



BRIEF
on
SOUTH AMERICAN CAMELID DISEASE RISK to WILD SHEEP
by
WAFWA Wild Sheep Initiative & Wildlife Health Committee
ver. 08-31-2022



"Commentary by ad hoc committee on the Brief on South American Camelid Disease Risk to Wild Sheep"

Point of clarification: The brief uses a non-specific familial SAC reference in the opening sentence and in the next sentence a specific species reference to llamas. This lacks the focus and necessary precision this subject demands. It allows use of a broadened data set involving all four species of South American Camelids that can be generally applied to llamas, the species used exclusively in back country packing. Let's be clear: This brief concerns **llamas** in Wild Sheep ranges.

INTRODUCTION

There has been concern and misunderstanding regarding use of ~~South American Camelids (SACs)~~ (llamas) ~~and alpacas~~ in occupied wild sheep range. Some wildlife- and land-management agencies have prohibited or proposed to limit pack llama use based on concern that SACs (llamas) can carry and/or transmit pathogens known to cause disease in wild sheep (see Appendix 1).

There has been no misunderstanding. All the agency prohibitions and limits based on pack llamas carrying or transmitting disease to wild sheep come from a single source; Dr Helen Schwantje and her hypothetical risk assessments of 2003 and 2005.

In 2003, Dr Schwantje published a Risk Assessment (RA): *Communicable Diseases Risks to Wildlife from Camelids in British Columbia*. The RA recommended banning llamas from BC sheep ranges but included this qualifying statement: "*Risks from camelids to wildlife in British Columbia remain hypothetical after this risk assessment, as no direct evidence was found to implicate camelids as sources of significant diseases in wildlife in BC or elsewhere.*"

In 2005, Dr. Schwantje & Dr. Elena Garde co-authored another RA: *Examining the Risk of Disease Transmission between Wild Dall Sheep and Mountain Goats and Introduced Domestic Sheep, Goats, and Llamas in the Northwest Territories*. The assessment documents the occurrence of pathogens in domestic sheep and goats that may threaten wild sheep and goats and recommends separating the domestic species from the wild species.

With no documentation of these pathogens in llamas, Schwantje/Garde arbitrarily recommended separating llamas as well and included this qualifying statement: "*Conversely, contact between llamas and wild Dall's sheep or goats may result in disease in wild species, but there is insufficient data available to clearly assess the role of camelids as a source of disease at this time*

(for additional information see Communicable Diseases Risks to Wildlife from Camelids in British Columbia)."

It is important to note the 2003 RA qualifies the enumerated risks as hypothetical. The second 2005 RA cites the 2003 hypothetical RA as support for its statement: *"Conversely, contact between llamas and wild Dall's sheep or goats may result in disease in wild species..."* These 2 RA's are the cited reference in all the agency decisions listed in the appendix to limit or ban llamas through 2017. Then Dr. Schwantje, in league with The Wild Sheep Foundation (WSF), published a third RA (CCH'17) billed as an update to the 2003 and 2005 RA's. This new iteration of the hypothetical disease threat became the favorite reference for agencies advocating llama bans.

These agencies have prohibited or proposed limits on pack llamas because they relied on the hypothetical RA's as a basis. Then they failed to solicit commentary from the llama industry as required in the NEPA process, in their EIS management plans. WSF helped fund and develop the false CCH '17 Risk Assessment and ultimately promulgated it to pursue a ban of pack llamas from all wild sheep ranges in North America in their *Conservation Vision 2020* statement.

Many agencies accepted the RA's ban recommendation at face value and without examination or critical thinking, set about drafting policies eliminating llama use. They failed to solicit input as required from the llama industry. Given the chance to comment, the llama industry has pointed out the RA's unsubstantiated claims regarding llama disease while at the same time presenting peer-reviewed research, mostly from wild sheep researchers, that counters the idea that llamas are a disease threat. Those ban attempts were thwarted. The only reason the bans aren't more widespread and comprehensive is legitimate rebuttal from the llama industry.

The Western Association of Fish and Wildlife Agencies (WAFWA) Wild Sheep Initiative (WSI) and Wildlife Health Committee (WHC) provides this brief, including a suggested path forward and recommendations for use of SACs (llamas) in wild sheep range.

The 2017 *Risk Assessment on the use of South American Camelids for Back Country Trekking in British Columbia*, is the most recent published risk assessment that reviews the literature on pathogens of SACs (llamas). The Centre for Coastal Health was contracted by the British Columbia (BC) Ministry of Forests, Lands, Natural Resources Operations, and Rural Development and the Alaska Department of Fish and Game to update a previous risk assessment, completed in 2003. It is acknowledged the focus of the 2017 Assessment was to assess risk of SACs used in backcountry trekking only in British Columbia and not elsewhere in western Northern America.

The title indicates the risk assessment was done for British Columbia (BC) and the data accumulated was mainly from BC. The llama population in BC is small and dictated the research data set would also be small. Focusing on BC created the illusion that research and documentation regarding disease information was not available. In reality, most of the researchers and available llama research data is from the U.S. where a robust llama population and a correspondingly large veterinary data base has been accumulated. Focusing the RA on BC allowed CCH to ignore the significant U.S. researchers and the data they generate that indicates llamas pose no disease threat to wild sheep populations.

The “bait and switch” became apparent when WSF used the CCH’17 recommendations as the basis for their 2018 statement *Conservation Vision 2020*. *Conservation Vision 2020* recommended banning llamas in **all North American wild sheep ranges**, supporting thinhorn and bighorn populations. WSF participated in producing the CCH’17 and in doing so exposed their strategy to confine the contributing data while broadly applying sketchy results.

The obvious question is, “Why is a risk assessment based on hypothetical disease risks in British Columbia and commissioned by a BC govt agency being allowed to influence U.S. land management decisions regarding llamas? (It should be noted that ADF&G did contribute financially to the study, but after seeing it’s lack of merit, disassociated from it and ceased to pursue llamas as a disease threat to any wildlife species in AK.) However, WSWG was silent as committee members proposed or endorsed ban initiatives after our ad hoc committee pointed out the RA’s unsupported recommendations and the damage it was inflicting on the llama industry.

The 2017 Risk Assessment stated that *Mycoplasma ovipneumoniae* (M. ovi), a bacterial pathogen considered to be an initiating agent in pneumonia in wild sheep, was not detected from limited sampling of SACs (llamas) kept alone or comingled with domestic sheep. The 2017 Assessment also stated that other pathogens associated with wild sheep and mountain goat disease (e.g., bovine viral diarrhea, contagious ecthyma, parapox virus, *Mannheimia haemolytica*, *Pasteurella* spp, Johne’s Disease, and Bluetongue virus) are rare to uncommon in SACs (llamas). CCH found no peer-reviewed literature on disease transmission from SACs (llamas) to mountain ungulates.

The methodology CCH employed, casts serious doubt on CCH’s qualifications to prepare and publish such an assessment. (CCH also prepared Dr.Schwantje’s 2003 RA.) It's a half-truth to state CCH found no-peer reviewed literature. After finding no peer-reviewed literature, CCH manipulated the scant data they found to arbitrarily conclude that: *Mannheimia Haemolytica*, *Pasturella* spp, and contagious ecthyma are a medium-high risk to be transferred from llamas to wild sheep and that BVDV, BTV, M.bovis, and Johnes were a medium risk. Thus, llamas should be kept out of wild sheep ranges. This conclusion has no scientific support and the RA should have been abandoned since no peer-reviewed literature provided numbers to analyze to serve as the basis for a risk assessment. Instead, CCH conjecture was published to live the life of a lie online and be referenced repeatedly as a basis to ban llamas from wild sheep ranges. Now, WSI has acknowledged the CCH ’17 has no valid data, rendering it and the ’03 & ’05 RA’s it purportedly updates, illegitimate as a basis for denying llamas access to wild sheep ranges.

WSI is attempting to distance itself from the bogus RAs and provide cover for Dr. Schwantje and their support of her work. Members of WSI and WHC comprise the majority of your 40 member panel of wildlife professionals and veterinarians that developed this brief. Over the years, some of these people have repeatedly failed to acknowledge the glaring lack of data and shortcomings of Dr Schwantjes’ three RA’s. Some of them were complicit with Dr. Schwantje in fabricating and advancing the recommendations in the CCH ’17 as evidenced in the 2017 Thinhorn Summit Synthesis. Some even used the RA’s to influence NGO’s and land management agency policy decisions. (See our edited appendix.)

Significant push-back from the llama industry and noted llama veterinarians/researchers went unacknowledged and raised no calls for reevaluation from the wild sheep veterinary/research

cohort. Those same people now complain about a lack of peer-reviewed literature after failing to acknowledge the very peers who tried to engage them and share peer-reviewed literature.

WSI and WHC acknowledge that populations of thornhorn sheep (i.e., Dall's, Stone's) that have been assessed are relatively naïve to domestic livestock pathogen exposure, compared to most bighorn populations in the western U.S., southern British Columbia, Alberta, and Mexico. Exposure of thornhorn sheep to novel pathogens could be catastrophic to well-connected thornhorn sheep populations in northern Canada and Alaska. Therefore, to preserve their health, all manageable disease risk to thornhorn sheep should be avoided.

In her January 2020 presentation to WSWG regarding highlights of *Mycoplasma ovipneumoniae* Research and Investigation in Alaska, Dr. Kimberly Beckman states they have discovered M. ovi strains that are *enzootic* and present in Dall's sheep, caribou, and moose since at least 2004.

This seems to undercut the statement, “that populations of thornhorn sheep (i.e., Dall's, Stone's) that have been assessed are relatively naïve to domestic livestock pathogen exposure, compared to most bighorn populations in the western U.S., southern British Columbia, Alberta, and Mexico. Exposure of thornhorn sheep to novel pathogens could be catastrophic to well-connected thornhorn sheep populations in northern Canada and Alaska.” The fact the M ovi has been present since 2004 with no die offs raises the question of how long has it been an enzootic presence and did it necessarily originate in domestic species?

WSI emphasizes “all manageable disease risk to thornhorn sheep should be avoided”. This position is indicative of a zero-risk policy, which is not attainable. WSI applies this label of manageable risk exclusively to llamas that are documented to harbor no endemic/novel disease while they fail to acknowledge the fact cattle, horses, yaks, caribou, and even humans present greater disease risks.

Regarding cattle, WSI continues to embrace cattle as posing no disease threat to wild sheep populations as did its WSF and WSWG predecessors. WSF is on record advocating removal of domestic sheep populations in wild sheep ranges and replacing them with cattle. Our ad hoc committee has repeatedly queried WSWG to supply reasoning for the acceptance of cattle in sheep ranges while advocating banning or testing and provisional access to pack llamas. Llamas pose the lowest risk of disease to wild sheep of any species currently accessing wild sheep ranges. Cattle have a close phylogenetic relationship with wild sheep as related bovids and endemically harbor at least 6 pathogens that are communicable to wild sheep and of considerable significance. These are the same pathogens the CCH'17 tried to ascribe to llamas, without supporting data. Cattle's respiratory system is vulnerable to pneumonias caused by *pasteurella* spp, *mycoplasma*, and *chlamydia*.

WSI is now demanding llamas be tested for M. ovi, which has not been detected in llamas. *Mycoplasma* spp have not been identified in the infrequent llama pneumonias, often attended to in veterinary teaching hospitals using sophisticated testing. Yet WSI does not advocate testing or cautionary separation of cattle though their frequently diagnosed pneumonias raise the probability they could carry M. ovi. Note this discussion on the topic:

Bighorn Domestic Sheep Working Group (BHDSWG)
Science Symposium – June 10, 2019
Post-Meeting Q&A Sent Via Email to Speakers

Question: *Over the last 25 years, some members of the wild sheep community have repeatedly included llamas with sheep and goats for separation from wild sheep. This happens in spite of the fact that llamas have undergone pen studies with wild sheep that show them not to carry *M. ovi* and other pathogens associated with polymicrobial pneumonia, the major cause of mortality in wild sheep populations. Llamas have no endemic diseases and as Tylopoda/camelids have a wide taxonomic separation from Ruminantia/bovids, including sheep, goats, & cattle. Yet the diseases endemic to these bovid species are cited as reason to consider separating llamas from wild sheep despite no documented occurrence in llamas. At the same time cattle are not recommended for separation and are even considered as replacement species for domestic sheep and goats. Can you explain this reasoning?*

Maggie Highland:

*To answer this question specifically, I cannot explain that reasoning. This would be better addressed to someone who believes cattle are OK among bighorn sheep and llamas are not. Perhaps someone from the WSF can explain this, since I believe they are one entity that push the idea that sheep and goats should go and cattle can be in bighorn habitat. **Percentage-based data that is published reveals that a higher percentage of bighorn sheep die when forced to co-mingle in captivity with cattle than the percentage that have died from being co-mingled with goats (even though there are more bighorn-goat co-mingling studies that have been performed than bighorn-cattle commingling studies).***

Tom Besser: *I agree that the wider phylogenetic separation of llamas from sheep lessens the likelihood of them carrying pathogens that could be transmitted to and cause disease in bighorn sheep. However, it does not preclude the presence of such pathogens, and some pathogens can transmit across hosts separated by a very wide phylogenetic distance. Too few pen studies have been done to date with llamas and bighorn sheep to provide a solid understanding of the degree of risk to wild sheep that contact with llamas might bring. In fact, I am only aware of one pen study involving a total of 3 llamas.*

In the case of cattle, hundreds of years of their presence in and near bighorn sheep ranges without an association with pneumonia outbreaks in wild sheep provides strong evidence of their lack of a role in wild sheep pneumonia.

*(Yes, *M. ovi* detection was reported – although not confirmed with sequence information – from cattle sympatric with bighorn sheep undergoing a pneumonia outbreak, but we have found that during a bighorn sheep pneumonia outbreak *M. ovi* can be detected in pretty much everything in the vicinity, including water, air, dirt, flies, etc., so this outbreak really does not support cattle as the source of the pathogens even though the authors considered this possibility.)*

A relevant principle is that of an abundance of caution: keep everything away from bighorn sheep that does not have a strong evidence base showing it is not hazardous to bighorn sheep. Pack animals potentially could gain very close proximity to bighorn sheep, increasing the risk posed by any pathogens they may carry. So, I think it is reasonable to try to maintain separation between llamas and bighorn sheep, at least until additional research provides stronger reassurance of the lack of risk.

(Cattle in Colorado (2007-2008) Wolfe LL, Diamond B, Spraker TR, Sirochman MA, Walsh DP, Machin CM, et al. A bighorn sheep die-off in southern Colorado involving a Pasteurellaceae strain that may have originated from syntopic cattle. J Wildl Dis 2010;46:1262.)

Dr. Besser seems conflicted that possible involvement of cattle in a sheep die-off can be ignored while llamas' phylogenetic separation and lack of disease require an abundance of caution, ie. zero risk. He likely does not realize that *M. ovi* has not been detected in llamas after years of intense scrutiny in a number of veterinary teaching hospitals. He likely does not realize that 120 years of comingling wild sheep and llamas in zoos and animal collections, a more continuous and close exposure than free ranging cattle's occasional proximity to wild sheep, has not resulted in sheep die-offs. Given the probability he relies on the wild sheep community for his base knowledge regarding llamas, this is understandable.

Horses present a risk of disease transmission to wild sheep. WSI's association of pack llamas as a risk to wild sheep ignores more significant forms of "manageable risk", including horses. Since WSI does not take issue with horses entering wild sheep habitat, there is no point in testing or limiting access to the pack llama user group. Dr. Michelle Kutzler, Oregon State University made this point as part of the May 13, 2020 public testimony of record in the following Arctic National Wildlife Refuge (ANWR) hearing transcript:

<https://www.regulations.gov/document/FWS-HQ-NWRS-2020-0013-2223>

In the above transcript of public record Dr. Kutzler also stated "horses are actually a greater risk than camelids to wild Dall sheep and mountain goats, as horses have several endemic diseases that can be transmitted to those wild species.

Horses are notorious for their vulnerability to respiratory diseases. They have a suite of viral infections and bacterial pathogens (notably pasteurilla, streptococcus, and mycoplasma) that pose a significant risk of pneumonia transmission to wild sheep. Case in point, the few instances of pneumonias occurring in llamas are typically caused by *Streptococcus zooepidemicus*. This bacteria is endemic to horses (strangles) and infected llamas have reliably been in close contact with horses prior to infection.

Regarding yaks, we find no policy regarding disease concerns for this Asian import that is currently employed as a pack animal in Alaskan thinhorn ranges. Yaks are bovids and more closely related to wild sheep. They carry a disease menu similar to cattle. We find no evidence the possibility of yaks carrying *M. ovi* has been determined. As a pack animal it's likely yaks would have closer interactions with sheep than free ranging cattle.

Regarding Caribou, we find no restrictions for First Nations guides using caribou for support, even though caribou harbor a number of pathogens transmissible to wild sheep and have been documented to carry *M. ovi*.

Lastly, the WSI and WHC recognize the inadequate sample size of ~~SACs~~ (llamas) tested for key pathogens (e.g., *M. ovi*) that can result in severe pneumonia outbreaks and catastrophic declines in bighorn sheep populations. A more robust sampling of ~~SACS~~ (llamas) is required to confirm the

absence of pathogens, and to fill in knowledge gaps. Tests conducted prior to 2010 lacked adequate diagnostic technological capacity for detecting *M. ovi*.

To ensure reasonable and science-based decisions are made by wildlife- and land-management agencies/jurisdictions, more SAC (llama) pathogen-testing data is desirable and necessary to safeguard wild sheep. The WSI and WHC provide the following summary of the issues, current knowledge and data gaps, next steps, and recommendations for future action(s).

This 2020 quote from Dr. Helen Schwantje regarding the CCH '17 effectively encapsulates the lack of basis for the origin and persistence of the wild sheep/llama disease threat issue. "This issue has been raised and examined with more than a decade gap to add new published material on risk of transmission of infectious diseases/pathogens, including non-respiratory pathogens from camelids. Almost none of the material was from camelid health researchers."

This is an incredible statement from a professional veterinarian whose biased and undisciplined work has, without merit, decimated the British Columbia llama industry and has harassed and defamed the llama and its associated industry in the U.S. for the last 20 years. More importantly, it is an indictment of the WSI to be relying on this biased, hypothetical, and unsupported projection as a basis "To ensure reasonable and science-based decisions are made by wildlife- and land-management agencies/jurisdictions,"

The lack of information you lament is due to a failure to look and to engage. The llama industry greatly expanded the research and information base for llamas and alpacas from the 1980's on and it is based on health surveillance of more than 250,000 llamas over more than 4 decades. It is augmented and supported by international research in Europe and South America. The WSI needs to address the lack of basis of Dr. Schwantje's RA's and understand WSI is complicit in engaging in this biased conjecture, while ignoring solid scientific data, all the while advancing a ban agenda unrelated to any real disease threat to wild sheep. The research and information from camelid health researchers is reliable, comprehensive, and available. Stop looking past it and demanding the llama community participate in an illegitimate testing program.

Issues

1. SACs (Llamas) are currently used as recreational pack animals in the United States (U.S.) and Canada, and have been, for ~~at least the past 30+ years~~ **more than 50 years**.
2. There is no comprehensive, current, and published dataset of SAC (llama) test results for pathogens considered a threat to wild sheep, particularly *M. ovi*.

*A comprehensive 700-page compendium ("Llama and Alpaca Care" *Medicine, Surgery, Reproduction, Nutrition, and Herd Health*) was published in 2014. There are 5 co-authors, 50+ contributing researchers and clinicians, and at least 10 University Veterinary Teaching programs involved in this compilation. It has an extensive bibliography. The publication is not acknowledged in the CCH '17 literature search supposedly spanning 2007-2017. What that compilation does establish is that there are no endemic diseases of llamas. It documents that many diseases can occur in llamas, but they manifest as atypical infections in a small number of animals, terminate, and do not recur.*

A statement from Dr. Chris Cebra, the publication's lead author: *"I can't remember seeing a Mycoplasma pneumonia case in a camelid. Pneumonia, in my eyes, is downright uncommon, and the most common bacteria is Streptococcus zooepidemicus, which is endemic in horses."* There's pretty scant information that camelids get any disease from the non-hemotropic Mycoplasma. There's a single case report of *M. hominis*, which mainly lives in the urinary tract, and camelids in South America develop antibodies to the main respiratory Mycoplasma of goats and cattle, probably due to co-housing with cattle and goats, but there's no evidence of disease. I couldn't find any mention anywhere of llamas/alpacas and *M. ovi(pneumoniae)*. As far as I can tell, there is no evidence that camelids get infected in their nasal passages.

-Dr. Chris Cebra-Oregon State University Dept Chair - Clinical Sciences; Glen Pfefferkorn and Morris Wendorf Endowed Professor in Camelid Medicine; Professor - Large Animal Medicine.

Prominent llama veterinarian and researcher, Dr. LaRue Johnson, CSU Professor Emeritus, has spearheaded international llama research and veterinary medicine since 1980. He has been an invited speaker to virtually all the USA state and national veterinary conventions as well as venues in Canada, England, Australia, Peru, Argentina, Bolivia and Ecuador. His colleague, the late Dr. Murray Fowler and Dr. Johnson initiated the annual Camelid Conference for Veterinarians that has been in existence for 33 years. This venue has greatly facilitated exchange of information regarding camelid health matters. 70 printed proceedings records include his presentations at the various venues. He is the sole editor and chapter contributor of two llama books in the Veterinary Clinics of North America series as well as one of the co-editors in the more recently published Llama and Alpaca Care on medicine, surgery, reproduction, nutrition and herd health.

Dr. Johnson has given input on several of the ban initiatives, starting with the Canyonlands Ban of 1995. He is flummoxed by the wild sheep industry seeking llama bans without scientific basis. He is particularly disappointed in their lack of professional decorum and lack of engagement. His response to this "brief" is that "he's not going to write another paper for the wild sheep veterinary/management community to ignore". He advised that since there has been no identification of *M ovi* in a highly scrutinized llama population in his 40+ years of research and consultation, there is no reason to test.

Precautionary Principle Paper Dr LaRue Johnson-2016:

"While domestic sheep can potentially introduce Mycoplasma ovipneumoniae to wild sheep, there is no evidence the infectious agent is a normal resident of camelid airways. In addition, the two most up to date camelid textbooks make no reference and thus do not consider it a camelid pathogen"

"It appears to me that risk assessment pertaining to pack llamas transmitting disease to BC wildlife remains hypothetical at best and unless all trafficking into the concerned areas ceases, there is no justification for restricting pack llamas"

Another noted llama researcher, the late Dr. Murray Fowler, DVM, Professor Emeritus of Zoological Medicine, U.C. Davis School of Veterinary Medicine, partnered with Dr. LaRue Johnson to lead the U.S. llama industry's drive to compile comprehensive health care protocols

and an associated data base that became the basis of a cooperative international research network. Dr. Fowler was an icon in the zoo profession. Recognized as the father of zoological medicine, Dr. Fowler was widely regarded for his teaching, scholarship and clinical practices that have been used to train veterinarians at zoos and wildlife centers around the world. Dr. Fowler's extensive involvement in llama medicine brought him and Dr. Johnson to the forefront representing the llama industry's fight against the various ban initiatives. He was amazed at sheep industry's failure to recognize the significance of phylogenetic separation. He was also dismayed at the wild sheep community's failure to honor the axiom of not managing wild species like domestic species.

Letter from Dr. Fowler to ADF&G

April 9, 2012

Alaska Department of Fish and Game Attn:
Craig Fleener, Deputy Commissioner 333
Raspberry Rd.
Anchorage AK 99518

My name is Murray E. Fowler, DVM. A major part of my career was devoted to dealing with the medical conditions of zoo and wild animals. When llamas became an industry in the United States, I became associated with the industry. I studied the existing literature of camelid diseases and became conversant with their clinical problems by dealing with them in a teaching hospital. I was the section head of Zoological Medicine which cared for camelids and other zoo and wild animals.

I was intimately involved in some of the original research that was conducted on these animals in the United States. I also traveled to Peru, Bolivia and Chile and have examined thousands of llamas and alpacas destined for importation into the United States and Canada. I have worked with government officials and diagnostic laboratories to try to determine what infectious and parasitic diseases to which llamas and alpacas are susceptible or resistant to.

I am the author or coauthor of 85+ publications on camelid medicine, several of which dealt with infectious and or parasitic diseases. I am the author of a definitive textbook, in English, on the Medicine and Surgery of South American Camelids, now in its 3rd edition and published by Wiley-Blackwell, Ames, Iowa, 2010. As a result of my studies and experience I have kept current on the world scientific literature on these unique animals.

May I share with you some information that may be pertinent to the risk of diseases from llamas to free-ranging wildlife? It is important to understand that camelids are not ruminants (not taxonomically, anatomically, behaviorally or physiologically), and should not be categorized with cattle, sheep, goats or cervids. They may share some of the same gastrointestinal parasites that are common to many artiodactylids, but they have their own unique lice and coccidia.

I have read two publications that have come to my attention.

1. Examining the risk of disease transmission between wild Dall's sheep and mountain goats and introduced domestic sheep, goats and llamas in the Northwest territories, by

Elena Garde, et al.

2. Communicable disease risks to wildlife from camelids in British Columbia by Helen Schwantje and Craig Stevens.

Both of these publications contain a wealth of information, however, there are some errors of interpretation that I take exception to. There has never been a documented case of South American Camelids (SAC) being responsible for disease transmission to cattle, sheep, goats or cervids. It is true that they acquire general infectious diseases that are common to most domestic animals, but SACs are not a reservoir for any infectious disease that may occur in cattle, sheep, goats or cervids.

I Applaud the efforts to require health checks and parasite control, but I see no justification for cart blanche exclusion of llamas from wilderness areas. I would be happy to speak to anyone about the statements that I have made.

Sincerely,



Murray E. Fowler, DVM

Professor Emeritu's of Zoological medicine

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Diplomate American College of Zoological Medicine, Amer. College of Veterinary Internal Medicine and Amer. Board of Veterinary Toxicology.

Dr. Murray Fowler letter to AK administrations (April 2012)

Gregg P. Adams DVM, MS, PhD, Diplomate ACT
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Western College of Veterinary Medicine
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Dr. Gregg Adams June 22nd, 2016 e-mail to BC llama owners:

*As LaRue mentioned, it is inappropriate to lump llamas with sheep and goats with respect to infectious disease - **this reflects a basic ignorance of the tylopod family**. Camelids are not new nor exotic to North America - they originated in North America. The diseases listed as a risk posed by llamas are no different than a list that could be made up for any species entering the back country, not least, humans. For example, every mammalian species harbours mycoplasma. Contagious ecthema, chlamydiosis and MAP in camelids are rare - far less than in humans. In any risk assessment, the objective is to determine the probability of an event happening and the consequences of such an event. There is no such thing as zero risk, and a zero-risk policy is not a legitimate argument to "strongly support a precautionary approach", if for no other reason than this approach is not being applied to all equally.*

The knowledge and data gaps regarding llamas are the exclusive domain of the wild sheep community. The llama industry has an extensive network of university veterinary teaching programs and researchers who have put together a significant reservoir of information and data and it's all paid for by the llama industry. That information is what advises the AASRP (1000+ clinical and research veterinarians) and supplied the information AASRP used in formulating their statement advising against banning llamas on public lands based on the diseases listed in the CCH'17.

Risk Assessments completed by independent contractors for agencies utilize data from various sources and are just that, risk assessments for agency use. WAFWA's WSI or WHC has no official position concerning disease or pathogen transfer risk from SACs to wild sheep (SACs are not addressed in the WSI's 2012 *Recommendations for Domestic Sheep and Goat Management in Wild Sheep Habitat*). The WSI and WHC encourage development of data sets and research designed to complete the knowledge around this issue.

WSI needs to be more discriminating in its criteria for conducting or contracting for a risk assessment. As demonstrated by the 3 Schwantje risk assessments, there needs to be peer-reviewed data supplying evidence of disease occurrence as well as a demonstrable threat to wildlife. Without those two points in place no meaningful risk assessment can be conducted. A risk assessment is not a valid tool to be used to "develop data sets and research designed to complete the knowledge around this issue."

We see no evidence any of the three Camelid Risk Assessments were performed under contract or request from WSI or WHC. When our ad hoc committee first discovered the CCH'17 posted on the WSWG website, we contacted chairman Mike Cox who wasn't aware of the RA or its posting. He listened to our criticism and after consultation, took it down and promised to speak with those responsible for its promulgation. Now WSI (WSWG) agrees with us that the CCH'17 lacks merit since it used no solid, peer-reviewed information. But instead of abandoning the issue, WSI is calling on the llama industry to test rather than doing what should have been done initially: study the available peer-reviewed research available in llama research literature and determine how to proceed thereafter.

We see no evidence WSI or WHC had identified llamas as a disease threat to wild sheep. The most recent statement we find from WAFWA specifically does not include llamas:

WAFWA-WSWG (2016) RECOMMENDATIONS FOR DOMESTIC SHEEP AND GOAT MANAGEMENT IN WILD SHEEP HABITAT -THINHORN SHEEP-CONSERVATION CHALLENGES AND MANAGEMENT STRATEGIES FOR THE 21st CENTURY- (2016)

"Effective separation is defined as spatial or temporal separation between thinhorn sheep and domestic sheep or goats. Reducing the potential for association between those taxa and the likelihood of transmission of pathogenic organisms or parasites between species is critically important. Maintaining effective separation is presently the only meaningful tool available for minimizing pathogen transfer and the risk of respiratory disease."

However, taking the same license Dr. Schwantje used in her 3 RA's in ascribing the diseases of sheep and goats to llamas, NGO's and land management agencies cite this WAFWA/WSWG statement in addition to the CCH'17 and include llamas with sheep and goats as a disease threat. The most notable, but certainly not the only instance of this misapplication occurred in the USFWS llama ban on the ANWR. They cited WAFWA 2012 & 2016 and Cassirer 2017 that specifically restrict disease threat to caprid species. USFWS cites 5 other papers that recommend separation of sheep and goats with no mention of llamas or camelids. Then they back it up with the CCH'17 which we pointed out is hypothetical and had no peer-reviewed data.

We are curious why WSWG/WAFWA has failed to take active exception to this expansion of its statement to include llamas. When our ad hoc committee brought the CCH'17 to the attention of WSWG we noted some of the principals involved in this issue cycled through the WSWG as members of the committee. Though their status as members of WSWG was intermittent, their membership in WSF was constant and they served active roles in that organization.

Notable WSF/WSWG members misrepresenting disease information for llamas as a disease threat.

Dr. Helen Schwantje originated the 3 RA's with no questions from WSWG, even after legitimate protests regarding validity from the llama community.

Kevin Hurley using CCH 17 to encourage Backcountry Hunters and Anglers (BHA) and other NGO's to issue policy statements in support of banning llamas in sheep habitat and in comments to USFWS regarding banning llamas on ANWR. Openly calling for llama ban without any basis @ TH Sheep Summit 2017.

Bill Jex is credited in the CCH '17 as the anecdotal source for the supposed transmission of CE to mountain goats. He used it to smear llamas as the source of CE lesions in a graphic depiction of a mountain goat overwhelmed with CE in BC. Dr Schwantje willingly bought into that line and included it in the CCH 17. In fact, CE was listed as one of the significant diseases llamas could transmit to llamas.

Clay Brewer, the WSF rep on the WSWG, referenced, but failed to specify the pathogens llamas carried other than M. ovi in at least one very large hunting/conservation podcast..

We see no evidence that CCH had the necessary aptitude or experience to conduct a risk assessment on this topic. Page 8 of the CCH 17 states, "This review set out to develop a list of pathogens that might create risk of disease transmission from SACs to wild ungulates, and to gather information about the probability and impact of those pathogens." Based on the stated lack of information, would any competent research analysis team enter into an analysis to determine the risk of something that has not happened, subsequently happening?

We see no evidence that Dr. Schwantje had any basis, evidence, or objectivity to oversee or conduct any of these 3 risk assessments. It's clear that Dr. Schwantje had created a solution (banning llamas from the wild sheep ranges) that fit an agenda (eliminating potential competition to WSF's monopoly on the sheep hunting industry), and was clearly searching for a problem (disease threat to wild sheep) to which it could be applied. As it became apparent her RA's lacked

any scientific validity, she characterized their use as a basis for agency bans as overstepping the purpose of risk assessments. She characterizes the agencies and individuals as misapplying the concept of a risk assessment when in fact they were simply following the RA's inappropriate recommendation to ban llamas on the basis of hypothetical disease transmission.

An RA should be focused on statistical analysis of risk factor(s) (possibility of occurrence) to assist decision making. She violated two rules for risk assessments: 1.) She had no disease occurrence in llamas and accordingly no evidence of disease transmission. There was no data to analyze to determine the risk of disease transmission from llamas to wild sheep. 2.) Risk assessments engage in probabilities of the occurrence of the subject event. RA's make no recommendation, they only present probabilities that policy makers can factor into their decisions. Having no data and no evidence of disease in llamas, Dr. Schwantje still proceeded to violate the proper use of an RA and recommended banning llamas in wild sheep habitat based on a disease threat that was non-existent.

Now Dr. Schwantje attempts to blame the naïve and/or biased biologists who point to her ban recommendation and use it to advocate llama bans. In reality, they have merely banned llamas on the recommendation of her biased, scientifically unsupported, and inappropriate personal opinion.

This is an email response to ad hoc committee member Phil Neuchterlein's inquiry to Dr. Schwantje regarding the peer-review status of the RA's:

From: Schwantje, Helen FLNR:EX [mailto:Helen.Schwantje@gov.bc.ca]

Sent: Wednesday, April 22, 2020 2:32 PM

Subject: RE: Camelid Risk Assessment Question

Hi Philip,

The document you refer to was developed originally in 2003 in response to questions to me by wildlife managers in BC who asked if the use of llamas in the backcountry presented disease risk, to wild sheep in particular. At the time there was no comprehensive assessment of camelid diseases and the potential for transmission to wildlife. Therefore we hired an NGO with that expertise to perform a disease risk assessment – see this set of guidelines that describe some of the manner in which these RAs are routinely developed for wildlife health purposes.

<https://portals.iucn.org/library/sites/library/files/documents/2014-006.pdf>

The paper was not published and therefore not submitted for peer review, it was simply a tool to direct decision making in BC. The final recommendations guided our management of llama backcountry use in parks and protected areas and simply provided direction such as describing the degree of risk and some methods to avoid them, ie permits requiring health inspections and preventative measures such as worming and vaccination. With time and due to further concerns as well as an outbreak of contagious ecthyma in mtn goats in a remote area where reportedly llamas had been used (anecdotal of course with no names or records), the risk assessment was repeated

in 2017, again as a contract to reassess the risk and to re-examine the literature. It also was not published but was provided as an RA.

Both documents have repeatedly been reported inaccurately, a disease risk assessment simply describes risk, its up to the entity that is making a decision on that risk how they use it. In our case in BC, the RA was part of the reason that the use of camelids is not allowed for the purposes of hunting in part of northern BC.

So what is the significance of this email?

In the above email dated April 22, 2020, Schwantje points out various issues with how her papers are being used by public agencies. She states (in her email) that the “paper” was not published, nor peer reviewed; is simply a tool for decision making in BC, Canada; and that “both documents have repeatedly been reported inaccurately.” **And interesting enough, this email reveals (in her own words) that evidence being used that llamas were in the area where an outbreak of CE occurred among wild mountain goats in Canada is merely “anecdotal of course with no names or records.”** This email further demonstrates that the basis of the llama disease threat purported in these Canadian papers is merely conjecture (not science) and that these documents should not be used by government agencies as a basis to ban llamas from U.S. public lands.

Co-author Schwantje also refers to a follow-up Canadian hypothetical risk assessment that was completed in 2017 (CCH 17) which was partially funded by the Alaska Department of Fish and Game (ADF&G). ADF&G concluded that CCH17 did not present any new information or substantiate a camelid disease threat to wild sheep or goats. ADF&G stated in a letter of public record dated June 11, 2018 to the Greater Appalachian Llama and Alpaca Association (GALA) that the Department’s position is as follows: “at this time we have no intention to promote or support limiting the use of South American camelids on public land in the State of Alaska.” ADF&G does not prohibit the use of pack llamas (camelids) for hunting in wild sheep or goat habitat.

The American Association of Small Ruminant Practitioners (AASRP), issued the following policy statement in February 2020. It was specifically directed at the CCH’17 and the diseases it ascribed to llamas.

“There exists concern that the entry of camelid pack animals (llamas, alpacas) onto public lands poses a potential risk of disease to resident endangered or threatened ungulate populations including Boreal Caribou, Northern Mountain Caribou, Central Mountain Caribou, Southern Mountain Caribou, Bighorn Sheep, Mountain Goat, Dall’s Sheep, Stone’s Sheep and Roosevelt Elk. The diseases of concern by National Parks and wildlife managers include: Mycoplasma ovipneumoniae, Mannheimia haemolytica, Mycobacterium avium paratuberculosis, Mycobacterium bovis, Pasteurella spp., contagious ecthyma, bovine viral diarrhoea virus (BVDV), and bluetongue virus. Transmission of pathogens from cattle and sheep to wild ungulates under natural conditions has been well documented in the literature. Examples include respiratory disease and fatal pneumonia following contact between domestic and bighorn sheep (Schommer & Woolever, 2008), M. bovis from cattle to elk in Riding Mountain National Park (Garde et al., 2009), and BVDV from cattle to deer (Passler & Walz, 2010). However, there have been no peer-reviewed publications documenting pathogen transmission from camelids to wild ungulates

or to domestic sheep and goats for the pathogens of concern. The American Association of Small Ruminant Practitioners is opposed to banning camelid pack animals on public lands until there is scientific justification for this action.” Revised February 2020.

[Http://www.aasrp.org/about/policy_statements/Llama_Ban_rev2020.pdf](http://www.aasrp.org/about/policy_statements/Llama_Ban_rev2020.pdf)

The Canadian hypothetical risk assessments are at this link -www.packllamas.org

In another statement from Helen Schwantje regarding her RA’s at the *Bighorn Domestic Sheep Working Group (BHDSWG) Science Symposium – June 10, 2019*. She addresses a question of why llamas that pose no documented disease threat to wild sheep are being targeted for separation while cattle, posing a meaningful threat, are not under consideration and are even being promoted by WSF to replace domestic sheep in wild sheep ranges.

Post-Meeting Q&A Sent Via Email to Speakers

“This issue has been raised and examined with more than a decade gap to add new published material on risk of transmission of infectious diseases/pathogens, including non-respiratory pathogens from camelids. Almost none of the material was from camelid health researchers. We did not have an agenda to persecute the species but had these RAs performed by a third party using standard methods. BC does have the responsibility to protect species that we believe are naïve to livestock diseases, including those carried by camelids. As BC has global responsibility to protect Stone’s sheep - a thinhorn sheep, we took the step of repeating the RA. We also had anecdotal information that one disease that can be carried by llamas was introduced to an area where mountain goats declined with that disease (Contagious Ecthyma) and llamas were used for packing. We could find no other reason for that disease introduction. There are pathogens that can be carried by camelids as hosts (with or without major impacts) but I wish we knew more about their carriage of pathogens as temporary hosts. Is it possible? We have little evidence but as you all know, lack of evidence is not proof. These risk assessments were simply circulated, and they are available as resources to take or leave. British Columbia did use them to support one proactive regulation controlling camelids (and other small ruminants) so that they may not be used for packing for the purposes of hunting in the northern regions of BC. That is the only action taken to date that I know of. The workshop that was held on June 10 was around domestic sheep, not these other issues.”

Dr Schwantje downplays the significance of the RA’s while ignoring the ban recommendation they contained. She plays heavily on her global responsibility to protect sheep while ignoring her responsibility to do so within the confines of science and truth. Her wishes that she knew more about the pathogens in llamas ring hollow after admitting she did not consult llama veterinarians or researchers.

Her admitted lack of knowledge regarding pathogens in llamas does not prevent her from making the presumptive statement that wild sheep need to be protected from “.....livestock diseases, including those carried by camelids.” She continues to push the anecdotal Contagious Ecthyma infection in mountain goats coming from a possible exposure to llamas used for hunting in that region. *“Lesions were first observed in these different mountain goat populations, coincident with the introduction and public use of pack llamas in those areas; no other domestic ruminants that can harbour contagious ecthyma are known to have travelled into those mountain goat ranges ahead of the observed infections (Bill Jex, pers. comm., 2017).”*

She assumes the infection had to come from domestic ruminants (That pesky phylogenetic separation strikes again; llamas are domestic camelids) conflicting with her statement in the RA, “reported mortalities of Mountain Goats with severe lesions as above in populations in contact with bighorn sheep herds with endemic CE, and a decrease in Mountain Goat numbers following observation of clinical signs (Helen Schwantje, pers.comm., 2017)”

She states the same assumption in the 2020 hunter conservationist podcast <https://thehunterconservationist.com/podcast/episode-14-the-life-and-times-of-a-wildlife-vet-with-dr-helen-schwantje/> Listening from time mark 1:12:30 – 1:19:12 she is ambivalent and unfocused about the threat posed by llamas to wild sheep.

She admits there’s no evidence the exposure actually occurred. If it did occur, and caused the CE infection, it’s more believable it was the result of exposure to the hunter, not the llama.

She fails to recognize the parapox virus causing CE in bovids and cervids in AK is zoonotic, and causes orf in humans. The parapox virus rarely occurs in llamas (per Drs Adams, Johnson, and Fowler) while it is endemic in Alaskan cervids and caprids/bovids, the likely source of the outbreak. Dr. Kimberlee Beckmen, an ADF&G veterinarian is a coauthor of a research paper, [Orf virus infection in Alaskan mountain goats, Dall’s sheep, muskoxen, caribou and Sitka black-tailed deer](#), that documents the high prevalence of CE as a zoonotic infection freely transmitted between members of the cervidae and bovidae family (sheep and goats both domestic and wild) and humans. Dr Schwantje cites this paper as well in the CCH ‘17 CE discussion regarding llamas. In management discussions at the 2017 THS Summit both Jex and Dr. Schwantje cautioned against “salting” sheep, as that fostered CE outbreaks in the congregated sheep

Camelpoxvirus, Dr. Murray Fowler ([Camelids Are Not Ruminants](#)) is the virus implicated in pox infections in camels in Africa and Asia and rarely infects llamas. CE in llamas is very rare. Considering them as a vector species for transmission of parapox virus/CE to wild sheep is without scientific support. It seems poorly considered for wild sheep advocates to be seeking separation of llamas from wild sheep on the potential of transmission of the parapox virus. Researchers and biologists routinely engage in management practices that are conceptually a highly effective method of transmitting parapox virus from sheep to sheep as well as from humans to sheep.

Routine trapping and handling of groups of wild sheep for testing and transplanting places typically dispersed sheep populations in close contact for extended periods under stressful conditions. The likelihood of endemic CE being transferred from affected sheep to healthy sheep through direct contact is necessarily increased. Add the human handling element of the testing and transmission is even more likely. Controlling a captured sheep typically requires grabbing the animal’s horns. The dermal interface between the horns and the head fiber is a reservoir for the parapox virus that typically sees active infection initiate on head and facial areas. Transferral of infected skin tissue on hands, gloves, blindfolds, etc. from one sheep to the next is likely. Zoonotic transmission between sheep and humans makes possible transmission from handlers to a previously CE free sheep population a possibility; a much greater possibility than controlled llamas without CE passing through dispersed sheep populations without contact, causing transmission.

When WAFWA, WSI, or WHC contracts for RA's, they need to stipulate a broad international database to provide a comprehensive basis to work from. They should also require the work to be submitted for peer review before any release within the scientific community and certainly before being published. That would eliminate the possibility of RA's as limited in scope as the CCH'17, Schwantje '03, and Garde Schwantje '05 being used to advise international policy.

3. Individuals and associations that use SACs (llamas) as pack animals are opposed to land-management agencies developing policies, positions, or regulations limiting SAC (llama) use on public lands associated with wild sheep with no scientific basis. This opposition is largely based on dated and minimal pathogen/disease sampling.

The opposition is based on an extensive record of pathogen/disease testing by the llama industry that has shown no endemic diseases in llamas. This information is comprehensive and current. The entire llama industry, not just packers, takes strong exception to the WSI discounting or ignoring this data and information. The industry regards their documented science superior to the biased conjecture WSI relies on to falsely attack llamas as a disease threat. Opposition is also based on personal management of our llama herds that show the animals to be very healthy and disease resistant. It's based on our personal use of llamas as pack animals in the backcountry demonstrating their low impact and hardiness as well as their compatibility with other user groups.

A significant point of opposition is based on WSF's stated goal to eliminate all use of llamas in all North American sheep ranges. Our first-hand experience with WSF over the last 25 years has been they are agenda driven and willing to distort or ignore science to realize their agenda. We've experienced WSF as monolithic, unilateral, and treacherous. Rather than educate themselves on facts, they are close-minded and willing to use bullying tactics to get their way. They have been engaged in a behind the scenes attack on the llama industry using these tactics for the last 25 years.

It's important to note the first RA, Schwantje 2003, resulted from a collaborative effort with British Columbia (BC) llama owners. They supplied test animals for Dr. Schwantje and did cost sharing in a good faith effort to obtain data regarding pathogens llamas may carry. Rather than receiving results from the study that found no disease threat, the owners received the RA'03 that advocated exclusion of llamas from wild sheep ranges. The projection of hypothetical disease threats in the RA initiated a WSF smear campaign against llamas and alpacas that ultimately involved death threats to some BC llama and alpaca owners. It effectively erased the fledgling llama packing initiative from British Columbia.

Failing to accomplish their U.S. ban agenda, they now want to engage U.S. llama owners in a testing program that promises to be a waste of time and money and a vehicle to institute a restrictive and unmanageable back country passport that would restrict, if not eliminate llama access to wilderness areas containing wild sheep. The indication is the passport would be modeled on the one currently in place for pack goats. WSF holds out their passport as the exemplar for back country cooperation and protection of wild sheep. The passport has effectively eliminated pack goat use in most wilderness areas without appreciable protection for the sheep. The goat packers feel betrayed after agreeing to participate in testing and then being ignored in the

interpretation and administration of the results. They nurse an open and remarkable antipathy for WSF and WSWG (now WSI).

B. Current Knowledge and Information Gaps

1. Based on limited testing to date, *M. ovi* has not been identified from a SAC (llama)

Why would one expect to find *M. ovi* in llamas? The following statement regarding *M. ovi* was made by Dr. Peregrine Wolff at the 2017 THS as recorded in the THS Synthesis. “..... ***M. ovi* infects only sheep and goats (caprinae), and is very rare in other species.**”

It is species specific and even sheep and goats carry different strains of markedly different lethality. *M. ovi* would be very unlikely to infect a camelid as Dr. Wolff has described in this statement.

Invited Paper: Pneumonia in Bighorn Sheep: Risk and Resilience (Cassirer 2017) *“A host-specific pathogen commonly carried by domestic sheep and goats is consistent with the high mortality observed in captive bighorn sheep when commingled with domestic sheep but not when commingled with non-Caprinae livestock including cattle, horses, and llamas (Foreyt 1992, Foreyt and Lagerquist 1996, Besser et al. 2012a).”*

*“Fewer than 10 tests of camelids have been conducted by WADDL as of a query on March 15th. The AHC has tested 14 llamas as of March 2020, and all were negative for *M. ovipneumoniae*.”*
Kezia R. Manlove, Asst Professor, Dept of Wildland Resources and Ecology Center, Utah State University

These statements from wild sheep researchers inform us to expect to not find *M. ovi* in llamas. This corroborates the actual findings of llama researchers and veterinarians.

2. Only one published experiment, nearly 30 years ago, was conducted to study pathogen transmission to bighorn sheep involving llamas, domestic goats, mountain goats, cattle, domestic sheep, and mouflon sheep. (Foreyt 1994). Bighorns only became sick and died after contact with domestic and mouflon sheep. At the time of the study, *Pasteurella haemolytica* was a pathogen of concern. It was isolated in all the study animals except llamas. However, because animal testing did not include *M. ovi* and other pathogens of current concern (please identify these pathogens), results are inconclusive relative to current diagnostic methods.

If the research was valid 30 years ago, there is no reason to question its validity now. There is no question as to the validity of the testing for the other species tested. Truth does not have an expiration date. It’s also important to note that just because wild sheep researchers were unaware of *M. ovi* does not mean it wasn’t a factor. The fact the polymicrobial pneumonia didn’t occur in the llama pen is a validation of the fact that the llamas included in that study did not have *M. ovi*.

Another statement by Dr. Wolff from the 2017 THS Synthesis: *“The new molecular technology has cleared up what has been going on the past decades. When pathologists have gone back to old tissues from die-offs many years ago, *M. ovi* was always present. Interestingly, the same strain that led to the first die-off, was still virulent ten years later. *M. ovi* is not new.”*

It's noteworthy Dr. Foreyt's research was consistent with llama industry research at that time. Furthermore, it's noteworthy that current veterinary research still supports his original findings. Llamas and alpacas were the most highly scrutinized domestic animal population in the U.S. from 1980-2000 regarding veterinary medicine and research. The high monetary value and personal attachment of owners resulted in close diagnostic examination of all llama sickness and mortality.

Llamas' lack of endemic disease and the robust immune system underpinning their exceptional hardiness have prompted a number of research labs to turn their attention to developing vaccines and monoclonal antibodies utilizing llamas' heavy chain nanobodies as templates for vaccines and palliatives.

It is with a high degree of accuracy that llama vets report rarely encountering pneumonia. Research summaries conclude that mycoplasma has not been identified in any confirmed llama respiratory infections. A few seroconversions have been noted, but since no active disease was associated with the conversions, it's probable the antibody response was from mycoplasma exposure rather than infection.

Reading Dr. Kimberly Beckman's January 2020 presentation to WSWG, *Mycoplasma Ovipneumoniae-Highlights of Research and Investigative Findings in Alaska*, it is striking to note the difficulty that was encountered in testing cervids that are in the same sub-order as sheep and confirmed to carry *M. ovi* (enzootic). The testing used four different labs. In addition to serology, they used four different PCR tests as well as different primers. They had actively infected animals as well as necropsy specimens to test and confirm positive infections. Yet, in summary, she makes the statement, "There is a lot more that we don't know than what we do know but we are keeping our minds open to possibilities to see what the data reveals."

Reading further, it becomes apparent Dr. Beckman is considering *M. ovi* testing in llamas. Documented llama research could help direct her efforts.

"Furthermore, as we demonstrated in cervids, detection of M. ovi by diagnostic lab testing of non-traditional species, thinking of camelids may not reveal M. ovi some strains or require great levels of testing to detect when enzootic at an extremely low level."

Focusing on llamas specifically as a phylogenetically separate species as opposed to her general reference to them as "non-traditional" identifies the likely reason testing llamas (camelids) would be difficult. *M. ovi* has not been identified in llamas. Zero is a very low level for detecting "enzootic" infection. It may even require abandoning the "enzootic" reference when referring to llamas. That also makes one suspect it would be difficult to detect disease if it's not present and it would be difficult to determine PCR cycling thresholds that detect positives.

She admits, *"Lack of serology except for sheep, increases the difficulties for detection."* It seems it will be very difficult working with a handful of converted llama serologies, none of which are from confirmed infections.

We agree with Dr. Beckman's statement that *"the presence of an enzootic strain does not suggest any decrease in vulnerability or risk from other M. ovi strains or respiratory pathogens that may be introduced or spread naturally or even an outbreak of disease of the enzootic strain with*

additional stressors to susceptible individuals.” We do think the potential for introduction, though small, resides in phylogenetically-related domestic species such as cattle and yaks as well as horses and their significant reservoir of pathogens. Since llamas are phylogenetically separated and harbor no endemic (enzootic) diseases they are a very low threat.

3. There is no more comprehensive and current dataset of SAC pathogen exposure for those pathogens that are considered a threat to wild sheep than the 2017 Risk Assessment.

The CCH'17 is not eligible for consideration as a comprehensive or current dataset for any llama-related disease issues. It is a fictional projection of disease in llamas based on a disease dataset for sheep and goats. These diseases show no prevalence in llamas. CCH'17 fails to consider phylogenetic separation of camelids from bovids and the fact that extensive llama research, clinical health monitoring, and herd health management has identified no endemic diseases.

C. Recommendations

1. Support generation of a comprehensive SAC (llamas) pathogen profile in western North America. Use this data to create a policy and guidelines that include recommendations for management of ~~SACs (llamas)~~ for outdoor recreation in occupied wild sheep range, including no restrictions, if ~~SACs (llamas)~~ are found to be void of pathogens of concern to wild sheep health.

This work has already been done by the llama industry. Given no endemic diseases have been identified in extensive modern research or in their natural history in North America or South America they accordingly should not require restriction in wild sheep ranges. WSI needs to work from this dataset as a baseline and reconcile any restrictions based on this dataset.

Until the comprehensive pathogen dataset is created:

- a. ~~SACs (Llamas)~~ should be segregated from other livestock known to carry pathogens of concern to wild sheep if those ~~SACs (llamas)~~ are to be used to recreate in occupied wild sheep range.

How does this make sense? Given horses and cattle are consistently present in the back country, segregation is not possible in view of random encounters with these species on trails. If llamas are under restriction merely by exposure to horses and cattle, what are horses and cattle doing in the backcountry?

- b. Avoid use of ~~SACs (llamas)~~ in thornhorn range.

Mycoplasma has not been identified in llamas. Pneumonia in llamas is uncommon. This restriction is arbitrary restricting only llamas while allowing other domestic species posing a greater disease threat.

Suggested Next Steps

1. The WSI and WHC recommend a facilitated collaborative forum (perhaps late fall 2022) with leaders from the SAC community, animal and wildlife health professionals, wild sheep and land managers, and conservation organization representatives with the goal of learning and sharing perspectives. This forum would:

We are told the representatives are primarily from WSI and WHC. This includes many of the people who have accepted and supported the hypothetical RA's and their recommendations for the last 20+ years. WSI and WHC have a lot of ground to cover in catching up to the facts regarding llamas. WSI lacks fundamental knowledge of llamas and it's questionable they can gain the unbiased perspective necessary to realistically advocate for collaboration. The llama industry has raised a number of substantive issues over the years and the sheep community has yet to acknowledge them, let alone respond. WSI has no credibility regarding llamas, eliminating the possibility of collaboration.

Allow wild sheep managers and ~~SAC~~ (llama) users to find common ground and gain a greater appreciation for each other's interests/concerns, wild sheep conservation and health issues, animal husbandry, recreational use, and management practices.

If this is the WSI goal, why have you spent 25 years seeking bans of llamas based on cursory examination of contrived pseudo-science? At the field use level of wildlife and land management there is an extensive understanding and appreciation of llamas. These people manage and use llamas on an ongoing basis both for agency use and the recreationalists they serve. They appreciate llamas' ability to work safely and effectively in the backcountry and reduce impacts and conflicts, as well as their workloads. Why don't you consult those personnel? They question why you seek bans on an animal they see as a solution to many problems they deal with.

Seek agreement in developing policy/guidelines for west-wide management of ~~SACs~~(llamas) used for trekking and hunting.

You jump immediately to managing llamas' access to the backcountry without doing the due diligence you advocated in item (a.). It's reminiscent of the line in old western movies, "We'll give 'em a fair trial and then hang 'em."

- a. Identify funding for the recommended testing needed to improve the knowledge base on ~~SAC~~(llama) pathogen profiles and potential risk to wild sheep.

This testing proposal is a waste of money. Any money we put into this issue will be directed at entities and individuals slandering and libeling llamas as a disease threat to wildlife.

In Conclusion:

1. The RA's are the sole reference for land management agency pack llama prohibitions/restrictions. Dr. Schwantje's email says that the agencies used the RA's in ways they were never intended.
2. Dr. Schwantjes' email states there has been no peer review of same references.
3. Dr. Schwantjes podcast: Hunter Conservationist - Episode 14 – The Life and Times of a Wildlife Vet with Dr. Helen Schwantje Jan 15, 2020 Podcast

<https://thehunterconservationist.com/podcast/episode-14-the-life-and-times-of-a-wildlife-vet-with-dr-helen-schwantje/>

mark (1:17:51) Referencing m.ovi pathogen transfer from llamas to wild sheep

“I don’t really think it’s the biggest risk in the first place, I really don’t. I sometimes wish it would never have come up.”

4. Each RA includes a statement within the RA itself that discredits RA findings.

5. ADF&G manages the thornhorn population in the US and has discounted RA findings as not worthy of acting upon.

6. AASRP position statement.

7. Other domestic species such as yaks, cattle (reservoir hosts of bovid diseases) and horses (with a number of significant endemic diseases) represent a far greater threat of disease transmission to wild sheep. WAFWA has focused this Brief on the pack llama that is not a host of bovid (wild sheep) disease and is also free of significant endemic disease. Meanwhile, WAFWA if not directly, is indirectly endorsing exposure of purportedly naive populations of wild sheep to yaks, cattle, and horses that present a far greater risk to these wild species.

After thorough consideration and subsequent clarification of the information presented in the WSI/WHC Brief and Appendix, the ad hoc committee sees no evidence that llamas pose a disease threat to wild sheep and as such sees no reason to test llamas for any pathogens, including *M. ovi*.

Please refer to the expanded Appendix and note the agencies and individuals relying on the RA’s.