot" behavior.

Purina Equine Senior and Nutreena/Life Design Senior are two pelleted feeds formulated especially for the needs of older horses. Both have been used for older llamas with good results and no long-term detriment; Nutreena Senior is easier to chew. Locally-formulated and milled senior horse feeds (Kropf's Blue Ribbon Senior Horse in the southern Willamette Valley, for example) may be better if they are formulated to compensate for

Performance llama analysis

Research Projects

Other llama sites

local nutritional deficiencies and surpluses.

*** * * Important * * ***

Greedy eaters will choke on supplements (and even hay). Because all types of pellets swell with moisture, they can cause a particularly life-threatening bottleneck in the event of a choke episode. Even choking on grain and hay can cause esophageal scarring, increasing the likelihood of a lethal choke.

Handfeed supplement to eager eaters so you can require them to chew and swallow after taking in a reasonable amount. Yes, it's time-consuming. So is an emergency vet visit and carcass disposal. When handfed, most "pellet-vacuum" llamas gain the confidence that their food supply is not in danger and will grow out of their dangerous behavior.

Alfalfa

Alfalfa and high-protein feeds are not a good choice in hot weather, or for those llamas who are at risk for kidney problems. A primarily-alfalfa diet does not have the proper balance of major minerals, and many problems can result. However, there is a place for a ***small*** amount of alfalfa in some llamas' diets.

The addition of a ***small*** amount of alfalfa may be warranted for certain llamas, particularly if additional protein is required (ie, pregnant, lactating,and growing llamas -- none of which are "beginner llamas" for many reasons). If you are stuck with a poorer-quality grass hay some winter, a ***small*** amount of alfalfa per llama ups the total protein adequately (in the case of poor-quality grass hay, other missing and deficient nutrients should be supplied through supplemental feeding, above).

If you don't rescue ...

We have found that some llamas (primarily those who have an easy time maintaining a healthy, trim weight as young adults) require a bit of extra protein to compensate for their less-efficient (though better-suited to domestic life in North America) metabolism. Again, ***small*** amount of alfalfa is all that's required.

DON'T BREED!

We bet you are muttering, "So what's a ***small*** amount?" Grab as much alfalfa as you can possibly fit in your closed fist. Shake it so all the "kling-ons" fall off the edges. What's left is a one-day serving for one adult llama. (And now you know how much to grab in the first place.) Safety check: If you are continually finding leftover alfalfa ***stems***, you are feeding 'way too much (unless the llama in question is the only one with access to the alfalfa -- first check his or her molars to see if the llama has more tender gum than tough grinding surface left).

Vitamins and minerals

Llamas require supplemental vitamins and minerals to maintain optimum health. Don't be fooled into believing that llamas need special llama minerals and/or vitamins. ***Vitamin and mineral deficiencies are regional, not species-specific***, so your first step should be to contact your county extension agent or your veterinarian to find out what deficiencies exist in your area.

Selenium deficiencies exist in much of the country. Some areas, however, have locally toxic selenium levels. Some people recommend injectable selenium, but injectable supplementation -- although it is more quickly absorbed -- typically only gives higher selenium levels for a week or two. Injectable selenium should be reserved for treatment of individual llamas who actually have a selenium deficiency, and only used until the deficiency has been corrected.

Copper is also deficient in some areas; however, a local deficiency of molybdenum can cause copper toxicity. Copper-to-molybdenum ratios should be between 6:1 and 10:1. Most non-regional "llama" formulas do not contain enough copper.

Some individual llamas are prone to a **zinc** deficiency that causes skin problems; others live in areas that are zinc deficient. Except for those llamas, heavy zinc supplementation is not generally necessary. Unfortunately, many non-regional "llama" formulas overdo the zinc.

A few llamas have difficulty absorbing **iron**. These llamas don't respond well to iron supplementation because the problem is not their diet, but in their own metabolism. Normal llamas usually receive adequate iron in their diet. A llama who has been diagnosed with anemia or a heavy internal parasite load may benefit from short-term oral iron supplementation with a blood-building product such as Lixotinic®.

It is important to understand that both zinc and iron supplementation in excess decreases copper absorption, and thus may lead to copper deficiency in some regions.

Additional **calcium and phosphorous** are often required, particularly for growing, pregnant, and lactating llamas, and must be present in a specific ratio to each other. (**Vitamin D** is also necessary for calcium and phosphorus utilization -- see below). Crooked and weak bones are a common result of calcium/phosphorous deficiencies and imbalances. An optimum ratio is presumed to be 2:1 as in other species, with a permissible range of 1:1 to 6:1. Remember that alfalfa is very high in calcium and will alter the total dietary balance. High dietary calcium levels can interfere with zinc absorption.

Salt will be necessary in all areas and should be available free-choice.

Regionally-formulated mineral mixes and mineral blocks are usually available and are highly recommended. If you use a mineral mix or block, do not provide additional salt -- it is already present in the minerals, and an additional salt source may result in one or more of the llamas "filling up" on salt at the salt lick and then not consuming enough minerals. Loose minerals can be spilled, become caked from atmospheric moisture, or be contaminated by droppings (llama or rodent). **Soft mineral blocks** avoid these drawbacks and have the added benefit of providing enjoyable

diversion for the llamas. Unlike hard "trace-mineralized" salt blocks, soft mineral blocks provide a complete source of all major minerals, and are easily consumed by llamas. Sweetlix® is a brand that is nationally available and has several formulations.

Vitamin supplementation can be boosted easily by purchasing a well-balanced powdered or granulated vitamin-mineral supplement for horses and adding an appropriate amount of it (determined by your llama's weight) to a small amount (1/2 to 1 cup) of grain. (This is in addition to the free-choice minerals -- not a substitute!) If you find yourself rescuing a growing, pregnant, or lactating llama, calcium and phosphorous can be added to the diet in the same manner -- dicalcium phosphate is a good source for both.

To get the expensive goodies to stick to the tasty goodies, mix the two with a small amount of A, D & E fortified wheat germ oil. The additional vitamin D is particularly important for young llamas in climates with seasonally restricted sunlight, such as the Pacific Northwest. Vitamin D supplementation may also be appropriate for older llamas, as it is for older humans.

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Breeding females also have additional dietary needs pre-breeding, at different stages of pregnancy, and during lactation. It makes good sense that people who've not yet mastered basic nutrition for normal adult llamas have absolutely NO business making more llamas. However, more and more responsible people are finding themselves saddled with pregnant females because they've taken pity on llamas that really needed rescuing. If you need detailed information on supplementing reproductive females, email Llama RescueNet for help with your specific situation.

Water

Clean, fresh, unfrozen water should always be available free-choice. When temperatures are above freezing, many options exist from 30-gallon plastic garbage cans to automatic waterers. Be sure that other animals (especially waterfowl) can't get into the water -- some llamas won't drink water that they consider dirty; others will drink fouled water. In either case, the result is one or more seriously ill llamas.

When temperatures remain below freezing, stock tank heaters (securely mounted!) or heated-bottom buckets can be used. The buckets are generally safer, but only hold five gallons each. Outlet-mounted submersible heaters installed in stock tanks are also a safe option. In both cases, the heater cord must be protected from chewing (remember that other species besides llamas may use the cord for dangerous entertainment). If temperatures only dip below freezing at night, you may be able to merely knock the layer of ice off the water once or twice a day.

Waterers placed out of the sun don't thaw as quickly, however, they do not need to be cleaned as often -- sunlight encourages algal growth.

*** * * Important * * ***

Llamas may not consume enough (or even any) water during sudden cold snaps. A heated water source is ideal, but not always possible, practical, or safe.

Watch closely for llamas that shiver but have an elevated rectal temperature. Although you should also consider consulting a veterinarian and/or administering an antibiotic in case these llamas are actually ill, immediately offer these llamas warmed water, and call their attention to it repeatedly until they drink. If dehydration is in fact the cause, the llama will drink deeply and then typically stop shivering within a half hour and have a normal rectal temperature within an hour or two.

Protection

Shelter

Llamas may be tough, but they require shelter in all but the mildest climates. In hotter areas, a breezy shelter provides essential shade. In windy and rainy areas, llamas are usually very quick to take advantage of available shelter (there are exceptions, such as llamas who have been trapped and/or abused in shelters). In rainy areas or in climates with heavy snowfall, shelter is essential to provide llamas with a dry place to kush and stand, thus minimizing damage to foot pads, the opportunistic fungi that love llamas' undersides, and various unhealthy conditions that can be lumped under the catch-all category of "rain rot."

Shelter can be simple or elaborate. The essentials are:

- dry flooring
- two and preferably three solid sides aligned against the prevailing winds
- 40 sq feet per llama minimum floor space (that's assuming that all of the llamas in question are compatible) with a minimum size of 8x8 for a single llama.
- a minimum interior height of seven feet (taller is OK).

Most people find that having a place to feed hay under shelter is ideal, but that also means an increase in the necessary space to keep squabbling

and fecal soiling of spilled hay to a minimum.

You may have heard that llamas won't soil their shelter. Although exceptions do exist, the vast majority of llama owners agree that llamas actually prefer to defecate and urinate in the privacy of their barn! It is possible to pick the area you'd like the llamas to use for a toilet and train them gradually to use it, although this is virtually impossible in crowded conditions.

Although you may think bedding makes the shelter look all snuggly and warm, bedding is rarely preferrable. Unless recently shorn, llamas' coats usually keep them quite warm enough, and bedding actually makes sanitation a much greater effort. For the few times when bedding is truly necessary or desirable, always use straw, and clean it every day or more often before feces get scattered below the bedding and necessitate bedding removal and replacement (all that straw is bulky and not an easy matter to dispose of).

If you don't rescue ...

For flooring, packed dirt or clay are both very good; rubber mats with either small holes for drainage or an open area for the "toilet" is as good, but much more expensive. Normal-sized gravel ("three-quarter minus") and round rock are both impossible to separate from feces, but pea gravel (if you can find it) outstanding flooring because it can be packed flat and it allows urine to drain off; it also won't mix with straw or hay. Turf is also good for short-term displays and open-sided, summer shelters -- but don't expect the grass to last very long.

DON'T BREED!

Whatever you do, never bed llamas on wood shavings, wood chips, and avoid sand as flooring material. Llamas gleefully roll in all three. The bedding material is quickly ground into the animals' coats, and feces and urine are thoroughly mixed with bedding in the process, creating amoniac, unsanitary and unpleasant living conditions within a very short time. Although sand can be blown out of the coat (over several days and with effort on your part) after the llama is removed from the source, a single roll in shavings results in tiny wood slivers and splinters remaining for as long as a year, ruining the fleece (of fiber producers) and making all llamas very uncomfortable. **For that reason, also keep wood shavings and wood chips out of llamas' pastures!**

You will greatly appreciate having lights in the llama shelter (particularly if you work dayshift), and having both lights and an electrical outlet (with weatherproof covers and on a GFI circuit for safety) can prove invaluable in an emergency.

A gate to close up the shelter and keep the llamas inside proves to be very handy, and can in fact be the best way to catch marginally-trained llamas, particularly if you feed in the shelter. We also have at least one gate in each shelter that usually stays against the wall, but can be swung out to divide the shelter area so that a sick llama can be kept in familiar surroundings, yet safe from aggressive or concerned pasturemates while still allowing those other llamas access to adequate shelter in inclement weather.

Fencing

Llamas will often stay inside anything once they are familiar with their area. This trait is directly attributable to llamas' strong territorial nature.

However, situations change, and llamas who were once content may suddenly show you that the fencing you *thought* was containing them is actually not strong enough, high enough, or safe enough.

Four feet is the minimum height for average use. Five feet is better, and is strongly recommended for separating llamas of opposite sexes, aggressive animals, and average jumpers. Genetically talented jumping llamas can clear barriers up to eight feet. Fortunately, these animals are relatively rare.

Just about every kind of fencing has been used to contain llamas; however, a number of common types pose significant danger or prove inadequate for some llamas:

- Barbed wire is not only unnecessary, but potentially dangerous. Llama wool can catch and wrap around barbs, and may actually immobilize a woolly llama. The barbs can cut any llama's face, ears, and legs when he or she puts extremeties through or over the fencing purposely to eat or investigate, or accidently, such as in a scuffle.
- Stiff fencing with openings large enough to allow legs and/or necks to pass through (such as cattle and hog panels) are dangerous and should not be used around some llamas, particularly males, late geldings, and crias.
- Electric fencing will not deter a determined llama. Some llamas learn to ground the fence, or to at least take quick advantage of any "natural" grounding or power outage. Others simpy ignore the temporary discomfort of the electrical shock in order to get at what they want.
- Fencing such as New Zealand high-tensile and smooth or barbed wire allows dogs and other predators (such as bears) to pass or push through. Even when electrified, these fences are llama death traps.
- Welded wire will break as llamas rub against it. "Knotted" fencing such as field fence and "non-climb" are much safer and more economical choices in the long run.
- "T-posts" can cause serious damage to a llama that stands up on his or her hind legs at the fence and comes down on a post top. You can buy plastic caps for the tops of t-posts.

We have been most satisfied with five-foot non-climb horse fencing for most situations. We prefer six-foot non-climb around trees and on the stud side of the double fenceline separating studs from females. We use treated round (peeler core) posts with a top rail for visibility and to keep the llamas from pushing down the top of the fence fabric. Although we use lightweight tube gates (some with a piece of hog panel welded into the bottom) in some areas, we prefer heavier steel gates with 2x4 mesh for llama safety whenever practical.

Some additional tips:

- Llamas can run into and be seriously (or fatally) injured by low-visibility fencing. A good solution is to initially "flag" the fence until the llamas learn where it is. A more permanent and aesthetic solution is to add rails, either on the top or one on top and one in the middle of each section.
- Intact llamas of opposite sexes are best separated by double fences at least ten feet apart and five or six feet high.
- Territorial and aggressive llamas are the most difficult to contain, and require thoughtful management to avoid provoking them ... in addition to maxium strength fencing. Because both territorialism and aggression are heritable, castration is an important additional management tool.

Mental and emotional needs

Space

Llamas evolved as creatures of open spaces. Llamas who are kept in small enclosures or paddocks show an incredible transformation when provided with the opportunity to roam a larger area. The ability to put some distance between self and herdmates and still have enough to eat is a basic need for all grazing animals; llamas in particular prefer to spread out over a larger area than other ungulates. Llamas also enjoy the opportunity to explore new areas and to sample varied flora.

Llamas also experience considerable physical benefits from adequate space. A varied diet is not just more interesting, it is more natural -- and healthier -- for llamas to consume. Llamas also need exercise, and running around in a large, open area can fulfill that need. Even moving constantly while grazing tones muscles and burns calories.

The most difficult part of providing adequate space for llamas is that most North American pastures are too rich -- and most llamas continually kept in large areas become far too obese, which certainly negates most of the advantages of having a large area. This difficulty is most commonly addressed by keeping the llamas in a smaller, relatively sparse area for the night and perhaps part of the day, and then allowing them free access to a large area for several hours or more. The precise amount of "out time" will depend on your geographic area, the time of year, and the amount and health of the forage available. When llamas do not have continual access to the larger area, they will generally spend more time running and less time eating in the larger area, which does help combat the fat problem.

Pasture varies tremendously throughout the country and with the seasons. A good starting point is to figure 3-4 compatible geldings and/or females for llama-only pastures with a lot of forage, and 1-1.5 llamas per acre for poorer pasture or with horses/cattle/other big grazers. Late geldings and studs need 1-2 *acres per llama* for social reasons, and thus are best pastured with grazing animals of other species to keep the forage at a managable level. A stud who must be pastured singly during breeding season should have at least a half-acre to roam, and preferrably more. He is unlikely to put on excess weight during that time, and too small an area will allow other llamas too close for his territorial instincts to handle -- thus a small area can keep a stud so anxious that it is impossible to keep adequate weight on him.

In many parts of the country, winter means that compromises must be made between space to roam and future pasture health. During harsh weather, many llamas (when given a choice) prefer to stay in a sheltered area that will conserve heat and allow their soft foot pads adequate time to dry out. Snow may also mean that constant maintenance -- more than is humanly possible with a large pasture -- is necessary to keep llamas inside

the fence instead of waltzing over the top. A good management practice for the winter months is to provide as much dry-floored shelter as possible, and restrict the llamas to a small area or paddock (a "sacrifice pasture") around the shelter. When weather and other conditions allow, the llamas might be allowed an occasional few hours in the larger pasture as a "vacation."

Companionship

Llamas need at least one other llama for their mental and emotional well-being. Although prospective owners on a limited budget may be suspicious that this is a way to sell two llamas instead of just one, this is unfortunately not true. Llamas who are deprived of llama company predictably develop neroses, from barely detectible but serious depression to obvious distress, and from abnormal interests in other species to severe aggression directed at "intruders," including humans. Fortunately, it is possible to obtain a llamower-quality companion for your single llama at very little initial cost. One option is to adopt one or more rescued llamas from an organization such as Llama RescueNet.

Most llamas are only truly happy with other llamas. Females in particular have a strong natural need to be part of a group. The best herd size for a group of llamas is usually four to six animals, although certain individuals can make or break the group peace no matter what the group size. Most llamas adapt well to being one of a pair, although human ineptitude can easily result in two llamas who will never go anywhere alone.

If the herd size gets too large, two groups may form. With adequate space, this may not be a problem, but if pastures are crowded, the amount of squabbling and even fighting often increase.

Adult intact male llamas are often a constant irritant in an otherwise well-adjusted herd. Males who are continually stirring up trouble are excellent candidates for castration; those males who are getting along have the best chance of producing the most managable and enjoyable offspring. Ultimately, mature breeding stud llamas have no ability to appreciate llama companionship other than that of "their" females (who cannot be copastured with studs without incurring certain risks). Intact males are also most prone to developing uncontrollable aggressive behavior when kept alone. Former studs do return to desiring llama companionship after castration, and also gradually lose their antagonistic tendencies.

Some llamas are highly territorial and want to protect certain creatures in their territory and expel all others. These llamas are happiest when employed as livestock guards, and they may be disruptive and unhappy in an all-llama herd.

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If you don't rescue ...

In other species, males can be castrated and kept with females. *Unfortunately, this just isn't possible with llamas.* Males castrated prior to 12-15 months and prior to any sexual experience can *usually* be kept safely with females. However, ALL late geldings (castrated after 15 months or after sexual experience) have already developed sexual interest that will be aimed at any female herdmates, *even if the geldings were never allowed any sexual experience prior to castration.* Not uncommonly, that sexual interest is foisted on gelded and intact herdmates

as well.

DON'T BREED!

Initial symptoms that a gelding is penetrating a female herdmate are obvious to the knowledgeable llama observer: the female is grouchy, irritable and defensive most of the time, suddenly "schmoozy" for a few days, then back to grouchy . . . and the cycle repeats. Depending on her coat type and condition, the female may also develop a "twiggy" tail, worn fiber on her back, and even sores or patches of missing skin. Although some of this may seem immaterial, the long-term effects are extensive reproductive tract scarring, infection, infertility, illness, and eventually untimely death for the female(s). They evolved to have intercourse only a dozen or so times in their lives -- not around 120 times in a single year.

A sexually-active gelding is at some risk as well -- he may damage his penis if hair from the female wraps around it and cuts or strangulates it. (All conscientious llama breeders take steps to ensure that the female's tail hair is safely confined before allowing a valuable stud to have access to her.) In "the wild," this damage ensures that no one male will dominate the gene pool. In domestication, it may mean the eventual loss of your animal's life if infection sets in or if the functional urinary tract is damaged.

Another risk to pasturing one or more geldings with one or more females is that some geldings' territorial instincts are triggered by the living arrangement. Such a gelding will fight being taken from "his property," will "act berserk" if the female is ever removed, and may attack anyone he perceives might harm or compromise his access to "his" female. Once these instincts are triggered, the only sure cure is removal of the territorial gelding to a different, single-sex farm.

If you are not sure how or are not able to determine whether a particular gelding is safe to keep with females, the safest policy is to decide whether you prefer geldings or females, and then buy only the one or the other. If it's too late for to follow that advice, always keep your females and your geldings in separate pastures and enclosures.

DO NOT be tricked into buying female-gelding combinations unless all geldings in question were both castrated by 15 months and have been proven completely safe with and disinterested in the seller's most prized, open breeding females!!!

Routine health care

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No drugs are yet approved for use in llamas. ALL of the products mentioned below fall under what's known as extra-label use when they are used in llamas, meaning that it is illegal to use any of these products -- even the over-the-counter products -- in llamas except under the direct supervision or order of a licensed veterinarian. In practice, llama owners routinely administer such drugs on their own, but with the risk that an adverse reaction could occur, or that the product might be ineffective. In both cases, there is no legal recourse.

Internal parasite control

Improperly chosen dewormers can be as ineffective as not deworming at all. All dewormers are ineffective against several significant species of internal parasites. For example, if nematodiris spp. are infesting your llamas, ivermectin products will do little good. If strongyles are the problem, moxidectin is usually the better choice. Rotating or alternating deworming products throughout the year may be necessary to get all species, however, rotation for the sake of rotation (ie, without a plan) only accidentally and occasionally results in effective parasite control.

In addition, nearly all internal parasites have an active season and a dormant season, so you will need to deworm at the proper times of year. For example, if you deworm in January (in most areas), you just wasted your money and left your llamas without the protection they will need come spring -- in winter, llamas won't be picking up parasites from their pasture, and most adult parasites they had have done their damage and are probably (or will soon be) dead of old age and gone.

Please consult with your veterinarian to develop an appropriate, effective deworming schedule for your own llamas. He or she may (correctly) recommend doing fecals on at least some of your llamas, particularly if they are showing outward signs of infestation.

A very useful means of environmental fluke control is an adequate population of mature, foraging ducks. Ducks can't completely prevent fluke problems, but they can greatly reduce them by eating snails, which are an essential intermediate host for the liver fluke parasite.

Deer can carry unwelcome parasites into your pasture. In some areas of the county, those parasites can be lethal. Fencing out deer can be a challenge, but if you put up five- or six-foot fencing and leave deer corridors around the perimeters, you will find that most of the deer will stay out of your pastures most of the time.

Types of dewormers we have successfully used in llamas:

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Administration of any of the following drugs falls under the category of "extra-label use" and must be done only by or on the direct order of your veterinarian !

ivermectin -- available as Eqvalan, Zimecterin, Equimectrin (pastes); Ivomec (injectable and pour-on);

Generally considered to be effective against a wide range of parasite species and stages, and also generally considered safer due to paralytic action rather than toxic principles. Best choice for trichuria spp. (whipworms).

We use the oral paste form at the same rate as for horses, rounded up to the next 50 pounds.

Pour-ons have produced temporary neurological symptoms in llamas, and also are reported to be less effective against internal parasites; we do not use them for those reasons.

Injectable ivermectin does sting, and also carries a risk of clostridial infections, so we do not use the injectable form.

Realize that many llama owners continue to use pour-on and injectable forms for their own convenience and without assessing their efficacy.

moxidectin -- available as Quest (oral gel) and Cydectin (pour-on)

Effective against somewhat fewer parasite species than ivermectin products, but has a longer residual action against larval stages of strongyles. Like ivermectin, moxidectin is a paralytic rather than a toxin. Unfortunately, moxidectin is comparatively expensive.

We use the oral gel form at the same rate as for horses, rounded up to the nearest 50 pounds. We do not use the pour-on preparation for internal parasites because we (and others) have not had good results with other pour-ons.

We have seen reactions to the pour-on form in some llamas and have not been able to determine why some react and others do not. The affected llamas have obvious coordination impairment when backing up, turning to the side, and sometimes, kushing. The symptoms do abate in about a week.

albendazole -- available as Valbazen (liquid drench)

Effective against liver flukes (adults only!), tapeworms, and a fairly wide range of parasite species (including nematodiris spp.), all at the standard dose. Very economical if you can buy a bottle and share with quite a few friends before the expiration date (typically 6-8 months); expensive if you cannot.

Because albendazole does not affect immature flukes (which cause most of the damage to the liver), **do not** rely on it for fluke prevention or control.

We are dosing at the cattle rate (1 ml per 25 pounds of body weight)

The label warns against use in cattle during the first 45 days of pregnancy; there have been abortions, stillbirths, and birth defects associated with (although not absolutely proven to be caused by) the use of albendazole in llamas during the first 45 days of pregnancy. We do not use this product in the first four months of a llama's pregnancy.

clorsulon -- available as Curatrem (drench)

Effective against immature and adult liver flukes ONLY. Long shelf life (about 5 years), but very expensive and sometimes difficult to locate.

When used at the right time of year and at appropriate intervals (or every 28-30 days year-round in heavily infested pastures), clorsulon is an

effective means of fluke control.

We are dosing at the cattle rate (0.37 ml per 10 pounds of body weight)

We use clorsulon in combination with fenbendazole (given a few days apart) for llamas in early pregnancy if the rest of the herd is receiving albendazole (Valbazen).

Rare individuals may experience a bellyache after receiving clorsulon.

*** * * Note * * ***

Clorsulon and ivermectin are also available in a combination injection as "Ivomec Plus." This form does not affect immature liver flukes (which cause most of the damage to the liver), so do not rely on it for fluke prevention or control.

fenbendazole -- available as Safeguard and Panacur (both pastes; Safeguard is also available as a drench, a pellet and a block)

Not quite as effective in some respects as ivermectin products, but does have superior performance against some species of parasites, particularly nematodiris spp. For tapeworms, the dose must be tripled to be effective; we prefer albendazole for tapes.

We use the oral paste form and dose at the horse rate.

The pellet form is difficult to chew and our llamas would eat it the first time, but usually refused it thereafter. The block form makes dosage rate impossible to control. We have not tried the drench.

We do not use any fenbendazole product in llamas under age one year, and avoid using fenbedazole in llamas under age two years. We have data that indicates fenbendazole may be responsible for temporary growth cessation in young llamas.

Fenbendazole does not appear to have any detrimental effects in llamas over two years, nor in pregnant llamas.

sulfadimethoxine -- available as Albon (injectable); also generic brands

If you don't rescue ...

highly effective against coccidia; most effective if the affected llamas can be moved to a "clean" pasture afterwards (or in mid-treatment) while their systems recover

dosage is the same as for cattle/calves

course of treatment lasts five days; the first day's dose is twice as high as days two through five

use only in llamas that have actually been diagnosed with coccidia

Notes about scheduling deworming and choosing dewormers

DON'T BREED!

Purge dewormers are more effective when they are given twice in a season in order to get the parasites that were previously eggs and thus unaffected by the first dose. We usually deworm twice, about three weeks apart, in the spring and again in the fall.

If you and your veterinarian believe that your pasture harbors liver flukes, dose all llamas with a flukicide (albendazole followed by clorsulon, or clorsulon only) in 2 to 8 week intervals (consult with your veterinarian to select the best interval for your situation) during the vulnerable season (usually from the onset of warm weather).

If fecal exams reveal elevated levels of a specific parasite, have your veterinarian help you choose the best dewormer for that species and the most appropriate deworming interval for it's life cycle.

We weigh all llamas before administering most kinds of dewormers.

We have been finding that around age 3 months, crias' weight gain slows, but responds well to an initial deworming with ivermectin or moxidectin at that time.

Pyrantel pamoate (Strongid, also called Strongid P, available as a paste) is only effective in monogastric species (such as dogs, horses, and swine). Although it has been used without reported harm in llamas, it is not adequately effective as a dewormer because camelids (that includes llamas!) and ruminants deactivate the drug before it gets to where most of the parasites are. **Pyrantel tartrate** (Strongid C, a pelleted form to be fed every day) has reported efficacy against several parasite species when given to true ruminants, but we have not used it in our llamas, and so can't comment on it.

*** * * Important * * ***

If you have a llama with liver flukes, administration of a flukicide (albendazole or clorsulon) can result in severe illness and possibly death. Left untreated, liver flukes will eventually kill llamas. Yes, it's a Catch-22. Discuss the risks, alternatives, and necessary simultaneous supportive therapy with your veterinarian before administering flukicides.

*** * * Important * * ***

In areas where meningal worm is present, it is necessary to treat all llamas with an injectable ivermectin product every 28 days in order to kill the immature worms before they can reach the spinal cord, where they commonly cause paralysis and/or permanent nerve damage, and are very difficult to eradicate. Your veterinarian can tell you if "m-worm" is a concern in your area, and also help you formulate an effective program to prevent m-worm in your llamas.

Administering dewormers and topical parasitides

Paste and gel dewormers are best put well back in the mouth at the bottom of the area between the cheek and lower gum, ***not on the tongue***. Most are formulated to be rather sticky, so even coughing and spitting llamas seldom "return" any of the product -- **IF it was placed correctly.**

Drenches (liquids) can be easily administered with a curved-tip infusion syringe (ask your veterinarian for a few). You will have to measure the dose separately because there are no marks on the infusion syringes. Tuck the entire tip in the corner of the llama's mouth (the syringe opening should then face the llama's throat). Hold the mouth shut and elevate the chin slightly if necessary to discourage a spitter or drooler. Wait until the

llama swallows before letting go.

Pour-on formulations must be applied very carefully to be effective; this can be nearly impossible on ungroomed llamas. Take a pair of slicker brushes and brush open a deep part (to the skin) along the llama's spine. Apply the product to the skin. Brush the fiber back over the part (it is good practice to always discourage fiber parting along the spine).

Caution: pour-ons are less effective against internal parasites than oral and injectable forms. Also, some pour-ons can render fiber less desirable or even useless for a time, and they can also make a classic llama's coat bind up and painful to groom.

Caution: no pour-on product has been formulated for llamas, so they may absorb it more rapidly than cattle, which can in turn lead to temporary paralysis or paralysis-like reactions. Don't use pour-ons if you will be doing anything with the treated llamas afterwards or if you will not be around to monitor them.

Injectable formulations -- see information on giving injections, below

Delousing

Lice are the most common external parasite of llamas. Our experience is that "clean" llamas stay clean of lice, and once lice are properly eradicated, llamas will not need further treatment unless they are exposed to contaminated llamas or contaminated bedding. Llamas have their own louse species, but some people who keep llamas with sheep have indicated that sheep lice apparently will infest llamas.

Adult lice can rarely be seen, but the nits (eggs) are readily visible in colored wool. Heaviest concentrations are found on the llama's flanks and thighs. For llamas with light colored or white wool, you will have to brush, comb, or shear (depending on coat type) a sample from the abdomen just in front of the rear legs and spread the fiber over a dark cloth. Look closely for nits attached to the hair shafts.

There are no delousing products labeled for or approved for use on llamas We have tried medicated shampoos and livestock dusts with mixed success. Both must be repeated several times to get the new lice that hatch after application.

There are numerous pour-on preparations available for cattle and sheep. Cydectin pour-on has worked best for us and has the advantage of not causing grooming difficulties, but it does leave a purple streak down the animals' backs and some llamas do react with temporary coordination impairment. We did have good success with a single application of Dectomax pour-on (doramectin) at the cattle dose (1 ml per 22 pounds body weight), but it caused significant grooming and shearing difficulties, so we no longer use or recommend it.

All pour-on products for lice must be applied carefully and correctly on llamas if they are to be effective at all (see above: administering dewormers). Some require that the animals remain dry afterwards. Read the directions carefully. Also remember that no pour-on product has been formulated for llamas, so they may absorb it more rapidly than cattle, which can in turn lead to temporary paralysis or paralysis-like reactions. Don't use pour-ons if you will be doing anything with the treated llamas afterwards or if you will not be around to monitor them.

Finally, do not use a pour-on preparation for lice and deworm the same llama(s) with any product in the same drug class within a week before or after. The combination could result in an overdose.

Other external parasites

Ticks may also be affected by externally-applied preparations. Injectable ivermectin was once said to be effective against ticks, but that has been called into question. We have no experience with ticks in our area, but Dusty did pick one up while packing out of the area -- despite a travel-permit-required injection with ivermectin less than two weeks prior to his last opportunity to pick up the nasty thing!

Inoculations

*** * * Important * * ***

Like dewormers and external parasitides, no specific vaccines have been tested in llamas. As such, administration of any of the following drugs falls under the category of "extra-label use" and must be done only by or on the direct order of your veterinarian.

It is also unknown how effective, if at all, each vaccine may be in llamas. Most llama owners assume that their llamas derive some protection from being inoculated.

Please consult with your veterinarian to formulate a vaccination program that is appropriate for your own llamas. If you want to learn how to give injections yourself, ask your veterinarian to show you how, and see injections, below.

Clostridial diseases -- We use a vaccine against Clostridium C & D and Tetanus (sometimes called "CD/T" or "three-way"). Other llama owners use "7-way" and "8-way" vaccines. Just because a vaccine is effective against many things does not mean that it includes tetanus -- you need to check to be sure. It is not known how long protection is conferred; we now give boosters every two years based on limited evidence that titers are still very adequate after one year.

Leptospirosis -- We use a "5-way" vaccine against five common strains of leptospirosis. It is not known if or how long protection is conferred; we currently give a single booster one year after initial vaccination.

Other vaccines -- Depending on your situation, your veterinarian may recommend additional vaccines. In some states, rabies vaccination is required by law.

If you don't rescue ...

*** * * Note * * ***

We do not inoculate with any vaccine against clostridial diseases on the same day that we deworm a llama with an ivermectin product. Most llamas are fine, but a few show definite discomfort (moderate to severe) for about 24 hours after receiving the two in combination.

DON'T BREED!

Grooming

The first and most important part of grooming is to **identify the llama's wool type**. There are three wool types (actually two true types and a cross between the two), and each type is groomed differently.

Classic llamas

The two defining features of classic llamas are:

- a double coat with abundant guard hair, and
- regular, seasonal sheds when dead underwool combs out easily

If your llama does not comb out easily, no matter how short the fiber is, it is NOT a classic llama. The only exception is a llama whose grooming has been so neglected that there is no hope of telling whether it is a classic llama or a cross. In any case, if the llama's coat won't comb, DO NOT comb it! It will only frustrate you and hurt the llama terribly.

Shearing a classic llama is not only unnecessary, it is potentially dangerous. The shedding double-coat (not fleece!) of the classic llama relies on

abundant guard hair rather than density for weather protection. A shorn classic coat is too sparse after shearing to maintain body heat in inclement weather, and the protective guard hairs will be too short to shed rain and snow or deter insects. A shorn classic llama will burn much more easily through it's sparse coat than a shorn, dense-fleeced woolly or crossbred llama.

Classic llamas will maintain a clean, healthy coat with occasional grooming. Very regular grooming can also allow some near-classic crosses to be kept free of dead fiber and mats. Combing minimizes the risk of heat stress as well or better than shearing, and also leaves adequate protection from inclement weather. In short, a combed classic llama is a true all-weather llama.

After combing, your classic llama needs no special care, but if s/he had any heavily matted parts, s/he may be a bit sensitive in those areas for a few days.

The grooming tools we recommend for classic llamas are:

slicker brush - Twinco/Lambert Kay "Ever Gentle", size large

These are pretty common and can be found in most pet stores. We've tried several other brands with poor to very bad results, so we wouldn't recommend experimenting.

v-rake

The Aaronco rake handle is most comfortable for the human, but it does tend to fatigue and eventually breaks under normal use. The "Grooma" brand v-rake is next most comfortable, but the rotating-tooth design tends to cost more without obvious benefit to the llama. Both the Aaronco and the Grooma rakes have rounded tines that are easy on llamas' skin.

Wooden-handled models have significantly better durability, but some of them have more pointed tines and require sensitivity from the human.

The slicker is used to break apart felting fiber tips, dried mud, and remove surface vegetation. Regular brushing decreases combing time markedly by removing dead fiber as it is shed and before mats form. On llamas that have been dematted to the skin, the slicker can also be used to gradually remove embedded vegetation and debris and mats that are just starting to form.

The comb or rake is used to remove dead underwool. A llama's wool grows out, not down, and so the rake is used primarily with a "picking" motion to tease mats and dead fiber clusters from the live wool without undue pulling and pain. A complete combing should be done once in the spring and once in the fall. If you notice there are some areas that resist combing even though others do not, wait a couple of weeks and try again -- the shed is not simultaneous, and some areas release fiber later than others.

A classic llama with a healthy, dematted coat will collect very little (if any) vegetation or debris on the coat surface, and very little beneath except at the base of the neck. Dust can be worked out with a leaf blower.

At some times of the year, guard hair becomes dry and tangles easily. A spray-on conditioner will make the job much easier for you and will make your llama a lot happier. Lama Groom has given us good results; EQyss rehydrant spray (diluted 1:4 with water) also works well. Both products allow the coat to shed debris and stay cleaner for some weeks, and they do not make the hair slick, so packing equipment will still function properly.

Reclaiming neglected classic coats

If your classic or near-classic type llama's coat was neglected, or if s/he got into a substance that cannot be removed from the coat, shear as for a crossbred llama (see below). After shearing, initially care for him or her as you would any shorn llama (see below under woolly llamas).

Grooming procedures for the neck and tail do not change unless severe mats or presence of an adhesive or unhealthy substance necessitated shearing them as well. "Dreadlocks" in the tail may take months to work out completely -- be patient, and try to tease them apart rather than pulling or combing them out. A horse mane-and-tail detangler will often ease the job ("Cowboy Magic" can work extremely well).

Woolly llamas

A woolly llama is defined by:

- dense body fleece that does not shed and will not comb
- dense neck fleece that does not shed and will not comb

The foundation of grooming for woolly llamas is shearing. This does not mean that the resulting fleece will be worth saving -- good fiber has characteristics besides density, and vegetable debris can ruin even the finest quality fleece. Fiber evaluation is a whole 'nuther topic!

Woolly llamas should be shorn yearly for their health. If you want to produce a usable fleece from your fine-fibered, single-coated llama, pasture him or her continually in areas that will minimize or eliminate vegetation and debris in the fiber (dirt and grease will wash out).

There just isn't space on this website to adequately describe how to shear a woolly llama safely. It is usually best to pay someone to give you a shearing lesson if your llama is tractable enough to touch all over. Otherwise, you will be paying someone to shear for you anyway.

Selecting a knowledgeable shearer is important. Sheep shearers don't always have an adequate knowledge of llama anatomy, which is particularly problematic because they use equipment that sacrifices safety for speed (sheep are usually perceived as being more expendable). Many, many so-called llama shearers will only shear the easy parts of the llama (usually the top and sides of the body) and then give you any number of stories why they will not shear the entire animal, such as "this is a pack cut" or "this is a show cut" or "this is how llamas are shorn." Some will not leave enough fiber on your llama because it is a lot easier to shear to the skin; some will leave too much because they don't know any better. Interview the shearer before he or she comes out! You want someone who will:

- shear to 1/2" (unless the situation is unusual, such as: the weather is cold and you need to shear the top off a rescue's fleece to rid the animal of debris or filth)
- shear the entire body, including the neck and down to the knees and hocks, and trim the tail if necessary ***(see photo at above right)***
- if the fleece is worth saving, grade and sort the fiber as it is shorn

Post-shearing care:

- provide shelter; make sure that other llamas do not exclude the newly-shorn one(s)
- bring a fitted windproof and water repellent sheet if you *must* take the llama into the backcounty (shorn llamas are not a good choice for pack animals, and should generally be avoided)
- when the fleece has grown back to about 2 inches, your llama will no longer be able to disperse heat safely when exerting -- shear again before asking the llama to pack or drive
- for the unusual case that must be shorn right to the skin, protect from sun with a combination of a fitted, breathable sheet and confinement to shaded areas until at least a half-inch of fiber has grown back.

It is normal for recently shorn llamas to take shelter or seem cold for the first one or two nights. It does take them some time to adjust, and that's no cause for concern as long as they are protected from rain and wind.

Use only soft brushes (such as a soft body brush for a horse) on closely shorn areas for the first month or so -- a slicker brush will jab and irritate the skin. Begin using a soft slicker (Ever Gentle® by Lambert-Kay) or a pin brush for surface grooming when the fiber has grown back to about an inch long.

A blower will help remove dirt and debris from a short fleece. If the remaining fiber has grease or staining from sweat, dirt and/or ashes, you can shampoo to give the growing coat a healthier start and a better chance at resisting mat formation (we use Pert Plus®). Virtually all llamas accept a warm-water bath very well; cold water is not as well-tolerated, even in very hot weather.

Stick to surface grooming once the fleece has begun to grow back. Deep grooming is painful for woolly llamas, and does not provide any advantage (unless the llama has a skin parasite or condition, in which case it should be re-shorn). Most handspinners prefer that the fiber is not deep-groomed, and certainly deep grooming allows much more debris to enter than is removed in the process.

If you don't rescue ...

Crossbred llamas

DON'T BREED!

A crossbred llama is the product of a woolly llama bred to a classic llama, or one of those llamas bred to a crossbred llama. The resulting llama may look anywhere in between the two types, but the fleece has characteristics of both:

dense body fleece that does not really shed and will not comb without pain
shorter neck and leg wool that has guard hair, does shed and will comb

A crossbred llama is shorn yearly or every two years depending on fleece regrowth (for information on shearing, see woolly llamas, above) and the neck and tail are kept brushed and combed (see classic llamas, above). You should go through the same interview process with any prospective shearers as you would for woolly llamas . The most important difference in shearing crossbreds is that the neck fiber is not shorn ***(see photo at right).***

Crossbred llama fleeces may be used for stuffing llama saddles and toys, and for making upholstery fabrics, curtains, and wall hangings. Although outer garments can be made from them, most people find the result itchy and uncomfortable. It's true that it's easy to pull out the long guard hairs, but there are also shorter guard hairs -- just as prickly -- and in practice, you'll never come close to getting them all.

Summary of common grooming malpractices:

Fashion shearing -- Pattern shearing is a hold-over from the days of big money for more wool, and still persists in the show ring (where it is rewarded by most judges) and in national advertising. Pattern shearing compromises temperature regulation (see temperature studies, phase two). The shorn sections are also commonly shorn to the skin (see below).

Rationalized neglect -- An unshorn llama is not bigger, nor does it have "more substance." A ten-pound coat of dead fiber and dirt is not healthy. It pulls at the skin and makes any contact painful; it can also restrict leg movement and bind the tail to the rear legs, trapping feces. It also provides a prime habitat where certain parasites and difficult-to-resolve skin conditions can proliferate.

Shearing all types or combing all types -- Dogs are not groomed alike. Cats are not groomed alike. Human hair styles are not maintained alike. Llamas have different coat types with genetically determined traits, and have different grooming practices appropriate to each. Woolly llamas and crossbred llamas are put through tremendous pain if their fleeces are combed; classic llamas are dangerously compromised when their sparse coats are shorn.

Shearing to the skin, leaving too much fiber, or shearing too short in inclement weather -- Llamas weren't meant to have their skin exposed to

the elements. Llama skin burns easily, and is very sensitive to insect irritation. Ideal cooling is achieved only when less than 1" of fiber remains; full weather protection is not afforded when the fleece is shorter than 2".

Toenail trimming

Each llama's toenails grows at a different, genetically-determined pace. Llamas' toenails should be trimmed on an individual schedule. Many require trimming 3-6 times per year; some never need trimming; a number need trimming every month or so. In addition to variable nail growth and individual wear, the weather conditions will make a difference in your llama's toenail trimming needs. Llamas can get by with less trimming if the ground is soft (their nails will sink in, and will also be softer and more likely to wear down); they need trimming more often when the ground is hard and the weather is dry. Nearly all llamas' toenails will need trimming when the ground becomes hard after spring rains and snowmelt are gone.

Regular toenail trimming is a simple task when you start with a llama that is cooperative about foot handling and has properly-trimmed nails. Reclaiming (or minimizing problems from) neglected, twisted, overgrown toenails is a job for a professional. Likewise, trimming a recalcitrant or frightened llama is also a job for a professional -- or two!

Like shearing, correct toenail trimming can be a fairly detailed proposition, and a full treatise would overload our alloted website space. We recommend that you find a compentent llama toenail trimmer in your area and arrange for a one-on-one lesson. Please understand that your veterinarian is not versed in llama toenail trimming, and a farrier won't know the first thing about llama toenails, either.

Most llama owners use and recommend tools similar to rose pruners for trimming toenails because it is simple to figure out -- it works like a pair of scissors. They also tend to draw a lot of blood when trimming nails. With all our experience, we can only manage to duplicate their blood-letting, and we've realized that the problem is not the technique, but the tool itself -- the blades are not placed fully on the nail before cutting, and even a minor jerk on the llama's part (fairly common, even among the well-trained) results in the tool cutting something that wasn't intended.

Although the learning curve is steeper for learning to handle them, the safest and best tool for toenail trimming is a high-quality pair of 10" horse hoof nippers. They are less likely to cut you or the llama, even if the llama becomes unexpectedly fractious.

For llama shearing, combing, and toenail trimming, or for lessons:

in western Washington -- JNK Llamas

Routine medical procedures

Neutering

Neutering enhances the quality of life for any domestic animal. Neutering also makes day-to-day management choices, options, and procedures much simpler. Finally, neutering greatly enhances the human/animal relationship and bond. It is unfortunate that some llamas lose the benefits of neutering for the sake of human fantasies or egotism.

The straight scoop about breeding is not a pretty picture. Although baby llamas sure are cute, they are only cute for six months to maybe a year out of their 20-30 year lifespans. It is important to understand and accept that there are far too many llamas already out there that have no hope of finding any home but the slaughterhouse. Also understand that breeding your favorite llama just once will result in permanent, negative changes to his or her personality and to your relationship with him or her. Also realize that raising a well-trained cria is not a simple matter, and that your screw-ups will live well into their twenties . . . if they can find a home that will accept them with their quirks.

Unless you have unusually oustanding llamas that excel at a given end use, the specialized knowledge to successfully breed llamas for that end-use, AND the thousands of llamas who are already out there can't fulfill the demands of that end use, neutering your llamas is the only responsible course of action to take.

Unfortunately, some people misunderstand what llamas' sex lives (or lack thereof) are really like, incorrectly anthropomorphizing that the animals enjoy being intact and yet not regularly fulfilling their strong natural drives. Quite frankly, a sexually-frustrated male llama is not an inspiring picture. Habitual, incessant pacing, senseless fighting with otherwise peaceful pasturemates, clambering on fencing, and refusal to be caught except by tricks and bribes are hardly the foundation behaviors of a rewarding relationship or a comfortable existance. Female llamas are not exempt -- their unique reproductive cycle leaves them constantly "in heat," and although less violent than their male counterparts, they experience similarly heavy stress and distraction. A true human friend sees these sexually-oriented behaviors for what they are and relieves nonbreeding llamas of sexual frustrations and anxieties through neutering.

Castration or gelding is the standard surgical procedure for neutering a male llama; spaying is surgical sterilization of a female llama. Castration is much cheaper at this time, but we highly recommend both procedures for llamas that will not be breeding, even if they have been bred in the past.

Fighting teeth

Llamas' canine teeth have evolved to become dangerous weapons. Instead of four, llamas now have six (and sometimes eight) razor-sharp canines, more commonly called "fighting teeth." It is important to remove the exposed portions of these teeth for herd and handler safety. (Most scientists still contend that the first upper canines are in fact modified incisors, but the evidence for that viewpoint is pretty slim. The exact classification is far less important than the severe damage that can be done by whatever-you-want-to-call-them!)

Two of the six fighting teeth in an adult male llama just before removal (see arrows).

Intact male llamas' front upper fighting teeth erupt around the age of 28 months, usually can be blunted by 32 months, and proper cutting is generally possible around age 3 years (but keep checking every month!). A second cutting will be necessary around 4-6 years. The lower canines usually follow shortly after the first uppers. In some individuals, the lowers may become visible through the gum as early as 8 months. Fortunately, these precocious lower teeth wait until the usual 28-30 months to resume eruption, so early blunting is not necessary. Once the front upper fighting teeth begin to erupt, castration will not alter the timetable of eruption and need for cutting, nor will castration affect final tooth size.

If you don't rescue ...

Females and geldings (unless castrated late) generally erupt smaller fighting teeth around the age of 3-1/2 to 4 years. Some females' fighting teeth never erupt. Most females and geldings are less inclined to fight, and so it may be possible to wait until the teeth are all fully erupted before removal. In addition, the teeth will only have to be cut once -- this is another good reason to practice timely castration.

DON'T BREED!

Fighting teeth are sawed off with obstetrical wire with the llama in a restraint chute or under sedation (sedation is generally used only if another procedure requiring sedation is necessary or if no chute is available), and is a job for an experienced individual. Teeth of females, geldings, and immature males are cut flush with the gum; teeth of older males and late geldings should be cut at least 1/8" above the gum line to minimize exposure of the dentin. When properly performed, fighting tooth removal does not cut into the sensitive portion of the tooth and causes the llama no pain other than the pressure on the tooth during cutting and the indignation of having human fingers inside his or her mouth.

*** * * Important * * ***

Fighting teeth may not be as represented. They may have been cut when the animal was young and continued to grow, or they may have erupted since they were last checked -- always check them yourself!

Dental care

Molars

Because of the structure of llama molars and the motion llamas use to chew, sharp points are often formed on the outer edges of the upper molars and the inner edges of the lower molars. These sharp points can interfere with general eating and cud chewing, and thus often result in lowered nutrition and often weight loss, from subtle to dramatic. Typically these points first develop between ages 8 and 12 years, but younger llamas may develop them as well. Older llamas frequently develop sharp points and other molar anomalies as they lose teeth, the remaining teeth shift, and grinding patterns change. All of these problems can be addressed by floating (filing) the teeth.

The most common sign that llamas' molars require floating is that they begin to routinely pack a wad of cud directly over the sharp pointed tooth for padding. This wad is easily visible to the observer. In older llamas, you may instead observe quidding -- big wads of partially-chewed hay and grass dropped out of the mouth and on the ground around the barn or pasture (although sometimes the only sign is grain or pellets dropped below that llama's feeder). For llamas that quid, x-rays are recommended because molar abcesses or other dental problems are likely.

An upper-arcade float for horses (or preferrably ponies or miniature horses) is the tool of choice for most situations. The head of the float holds a small file, usually reversable from coarse to smoother. We use the smoother side, preferring to take off less in more sessions rather than taking off too much at once.

We have had the best results with the llama held, tied, or in a chute depending on it's training and comfort level. Under sedation, the llama's mouth tissues relax and are easily caught and damaged in the process, so we do not sedate for this procedure.

Patience is the key!!! It may take quite some time to get the mouth open and the float inserted, and some more time to get it properly situated (against the outer edge of the upper molars and diagonal to them), but once the llama is resigned to a big thing in it's mouth and allows everything to be set up, the actually filing goes quickly and easily. File only until the float begins to move easily over the tooth edges (you'll hear a change in the sound). If cud-packing is not resolved or if it recurs in another location (not uncommon), you can repeat the procedure in a week or two.

If you don't have enough llamas to justify buying the floats and learning the techniques, virtually any large animal veterinarian has the skills and tools (although some may cling to outdated information that llamas "don't need floating").

Incisors

Yet another legacy of our mixed-breed (llama-alpaca) North American gene pool is a significant segment of the llama population has inherited the constantly-growing incisors of the alpaca (and vicuna). Some llamas also have malconfomed jaws that prevent their incisors from properly contacting the bite plate (upper jaw).

In both cases, the incisors should be trimmed. Sedation is required, and thus a veterinarian is usually called to do the job. A small, hand-held Dremel® tool with a miniature circular-saw type blade works very well for scoring the teeth. The cut can be finished with the Dremel® if very little is being removed and the teeth are thin; otherwise obstetrical wire is placed in the groove made by the Dremel® and is used to finish the job.

*** * * Important * * ***

Do not confuse receeding gums in older llamas for too-long incisors! If the tops or very upper inside edges of the incisors are contacting the front edge of the bite plate and the top and bottom molars are meeting, it does not matter how long the incisors appear to you. Trimming incisors on these animals can have devestatingly negative effects on their ability to eat, and you can't reverse the procedure once it's been done.

Monitoring for abcesses

Llamas are prone to lower molar abcesses. No one is really sure why, although there is reason to believe that females bred young may be prone, and that there is a genetic predisposition to peridontal disease. Both groups typically develop abcesses at a fairly early age -- between ages four and eight. However, other llamas with no particular risk factors may also develop abcesses, and at any age -- from under age two (in the deciduous teeth) and throughout their long lives (until they run out of teeth to abcess).

Small abcesses can only be detected with an x-ray. Most people do not schedule periodic dental x-rays for their llamas, but for llamas at risk, this is a good practice. Llamas with more advanced molar abcesses may be reluctant to drink cold water, may quid (drop partially-chewed grain or hay out of their mouths), or may avoid eating grains or pellets entirely. Many times you will be able to feel a slight swelling of the lower jaw bone around the tooth; you may also see the skin below one jawbone droop. In acute cases, the entire side of the face may swell dramatically -- feel for a hard, enlarged area on the jawbone to distinguish from soft tissue abcesses, insect bites, and other causes.

An x-ray will be needed for diagnosis. Although small abcesses can be put in remission with long-term antibiotics, most will require surgical treatment. If the abcess is not too advanced (which is unlikely if you've already seen any external symptoms), the llama equivalent of a root canal may be possible. Otherwise, extraction will be the recommended treatment. Llamas' molars continue to erupt slowly over their lifetime to compensate for the extreme wear from grinding their abrasive foods (grass and hay contain a lot of silicates), so in an older llama (18-20 years and older), it is more often possible to remove an abcessed tooth under sedation because the roots are shallower. In young and middle-aged llamas, however, the abcessed tooth must be punched up from below, which requires careful surgical preparation and general anesthesia -- not cheap, but the results tend to be excellent.

Injection sites

The best way to learn how and where to give injections is with the help of your veterinarian -- a demonstration is worth a thousand words,

particularly if the words aren't read carefully!

Subcutaneous injections (also "sub-Q" or "SQ") are generally given into one of three sites in front of the shoulder blade. Don't try this without a demonstration -- there are critical nerves and blood vessels that you could damage! Injectable dewormers are usually given SQ, as is Albon (for coccidia).

Intermuscular injections (also "IM") may be given into the triceps and the semimembranoses. Again, don't try this without a demonstration -- you could lame your llama! Some veterinarians are comfortable administering injections IM into the lower muscling of the neck; others say to NEVER do such a thing. A few use the lumbar muscles because of their ready accessability; as users of working llamas, we absolutely do not allow use of this site unless the animal in question is a difficult-to-restrain rescue with no safe alternatives. In any case, learn to use all the available sites your veterinarian will teach you. If you will be giving injectable medications for several days, it is important to rotate injection sites.

Absorption rates are different for SQ and IM, and some substances behave differently when given by different routes. If your vet prescribes one route, consult with him or her before changing to a different one.

Most well-trained llamas will accept injections while tied or cross-tied. Putting a llama in a restraint chute for an injection may not be wise, depending on the chute design -- the most common problems are injury to the handler's hands, and increased risk of damage to the llama from bent and/or broken needles. It is worth mentioning that we have never needed a restraint chute for administering injections despite the large number of rescues and rehabs we have dealt with over the years.

20 gauge, 3/4" needles work best for IM injections in llamas. 20x1" are good for SQ injections, can be used for IMs on muscular adults in a pinch, and also work well for jugular blood draws on the thicker-skinned males and geldings. If you find yourself dealing with a lot of crias, stock some 22x1/2" needles as well.

Techniques for administering oral medications to llamas

Liquids

If your llama is not a fussy eater, liquids can be mixed into crushed or rolled grains (not pellets). Do watch to make sure your llama doesn't dribble the medicated grain on the ground. Not only will he or she not get all of the meds, but some substances are toxic to other animals, and so any spills will need to be cleaned up.

If your llama can't or won't eat grain, or just won't touch anything that's been adulterated, a 12ml infusion syringe (ask your vet for a few) will

usually do the trick -- unless the liquid in question is too stiff or thick to draw into the syringe.

Measure out the dose in another syringe first (there are no marks on the infusion syringes). Standing on the llama's right side (if you are right-handed), tuck the curved tip into the corner of the llama's mouth so that the tip is facing the llama's throat. Slightly (not too much!) elevate the llama's head so that the liquid will not cascade out onto the ground and push the plunger. Wait until the llama has swallowed before letting go. A spitter may need to have his or her mouth held shut for awhile afterwards.

If you don't rescue ...

Powders and pills

Powders can also be mixed into crushed or rolled grains (not pellets). The trick is to get all of the powder to stick to the grain and not be left at the bottom of the bowl. A tablespoon of oil works well (A, D, & E fortified wheat germ oil may be a desirable addition to some llamas' diets). For llamas that like apples, a small spritz of apple juice will provide the necessary moisture. Others may not like apples, but are suckers for watered-down maple syrup. Grated carrots can also do the trick for those llamas who like them.

DON'T BREED!

Pills can be ground into a powder with a mortar and pestle, or with a hand-operated pill powdering device. If you have the option, get capsules instead of pills and just open the caps as needed.

Then there are the llamas who won't touch grain that's been tampered with (as well as those llamas who should not or cannot have grain). Powders can be mixed in just enough syrup or jam (which one depends on the properties of the powder) to make a thin paste that is just barely runny, spooned into a spent ivermectin tube, and administered like a paste dewormer. (To get the ivermectin plunger to slide more easily in the tube, use a bit of oil.) Although this is sometimes a tedious procedure, if you chose a syrup or jam that is to the llama's liking, you'll get a wonderful payoff later: a llama that is very easy to deworm. (Logan was keen on blueberry and maple syrups and loganberry jam, but did not like strawberry or blackberry -- "Too sweet," he said.)

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If you don't rescue ...

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