PAPER ID: PMC1831764

TITLE:
Ethnoveterinary medicines used for ruminants in British Columbia, Canada

ABSTRACT:
BACKGROUND: The use of medicinal plants is an option for livestock farmers who are not allowed to use allopathic drugs under certified organic programs or cannot afford to use allopathic drugs for minor health problems of livestock. METHODS: In 2003 we conducted semi-structured interviews with 60 participants obtained using a purposive sample. Medicinal plants are used to treat a range of conditions. A draft manual prepared from the data was then evaluated by participants at a participatory workshop. RESULTS: There are 128 plants used for ruminant health and diets, representing several plant families. The following plants are used for abscesses: Berberis aquifolium/Mahonia aquifolium Echinacea purpurea, Symphytum officinale, Bovista pila, Bovista plumbea, Achillea millefolium and Usnea longissima. Curcuma longa L., Salix scouleriana and Salix lucida are used for caprine arthritis and caprine arthritis encephalitis.Euphrasia officinalis and Matricaria chamomilla are used for eye problems. Wounds and injuries are treated with Bovista spp., Usnea longissima, Calendula officinalis, Arnica sp., Malva sp., Prunella vulgaris, Echinacea purpurea, Berberis aquifolium/Mahonia aquifolium, Achillea millefolium, Capsella bursa-pastoris, Hypericum perforatum, Lavandula officinalis, Symphytum officinale and Curcuma longa. Syzygium aromaticum and Pseudotsuga menziesii are used for coccidiosis. The following plants are used for diarrhea and scours: Plantago major, Calendula officinalis, Urtica dioica, Symphytum officinale, Pinus ponderosa, Potentilla pacifica, Althaea officinalis, Anethum graveolens, Salix alba and Ulmus fulva. Mastitis is treated with Achillea millefolium, Arctium lappa, Salix alba, Teucrium scorodonia and Galium aparine. Anethum graveolens and Rubus sp., are given for increased milk production.Taraxacum officinale, Zea mays, and Symphytum officinale are used for udder edema. Ketosis is treated with Gaultheria shallon, Vaccinium sp., and Symphytum officinale. Hedera helix and Alchemilla vulgaris are fed for retained placenta.
CONCLUSION: Some of the plants showing high levels of validity were Hedera helix for retained placenta and Euphrasia officinalis for eye problems. Plants with high validity for wounds and injuries included Hypericum perforatum, Malva parviflora and Prunella vulgaris. Treatments with high validity against endoparasites included those with Juniperus communis and Pinus ponderosa. Anxiety and pain are well treated with Melissa officinalis and Nepeta caesarea.

Background:
Our research co-operatively documented and validated (in a non-experimental way) the ethnoveterinary medicines used by livestock farmers in British Columbia. As scientists we evaluated technology already developed by farmers or community members. Ethnoveterinary medicine is the scientific term for traditional animal health care. Research into ethnoveterinary medicine is often undertaken as part of a community-based approach that serves to improve animal health and provide basic veterinary services in rural areas. The research area of British Columbia had 383 organic farms in 2004, a decline of 1.5% since 2001, on approximately 25,000 acres [10,000 ha]. This represents 1.9% of all farms. There are an additional 77 farms in transition to certified organic production [1]. Only 1.5% of the population of British Columbia lives on a farm [2].
The average wage for farmers working full time in agriculture in the Capital Region of Vancouver Island was $14,000; however 53% of all farms have receipts of less than $5000. It was reported that 7,460 farmers in British Columbia with annual sales of over $10,000 have a low net farm income. The return to assets on these farms ranges from -1% for farmers with sales of $19,000 to $25,000 to 5.2% from farms with sales of over $250,000. Only 13% of farmers report receipts of over $25,000 [2]. In 2003 there were 420 certified organic farmers 51% of which had less than $10,000 in gross sales [1]. Twenty percent of these organic farmers had over $50,000 in gross sales [1]. These figures are important because sustainable agriculture has been defined (by the Federal-Provincial Agriculture Committee on Environmental Sustainability) as that which is economically viable for the present generation of farmers and environmentally sustainable for the future generation [3,4].

Validation workshop ::: Materials and methods:
Ten participants with experience in traditional human and ethnoveterinary medicine took part in a participatory five-day-long workshop at the University of Victoria (BC), in October, 2003. In the

workshop the facilitator asked participants very specific questions in a supportive environment about the medicinal plants used. Each animal/livestock species was covered in a morning or afternoon session, other than the core group, different participants came to different sessions [4]. At the ruminant session the four participants (herbalists and ruminant owners) introduced themselves and their work and were instructed on the participatory workshop method. The participants discussed the previously produced ruminant section of the data. There were two editorial assistants/facilitators in attendance. After the discussions, the ruminant section was edited.

Non-experimental validation of ethnoveterinary remedies ::: Materials and methods:
The researcher and the ethnoveterinary consultant completed the non-experimental validation of the remedies in advance of the workshop. A low-cost, non-experimental method was used to evaluate the potential efficacy of the ethnoveterinary remedies [4]. This method consisted of:
• obtaining an accurate botanical identification of the herbal remedies reported;
• searching the pharmaceutical/pharmacological literature for the plant's identified chemical constituents in order to determine the known physiological effects of either the crude plant drug, related species, or isolated chemical compounds that the plant is known to contain. This information was then used to assess whether the plant use is based on empirically verifiable principles.
Supporting ethnobotanical data and pharmacological information was matched with the recorded folk use of the plant species [5-12], to determine degrees of confidence about its effectiveness. Four levels of confidence were established:
1. Minimal level: If no information supports the use it indicates that the plant may be inactive.
2. Low level: A plant (or closely related species of the same genus), which is used in distinct areas in the treatment of similar illnesses (humans or preferably animals), attains the lowest level of validity, if no further phytochemical or pharmacological information validates the popular use. Use in other areas increases the likelihood that the plant is efficacious.
3. Mid level: If in addition to the ethnobotanical data, available phytochemical or pharmacological information is consistent with the use, this indicates a higher level of confidence that the plant may exert a physiological action on the patient.
4. High level: If both ethnobotanical and pharmacological data are consistent with the folk use of the plant, its use is classed in the highest level of validity and is considered efficacious.

Cuts, scratches ::: Various injuries – abscess ::: Results:
Calendula (Calendula officinalis) infused oil is considered beneficial for the reversal of numerous skin and tissue conditions. It is used only after the threat of infection has passed. It is not used on deep wounds since it is felt that calendula may seal the wound too quickly preventing drainage. It was claimed that olive oil does not work on cows as an ointment since it does not absorb into the skin; lanolin does.
Chewed up leaves of yarrow (Achillea millefolium), are put on wounds and then wrapped with breathable tape. The spore mass of puffball (Bovista pila, Bovista plumbea) is applied to hoof trimming 'nicks' that bleed excessively. It is then wrapped with breathable first-aid tape. Comfrey (Symphytum officinale) and calendula (Calendula officinalis) are used on injuries only after the threat of infection has passed (see wounds).

Dehorning adult animals ::: Various injuries – abscess ::: Results:
After horns are sawed off, the wound area is cauterized with a hot iron to deaden the pain. Once the initial bandages have been removed (after two days), the cavities are packed with Usnea lichen to enhance the healing process.

Dehorning – disbudding ::: Various injuries – abscess ::: Results:
Disbudding of young kids is done with a hot iron. If the scab left after disbudding is knocked off and excessively bleeds, dried puffball (Bovista pila, B. plumbea) sporemass is applied to the wound which is then bandaged if possible. Clean puffball spores (Bovista pila, B. plumbea) are dusted on wounds left from removing loose scurs (horns) or small horn regrowths.

Proud flesh ::: Various injuries – abscess ::: Results:
Goats are treated for proud flesh with several herbs. Wound-knitting herbs (comfrey – Symphytum officinalis, goldenseal-Hydrastis canadenis or calendula – Calendula officinalis) are not used on fresh wounds since they are thought to close the wound too quickly, before it has healed

underneath. Bee propolis is also used as a wound treatment Proud flesh is dealt with by scrubbing until it bleeds twice a day with a stiff scrub brush. Then hydrogen peroxide is applied using a syringe. A purchased product called 'Wonder Dust' antifungal powder is sprinkled on the wound. Once the wound is healed vitamin E, and infused oil or salve of St. John's Wort (Hypericum perforatum) or essential oil of lavender (Lavandula officinalis) is put on the area. Another treatment involves a comfrey poultice (Symphytum officinalis) made with 1 tsp curcumin or fresh grated turmeric and bromelain (crush 1 or 2 purchased pineapple or papaya enzyme tablets for papain).

Sternal abscess ::: Various injuries – abscess ::: Results:
The gleba (sporemass) of Bovista pila or Bovista plumbea is applied to wounds. Alternate applications are made with the salve recorded below or with poultice of yarrow, or a combination of them both is used to draw out the pus. A salve is made with 1/2 cup honey or sugar, 1/2 cup alum, 1 vitamin C pill (or ascorbic acid powder) and 1/2 cup ground Usnea spp. (old man's beard lichen).

Deep wounds, broken horn, shearing cut, wire cut ::: Various injuries – abscess ::: Results:
Wounds are bathed with a slimy tea made of mallow (Malva sp.) (3 tsp mallow aerial parts steeped for 15 minutes with 1 cup of boiling water). Another treatment consists of the infused oil of St. John's Wort (Hypericum perforatum) (2 cups of olive oil and 1 1/2 oz (50 g) Hypericum flowers in a glass jar, stored in the dark for 2 months before straining and using). Another treatment consists of a wad of clean spider web put on the bleeding wound. Cornstarch is sprinkled on the wound to help blood clot.
Another treatment consists of a wash made with an infusion of 2 tsp dried aerial parts of self heal (Prunella vulgaris) steeped in 1 cup of boiling water and allowed to cool. Ample fresh or dried comfrey aerial parts are fed. To boost the immune system and fight infection, Echinacea or Oregon grape teas are given for seven days. These are made with 1/2 cup coarsely cut dried Echinacea or Oregon grape roots simmered in water for 10–15 minutes. One cup of tea is diluted in 1 gallon of water and given as the only drinking water.
Bovista pila or Bovista plumbea puffball gleba (sporemass) is applied to a clean wound to stop bleeding. A chewed leaf of yarrow (Achillea millefolium) is used as a poultice to staunch bleeding on a superficial wound. Leaves of shepherd's purse (Capsella bursa-pastoris) can be used instead of yarrow.

White line abscess or foot rot ::: Various injuries – abscess ::: Results:
After paring out the rot, a zinc-based or copper-based liquid is put into the pared-out pocket, with old man's beard lichen (Usnea spp.) inserted into cavity to hold the liquid in. If the animal is lame (pus pockets forming) it is treated with penicillin for three to four days. Copper-based liquids are not used for sheep.

Wounds – bruises ::: Various injuries – abscess ::: Results:
Wild arnica (Arnica sp.) leaves or flowers (1 or 2) are rubbed on to bruises or the crushed leaves are bandaged on the wound. Arnica is not used on open wounds. Arnica is only used externally (or as a homeopathic drug). Ointments containing bee propolis and other bee products are used to seal wounds and protect them against flies. Pine tar is used to seal wounds and keep flies out.

Management – Bedding ::: Various injuries – abscess ::: Results:
Big leaf maple leaves (Acer macrophyllum) are used as bedding to ensure that grass seeds do not get into the compost. These leaves are raked up and stored dry in autumn.

Flies ::: Various injuries – abscess ::: Results:
The same fly control remedies are used on all ruminants. Bunches of vanilla leaf (Achlys triphylla), European rue leaves (Ruta graveolens) or European pennyroyal (Mentha pulegium) are hung in stables and the milking room. These are kept out of the animals' reach as some are mildly poisonous. Animals are rubbed with oil that has European pennyroyal (Mentha pulegium) soaked in it. This is not used on pregnant animals. Lavender (Lavandula officinalis), cloves (Eugenia caryophyllata) and peppermint (Mentha piperita) essential oils are dissolved in water and used for fly control. Citronella is also used for fly control.

Flystrike (maggot infestation) ::: Various injuries – abscess ::: Results:

All ruminants are treated for flystrike with comfrey salve, if the wound is partially healed or if it is not deep. Pine tar is applied if it is warm weather (corresponding to the fly season).

Pre-show protection ::: Caprine arthritis ::: Results:
An Echinacea (Echinacea spp.) tincture is given to animals before shows. It consists of 4 ounces of dried Echinacea purpurea or augustifolia root or 1 or 2 fresh Echinacea chopped roots. A jar or glass bottle is half-filled with the chopped fresh or dried root. Vodka, brandy or rum is added until it covers the root completely. This is stored in a dark place for two to eight weeks. It is shaken daily for the first week then weekly for the remaining weeks. Then it is decanted into a tincture bottle. One tsp of Echinacea (Echinacea purpurea or augustifolia) tincture per animal in is added to the feed bowl daily for self-medication (immune stimulant) at least six to ten days before the show. A by-product from processed Echinacea can be used instead of a purchased product to reduce costs. Nettles (Urtica dioica) are fed daily for a few weeks before the show.

Pain killer ::: Caprine arthritis ::: Results:
Catnip (Nepeta cataria) or valerian (Valeriana officinalis) are used as pain killers for goats. One tbsp of chopped valerian root is steeped in 1 cup of hot water for 20 minutes. The pot is covered to retain the essential oils. Or 1 tbsp of chopped catnip herb is put in 1 cup of hot water and steeped for 10 minutes. Or willow twigs (Salix sp.) are given since they contain salicin.

Urine scald ::: Caprine arthritis ::: Results:
Propolis cream (propolis, beeswax, shea butter), or any barrier salve are used on sheep with urine scald.

Deformed kids (case history) ::: Various health issues – CAE (Caprine arthritis encephalitis) ::: Results:
A doe had produced kids with front limb deformities two years in a row (from different sires). The owner speculated that the doe had been eating mouldy bits of hay that other goats refused during early pregnancy. Therefore during the subsequent pregnancy, the owner regularly fed the doe turmeric with the result that the doe gave birth to completely normal triplets. The dose was 1/2 tbsp turmeric (Curcuma longa) added daily to the feed three weeks prior to breeding and for at least a full month after breeding to 'detoxify' the system of the doe. The owner repeated the treatment the following year during pregnancy with the same result – normal triplets.

Respiratory conditions ::: Various health issues – CAE (Caprine arthritis encephalitis) ::: Results:
Goats are allowed to browse on mullein (Verbascum thapsus) as a respiratory tonic (self-medication). Several crushed cloves of garlic are given orally as an antibiotic for goats that aren't milking. A strong tea (decoction) of Oregon grape root (Berberis aquifolium/Mahonia aquifolium) or Echinacea root (Echinacea purpurea or Echinacea augustifolia) is given as the only source of drinking water (1/2 cup of coarsely cut dried Oregon grape root or Echinacea root in 2.5 cups of water, simmered for 10 to 15 minutes). One cup of the resulting fluid is diluted with 1 gallon of water and given as the drinking water.

Unidentified sickness ::: Various health issues – CAE (Caprine arthritis encephalitis) ::: Results:
The animal had the following symptoms: low energy, tail down, stressful bleat, separated itself from herd, was hunched, had difficulty lying down (and other symptoms). It was given whole leafy branches of blackberry (Rubus ursinus and laciniatus), grape (Vitis sp.), and willow (Salix sp), free choice.

Urinary stones ::: Various health issues – CAE (Caprine arthritis encephalitis) ::: Results:
Sheep and goats with urinary stones are given 1/3 cup apple cider vinegar twice a day diluted in 1 cup of water, orally.

Diarrhoea, scours ::: Results:
A combination of fresh plantain leaves (Plantago sp.), flower heads of calendula (Calendula officinale), tops of nettles (Urtica dioica) and leaves of comfrey (Symphytum officinale) was given. If blood was seen in the stool, 1/2 tbsp of slippery elm bark powder (Ulmus fulva) was added. Calendula (Calendula officinalis) flower head tea is given to calves with sore stomachs. Branches of long needle yellow pine (Pinus ponderosa) are put in the pen of young animals (four weeks old, still nursing) with grey pasty diarrhoea. They can then eat it free choice. Animals will

self-medicate with aerial parts of fresh cinquefoil (Potentilla sp). An alternative treatment consists of a drench made with 1 part or 1 tsp marshmallow (Althaea officinalis), 1/2 part dill seed (Anethum graveolens), 1 part bark of white willow (Salix sp) and 1 part inner stem bark of slippery elm (Ulmus fulva). If not already powdered it is ground and mixed with water before drenching. A pinch of cinnamon (Cinnamomum zeylandica) and a pinch of ginger (Zingiber officinalis) can be added. If there is blood in the feces then 1/4 part cloves (Syzygium aromaticum) is added to control coccidia. A dose of 2 tbsp is used for animals over 50 lbs. A dose of 1 tbsp is used for animals under 50 lbs. The drench is given once a day until the diarrhoea stops (two to three days). Goats are allowed to self-medicate with the charcoal from a cold wood fire. Animals are starved for one day, then purged with a senna pod infusion (Senna sp.). Afterwards they are drenched with slippery elm (Ulmus fulva) powder to soothe the stomach.

Eye problems (Conjunctivitis) ::: Results:
Infected eyes of cows are treated with eyebright tea (Euphrasia officinalis) which is applied several times by soaking gauze and dropping the tea onto the eyes. Alternatively a tea made with a chamomile (Matricaria chamomilla) tea bag is allowed to cool, then the teabag is dipped back in the tea and a few drops of tea are dropped into the eye of the animal.

Coccidiosis ::: Parasites – Internal parasites (endoparasites) ::: Results:
Feeding ample amounts of branches of Douglas fir (Pseudotsuga menziesii) is said to prevent coccidia.

External parasites – Lice ::: Parasites – Internal parasites (endoparasites) ::: Results:
Bark shavings of cedar (Thuja plicata) are put in the bedding. Powdered neem (Azadirachta indica) is brushed into the coat. Neem is used less often than clipping. Alternatively the infused oil of pennyroyal (Mentha pulegium) is rubbed onto the top of the head and the spine of the goat – it is brushed well into the coat.

Mastitis ::: Dairy issues – Mastitis ::: Results:
Cows with mastitis have apple cider vinegar (1/2 cup) added to the grain and fed twice a day. Cows are treated only if they show susceptibility. Woodsage (Teucrium scorodonia) tincture is infused in the udder. An infusion of cleavers (Galium aparine) is made by steeping 1 tbsp of cleavers in 1 cup of boiling water for 15 minutes. This is then drenched to help boost circulation in the udder and for lymph support.

Milk production ::: Dairy issues – Mastitis ::: Results:
Pregnant and lactating goats and cows are allowed access to fresh nettles or wilted cut nettles. Milking ewes are given a tea of dill seed for milk production. Dill seed (Anethum graveolens) (2 tsp) is steeped in 1 cup of boiling water for 10–15 min. Or 1/2 cup dill seeds is steeped in water overnight. This is then boiled until very dark in color and strained. Each animal is given 1 cup of this dill tea per day as the drinking water. Armfuls of comfrey (Symphytum officinale) are reputed to increase butterfat and act as a laxative. A handful of fresh or dried leaves of thornless raspberry (Rubus sp.) is given free choice.

Udder edema ::: Dairy issues – Mastitis ::: Results:
A handful of dandelions (Taraxacum officinale) leaves and/or cornsilk (Zea mays) are fed as diuretics. Both can be dried (on a cookie sheet on low heat -100 to 200 degrees- in the oven) and used in the winter. Fresh or dried comfrey (Symphytum officinalis) leaves and/or stems are also fed.

Milk reduction (drying off) ::: Dairy issues – Mastitis ::: Results:
Goats are dried off using a paste of 1 tsp of dried sage (Salvia sp.) in water. The paste is put on the udder. Alternatively the tsp of dried sage is fed by crumpling it on grain with molasses for palatability. A couple of stalks of comfrey (Symphytum officinale) are given every couple of days during the lactation period.

Trace & other minerals ::: Diet ::: Results:
Sunflower seeds are fed with the shells to add the calcium needed for growing kids, and pregnant and lactating does. Washed (sand-free) seaweeds fresh from the sea, such as bladderwrack are given to provide iodine and trace minerals. Flax (Linum usitatissimum) whole seed (milder taste) is

fed to improve the coat. One tbsp is given with each feeding of grain. Goats search for horsetail (Equisetum arvense) in spring. Twelve goats (one pen) are given 6 dried horsetail plants (Equisetum arvense) or they are given it fresh once or twice a month (free choice). Dried nettles (Urtica dioica) are sprinkled on the food daily or when available. A handful of dry dandelions leaves (Taraxacum officinale) is given every week when available. Kelp, a 3-litre pail for 90 cows, is put into the bottom of the hay manger so that the cows have "free choice" access to that much each day.

Pregnancy toxaemia – ketosis ::: Pregnancy ::: Results:
Animals are hand fed all and any tasty forest browse (e.g. salal (Gaultheria shallon), huckleberry (Vaccinium sp) or armfuls of comfrey (Symphytum officinale).

Retained placenta ::: Pregnancy ::: Results:
A handful of leaves of English ivy (Hedera helix) is fed at the time of birth, to contract the uterus, and prevent retained placenta. A tincture of lady's mantle (Alchemilla vulgaris) (90 ml twice a day (after evaporating off the alcohol) is given for uterus infection after calving, diarrhoea or for retained placenta. Alternatively it was given as a drench for five days. There are reports that cows eating Alchemilla vulgaris have tainted milk.

Discussion:
The non-experimental validation of the plants is provided in Table 5. The plants are listed in alphabetical order. As stated previously this validation process was undertaken in the process of preparing the draft manual of remedies and continued after the workshop when the final version of the manual was prepared.
We suspected that traditional medicines in British Columbia are derived from the knowledge and traditions of First Nations peoples, and from Asia and Europe. Elders of the Saanich and Cowichan Coast Salish people of southern Vancouver Island treat, or have treated in the recent past, many ailments with bark preparations [6,10,11]. Respiratory ailments were treated with bark of Abies grandis, Arbutus menziesii, Cornus nuttallii, Prunus emarginata, Pseudotsuga menziesii and Quercus garryana, digestive tract ailments with the bark of Abies grandis, Alnus rubra, Arbutus menziesii, Malus fusca, Oemleria cerasiformis, Populus tremuloides, Pseudotsuga menziesii, Rhamnus purshianus and Rubus spectabilis, gynaecological problems with bark of Abies grandis, Arbutus menziesii, Populus tremuloides, Prunus emarginata, Pseudotsuga menziesii and Sambucus racemosa, and dermatological complaints with the bark of Mahonia spp., Rubus spectabilis, and Symphoricarpos albus.
One First Nation group used medicinal preparations from Arbutus menziesii bark and leaves for colds, stomach problems, as a post-childbirth contraceptive, and in a ten-ingredient bark medicine for tuberculosis and spitting up blood [6,10,11]. Tree barks have also been used to treat fevers, diabetes, kidney problems, sore eyes, and haemorrhaging, and also as general tonics. In most cases, infusions or decoctions of barks are used. The medicines are drunk or applied externally as a wash. Several of these uses are similar to the ethnoveterinary uses described in this paper. These commonalities and those with European folk medicine will be discussed in more detail in future publications.

Conclusion:
This research was undertaken with the understanding that the use of safe and effective medicinal plants can reduce farmers' input costs, preserve the resource base, enhance biodiversity and protect animal health. If plants are grown on-farm this will enhance the biological interactions on which productive agriculture depends. Successful medicinal plant use can contribute to farm incomes, maintain the resilience of farm communities, promote self-reliance and contribute to an internationally recognized safe and good quality food supply, in addition to providing improved and affordable livestock health care. It can also strengthen rural community capacity building, leadership and skills development and help preserve the ethnomedicinal heritage of British Columbia.
Ethnoveterinary alternatives (based on medicinal plants) are an option for small-scale livestock farmers who cannot use allopathic drugs or for those larger conventional farmers whose economic circumstances prevent the use of veterinary services for minor health problems of livestock. Participatory workshops in combination with non-experimental validation are an effective means of producing information to be disseminated to farmers in a user-friendly format.

Scientists may be motivated to conduct formal validation on plants that they know are being used for specific purposes.
The majority of the plants were used for goats. This reflects the browsing nature of the goat and the corresponding need for their owners to monitor what they were browsing and its constituents. Goats and sheep were the main species medicated or self-medicated on the Pinaceae, Cupressaceae and Ericaceae.
The majority of the plants achieved the mid to high levels of validity. This may be due to the fact that the majority of the respondents were referring to published material [5, 6, 7 and 120 among others] in their decision making. Some of the plants showing high levels of validity were Hedera helix for retained placenta and Euphrasia officinalis for eye problems. Plants with high validity for wounds and injuries included Hypericum perforatum, Symphytum officinale, Usnea spp., Malva parviflora and Prunella vulgaris. Treatments with high validity against endoparasites included those with Juniperus communis and Pinus ponderosa. Anxiety and pain are well treated with Valeriana officinalis, Melissa officinalis and Nepeta caesarea. Verbascum thapsus has high level validity as a respiratory tonic.Zingiber officinale is a good, but possibly expensive, treatment for diarrhea as are the other spices used. This high level of correspondence with the published literature is a reflection of the many ancient folk traditional practices that have been translated into ethnoveterinary practices and also reflects the recent scientific interest in subjecting medicinal plants to clinical trials.
In the participatory manual that we produced from this research and gave to participants, we cautioned against giving goats large amounts of red cedar (Thuja plicata) in early pregnancy (first six weeks) because of a neurotoxin in the plant. Red cedar (Thuja plicata) gives the milk of dairy animals a pitchy flavour. Respondents were initially concerned about the safety of Western hemlock (Tsuga heterophylla) branches fed to goats during pregnancy for its vitamin C content. Western yew foliage is poisonous to cattle and horses, the berries are poisonous.
Many plants designated as weeds by professionals (who have devoted considerable resources to understanding and eradicating them) are included in the diets of ruminants and the non-experimental validation of them suggests that they are nutritious and valuable feed supplements. The preliminary evaluation of the plants used for ruminants in British Columbia indicates that they are practical and possibly efficacious remedies that merit more formal evaluation.

Competing interests:
The author(s) declare that they have no competing interests.