*JWD* 2019 55(4):745-754

[**Pathogen Prevalance In American Black Bears (*Ursus americanus amblyceps*) Of The Jemez Mountains, New Mexico, USA**](https://doi.org/10.7589/2018-12-286)

Bard SM and Cain JW 3rd

**ABSTRACT:** Informed management of American black bears (*Ursus americanus*) requires knowledge of the distribution and pathology of diseases affecting the species. Little information is available on pathogen prevalence from black bear populations in the Southwest, US, and it is unknown how these infections may influence black bear populations or disease transmission. We captured New Mexico black bears (*Ursus americanus amblyceps*) during 2016-17 as part of a long-term monitoring project and opportunistically collected 36 blood samples from 12 female and 17 male black bears. We wanted to determine prior exposure to canine distemper virus, canine parvovirus, *Yersinia pestis*, *Francisella tularensis*, West Nile virus, *Toxoplasma gondii*, and the tick-borne pathogens, *Anaplasma* spp., *Ehrlichia* spp., *Borrelia burgdorferi*, *Rickettsia* spp., and *Babesia* spp. Approximately half (55%, 16/29) of the individuals sampled had antibodies to *Y. pestis*, and 37% (10/27) had antibodies to *T. gondii*. Prevalence of antibodies to West Nile virus, *F. tularensis*, and canine parvovirus were lower (i.e., 11, 10, and 3%, respectively). We detected no antibodies to canine distemper, *B. burgdorferi*, *Rickettsia* spp., or *Babesia* spp. We documented changes in antibody titer levels for both sexes of several recaptured black bears. Our data will inform managers of pathogen prevalence and distribution in black bears in north-central New Mexico and provide a vital baseline dataset for future pathogen monitoring. Additionally, these data support actions to minimize exposure through handling wild individuals or through hunter harvest activities.

**Key Points:**

* Prospective serosurvey (*n* = 29 healthy black bears) in north-central New Mexico form 2016-17
  + Titers: CDV, CPV, WNV, *Y. pestis*, *F. tularensis*, *T. gondii*
  + PCR: *Anaplasma* spp., *Ehrlichia* spp., *B. burgdorferi*, *Rickettsia* spp., & *Babesia* spp.
* Moderate/high prevalence: *Yersinia pestis* (55%), *Toxoplasma gondii* (37%)
  + Southern Rockies has a high incidence of plague transmission
    - Bears potentially prey on infected rodents when food limited
  + Bears regularly overlap with pumas and bobcats; zoonotic implications
* Low prevalence: Tularemia (10%), WNV (11%), *Anaplasma* spp. (4%), *Ehrlichia* spp. (4%)
  + 1 female bear tested positive for *Anaplasma* spp. & *Ehrlichia* spp.
  + First report of WNV in a western black bear population
* Negative: CDV, CPV\*, *B. burgdorferi*, *Rickettsia* spp., & *Babesia* spp.
  + 1 bear positive; negative upon resampling (suspect false positive)

**TLDR:** New Mexico black bears had relatively high *Yersinia pestis* (55%) & *Toxoplasma gondii* (37%) titers

**Related Articles:** *None on the current ACZM reading list*

*JWD* 2019 55(3):576-588

[**Exposure Of Alaska Brown Bears (*Ursus arctos*) To Bacterial, Viral, And Parasitic Agents Varies Spatiotemporally And May Be Influenced By Age**](https://doi.org/10.7589/2018-07-173)

Ramey AM, Cleveland CA, Hilderbrand GV, et al

**ABSTRACT:** We collected blood and serum from 155 brown bears (*Ursus arctos*) inhabiting five locations in Alaska, US during 2013-16 and tested samples for evidence of prior exposure to a suite of bacterial, viral, and parasitic agents. Antibody seroprevalence among Alaska brown bears was estimated to be 15% for *Brucella* spp., 10% for *Francisella tularensis*, 7% for *Leptospira* spp., 18% for canine adenovirus type 1 (CAV-1), 5% for canine distemper virus (CDV), 5% for canine parvovirus, 5% for influenza A virus (IAV), and 44% for *Toxoplasma gondii*. No samples were seropositive for antibodies to *Trichinella* spp. Point estimates of prior exposure to pathogens among brown bears at previously unsampled locations generally fell within the range of estimates for previously or contemporaneously sampled bears in Alaska. Statistical support was found for variation in antibody seroprevalence among bears by location or age cohort for CAV-1, CDV, IAV, and *T. gondii*. There was limited concordance in comparisons between our results and previous serosurveys regarding spatial and age-related trends in antibody seroprevalence among Alaska brown bears suggestive of temporal variation. However, we found evidence that the seroprevalence of CAV-1 antibodies is consistently high in bears inhabiting southwest Alaska and the cumulative probability of exposure may increase with age. We found evidence for seroconversion or seroreversion to six different infectious agents in one or more bears. Results of this study increase our collective understanding of disease risk to both Alaska brown bear populations and humans that utilize this resource.

**Key Points:**

* Opportunistic serosurvey (n = 155 brown bears) in five locations in Alaska during 2013-2016
  + Tested for *Brucella* spp., *Francisella tularensis*, *Leptospira* spp., canine adenovirus type 1 (CAV-1), CDV, CPV, influenza A virus (IAV), *Toxoplasma gondii*, *Trichinella* spp.
* Differences in seropositivity for CAV-1, CDV, IAV, and *T. gondii* between sampling locations
  + However, no clear geographic gradient to distribution
  + IAV and *T. gondii* differences skewed by high seropositivity in two locations, respectively
  + No differences in seropositivity for any bacterial agents or CPV
* CAV-1 seropositivity was positively correlated w/ age & varied w/ sampling location
  + Consistently high in bears inhabiting southwest Alaska
  + Suggests increasing cumulative exposure probability with age
  + No other pathologic agents were correlated with age
* CDV positive bears were only at one site (Gates of the Arctic National Park)
* Evidence of previously unrecognized influenza A virus outbreak
  + 45% of bears sampled at Katmai National Park seroconverted in 2016
* No serological evidence of *Trichinella* spp. exposure

**TLDR:** Alaskan brown bears had seropositivity for a wide variety of pathogens, but not *Trichinella* spp., which varied by location (CAV-1, CDV, IAV, T. gondii) and by age (CAV-1)

**Related Articles:** *None on the current ACZM reading list*

Niedringhaus, Kevin D., et al. "Serology as a tool to investigate sarcoptic mange in American

black bears (Ursus americanus)." *The Journal of Wildlife Diseases* 56.2 (2020): 350-358.

**Abstract**: Black bears (Ursus americanus) have historically been considered an uncommon host for sarcoptic mange. However, over the last 25 yr, sarcoptic mange has been increasingly reported in black bears in the northeastern US. Syndromic monitoring is the most common surveillance approach for mange in bears, but tools to monitor exposure to Sarcoptes scabiei in bear populations have not been thoroughly evaluated under field conditions. **In this study, we validated a commercially available enzyme-linked immunosorbent assay (ELISA), designed to detect antibodies against S. scabiei in dogs, for use in black bears with a sensitivity and specificity of 95.6% and 96.6%, respectively.** To further examine the performance of this assay, serial serum samples from seven black bears with confirmed sarcoptic mange were collected posttreatment to determine the persistence of detectable antibody response with the ELISA. Antibodies in black bears waned to below the limit of detection between 4 and 14 wk, suggesting that serology studies might underestimate the number of exposed black bears after antibodies have waned. State-wide serosurveys in Pennsylvania from hunter-harvested black bears in 2017 and 2018 showed a significant difference in seroprevalence between regions with high occurrence of mange (mean seroprevalence 6.7%, range of 6.6–6.8%) and low occurrence of mange (no seropositive black bears were detected). Within Pennsylvania, these data indicate that the geographic distribution of exposure to S. scabiei, based on serologic testing, generally reflects the distribution of overt disease, as determined by syndromic surveillance. **Collectively, these results indicate the evaluated ELISA is an effective tool for monitoring S. scabiei exposure in bear populations and provides the framework for additional studies regarding sarcoptic mange epidemiology in black bears.**

**Key Points:**

* Introductions of Sarcoptes scabiei into susceptible populations has resulted in swift widespread morbidity and mortality
* Current methods for investigating the prevalence of disease rely on scrapes and individual skin samples
* Developed a serology test – mean seroprevalence was 6.7% - consistent over the years 2017 & 2018
* Antibodies from clinically normal animals might be from exposure without development of clinical disease or recovered clinical mange cases as seen in Iberian Ibex and chamois
* Other black bear mites
  + Demodex ursi
  + Ursicoptes americanus
  + Cross reactivity with this test unknown

**Take home:**  Serology can now be done on black bears to evaluate Sarcoptes prevalence on a population level

Sheldon, Julie D., et al. "MORBIDITY AND MORTALITY OF FREE-RANGING AMERICAN BLACK BEARS (URSUS AMERICANUS) UNDERGOING REHABILITATION IN EASTERN TENNESSEE, USA, 1996–2021." *Journal of Wildlife Diseases* (2022).

ABSTRACT: Free-ranging American black bears (Ursus americanus) often share habitat with humans and domestic animals, predisposing them to anthropogenic conflicts. Rehabilitation under professional care is a management option for orphaned, injured, and/or ill bears. Across several southeastern states, rescued bears are assessed and treated at the University of Tennessee and rehabilitated at **Appalachian Bear Rescue (ABR). Records from 1996–2021 showed 337 bears (170 males, 166 females, 1 unknown) from nine states were admitted to ABR.** Three bears were admitted twice, resulting in 340 admissions (42 neonates ,3 mo old, 206 cubs 3–12 mo, 87 yearlings 1–2 yr, and 5 adults .2 yr). Bears presented as orphans (58%), malnourished (24%), injured or ill (12%), or confiscated/other (6%). Individuals were returned to the wild (85%); died or were euthanized (12%); or were placed into professional care (3%). Of released bears, 195 had complete medical records available for evaluation; 31% were healthy upon intake while the remaining were treated successfully for malnutrition and internal parasites (49%), orthopedic (9%) and soft tissue injuries (5%), or other diseases (5%). Causes of death determined during necropsies performed (n¼30) were classified as trauma (50%), developmental (13%), undetermined (13%), malnutrition (13%), infectious or inflammatory (7%), and toxicosis (3%). **Despite the lack of maternal care and high prevalence of malnutrition and trauma, most bears recovered to release with appropriate husbandry and medical care.** This study provides a foundation for research to further improve care of rehabilitating black bears.

Intro

* This study describes morbidity and mortality of bears housed at Appalachian Bear Rescue (ABR) in Tennessee from its inception in 1996 through 2021, to ultimately guide health care and future research.

M&M

* Retrospective of records at ABR

Results

* 337 bears (170 males, 166 females, 1 unknown) from nine states (US) were admitted to ABR
* Bears were most likely to present in June and May, least likely to present in December and September
* Most likely to present in spring and summer and least likely to present in fall and winter
* Three bears were admitted twice, resulting in 340 admissions (12.4% neonates; 60.6% cubs; 25.6% yearlings; and 1.5% adults)
* Reason for intake: Most bears presented as orphaned neonates or cubs, or malnourished yearlings, with fewer bears injured or ill, confiscated, or other
* Outcomes: Individuals were returned to the wild (85%), died (6.2%), were euthanized (5.6%), or were placed into professional care (3.0%)
* There was no association between sex and reason for intake
* Orphaned neonates and cubs were statistically just as likely to return to the wild as were malnourished yearlings
* Injured or ill and ‘‘other’’ bears were significantly less likely to return to the wild compared with orphans and malnourished yearlings
* Causes of death or euthanasia determined by postmortem examination (n=30) were classified as trauma (50%, n=15), developmental (13%, n=4), undetermined (13%, n=4), malnutrition (13%, n=4), infectious or inflammatory (7%, n=2), and toxicosis (3%, n=1).

Discussion

* Despite an overall high survival rate for admitted bears, injured or ill bears were significantly more likely to be euthanized compared with orphaned or malnourished bears
* Traumatic injuries, undetermined causes of illness, and developmental abnormalities all decreased the likelihood of survival.
* Trauma was most common cause of mortality
* No bears died of a primary contagious infectious disease

EVALUATION OF CHEMICAL IMMOBILIZATION IN CAPTIVE BLACK BEARS (URSUS AMERICANUS) RECEIVING A COMBINATION OF NALBUPHINE, MEDETOMIDINE, AND AZAPERONE

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ABSTRACT: To assess potential seasonal differences in responses to immobilization, we sedated eight orphaned yearling black bears (Ursus americanus) being held for rehabilitation at a wildlife facility in Colorado, US, using a premixed combination of nalbuphine (40 mg/mL), azaperone (10 mg/mL), and medetomidine (10 mg/mL; NalMed-A) in October (autumn) prior to hibernation and again after emergence in May (spring) prior to their release. We dosed all bears at 1 mL NalMed-A per estimated 45 kg body mass (1 mL NalMed-A/45 kg), delivered by intramuscular injection using a pole syringe, to facilitate routine examination and ear tagging. Arterial blood gases were measured to assess oxygenation and acid-base status of bears both pre and post oxygen supplementation. The mean (SE) dose calculated post hoc was 0.9 (0.04) mg nalbuphine/kg, 0.2 (0.01) mg azaperone/kg, and 0.2 (0.01) mg medetomidine/kg. The mean induction time was 8 (1) min for six of the bears in October and 6 (1) min for eight bears in May. The NalMed-A combination provided good sedation in captive yearling black bears in autumn and spring and was effectively antagonized with a combination of naltrexone and atipamezole. Mild hypoxemia (PaO2: 53.5 54.4 mmHg) was the most significant side effect and was corrected (PaO2: 68.4 150.1 mmHg) with supplemental oxygen administered at 2 5 L/min for 5 min (point of sampling).

Background:

* Evaluated responses in 8 orphaned yearling black bears (similar in age and size) held for hehab at Colorado Parks and Wildlife Frisco Cree Wildlife Facilty
* All bears were in captivity for average of 71 days prior to first handling event
  + Handled first in October prior to hibernation and then again 7 mo later in May prior to release
* Both sessions used: NalMed-A combo: 40 mg nalbuphine, 10 mg azaperone and 10 mg medetomidine/ml)
* Subjectively monitored and scored sedation throughout the handling period (jaw tone, muscle tension, and response to stimulus) and measured PaO2, PaCO2, SpO2 via arterial blood gas and pulse ox
* Once session completed- 5 mg atipamezole/mg medetomidine and 1.3 mg naltrexone/mg nalbuphine

Results:

* Two bears during October needed supplemental injections-> suspect one the initial injection failed and the other was underestimated in body mass
* Mean induction for the 6 (October) was 8 min and mean in May was 6 min (all 8 bears)
* Mean recovery time for 7 (October) was 10 min and in May for 7 bears was 11 min (2 bears did recovery but times were not recorded)
* Mean PaO2 measured before O2 supplement (October) was 53.6 (3.3) mmHg and in May it was 54.4 (2.0) mmHg– both were below the targe of 55.6 mmHg
* Mean PaCO2 25.6 in October
* Mean SpO2 before oxygen supplementation was 84.2 in October and 84.5 in May- measured oxygen saturation did not increase when oxygen was supplemented at 2L/min
* October the scoring of sedation in 7 bears was 5 (meaning no response to stimulus throughout the handling and sampling); one was scored as 4 because of slight jaw tone was noted; in May all bears were a 5

Take Away:

* This combo provided acceptable sedation in all 8 bears with effective antagonization once the session was completed; there was low delivery volume in all bears
* There was mild hypoxemia prior to oxygen supplementation at both sessions but corrected with 2L/min and 5L/min via nasal catheter or cannula

LEPTOSPIROSIS IN URBAN AND SUBURBAN AMERICAN BLACK BEARS (URSUS AMERICANUS) IN WESTERN NORTH CAROLINA, USA

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ABSTRACT: American black bear (Ursus americanus) populations in North Carolina, US have recovered significantly in recent decades and now occupy much of western North Carolina, including urban suburban areas. We used the black bear as a potential sentinel for leptospirosis, a bacterial zoonotic disease caused by Leptospira spp., which is maintained by domestic and wild mammals. We determined whether Leptospira spp. were present across a gradient of housing densities in the urban and suburban black bear population in and around Asheville, North Carolina using serologic and molecular surveys. We collected blood from captured black bears (n¼94) and kidneys and bladders from carcasses (n¼19). We tested a total of 96 (47 females, 47 males, and 2 unknown) serum samples by microscopic agglutination test (MAT) and had positive results (titer .1:100) for L. kirschneri serovar Grippotyphosa (L. Grippotyphosa) in 4 females (8%) and 5 males (10%). No other serovars showed elevated titers in MAT. We tested a total of 125 samples using PCR (n¼96 serum, n¼20 kidney, and n¼9 bladders) and obtained positive results from one serum (1%), one kidney (5%), and one bladder (11%). The presence of Leptospira spp. in black bears occupying an urban and suburban landscape may indicate a more extensive occurrence of the bacteria among animals in the study region because black bears are the top carnivore in that ecosystem. Potential threats of widespread contamination during natural events such as flood or drought must be considered.

Background:

* Objective: conduct a serologic and molecular survey to determine the presence of different serovars of Lepto spp. Across a gradient of housing densities in an urban/suburban black bear population– wanted to know if black bears with a greater housing density (density/km^2) within their occurrence distribution had a greater likelihood of testing positive for lepto
* Area: western NC centered on the urban-suburban Asheville
* Baited traps with day old pastries- immobilized bears with 5 ml Telazol and 4 ml ketamine and 1 ml xylazine
  + Placed ear tags, tattooed inside upper lip, removed an upper premolar (for age), and inserted a PIT tag
  + Collected ectoparasites and hair, serum from the femoral artery
  + Recorded BM, sex, repro status, external morphometric measurements and date and capture location
  + Fitted bears with a GPS radio collar
* Collected kidneys and bladder from vehicle killed bears on roadways; necropsies were performed on any that were received within 24 hours of the animal’s death
* All samples were shipped frozen at 20C to Cornell Animal Health Diagnostic Center every 2-3 mo
* Tested tissues and serum using PCR; seroconversion or a fourfold rise in titer in paired sera was considered consistent with current lepto infection

Results:

* Tests 96 bears (47 females, 47 males, and 2 unknown)
* Had positive results for L. Grippotyphosa in four females and five males but there ere no elevated MAT titers to any other serovars
* PCR- tested 125 samples- positive results in one serum, one kidney and one bladder
* None of the MAT positive animals had corresponding positive PCR results (however, with MAT animals they only tested for 7 spp. And could not rule out chronic renal colonization

Take Away:

* Documented the presence of L. Grippotyphosa in an urban and suburban black bear population
* The observations of this lepto spp was in very low density housing areas- suggesting Lepto is not strictly limited to the densely populated areas
* Black bears should be considered another species capable of perpetuating disease transmission to people and domestic animals and the presence of Lepto in kidney and bladder indicate the animals ability to shed it
* Antibody prevalence for Lepto in black bear populations could be considered low compared to racoons, skunks, bobcats, rats, and squirrels
* This serovar specifically is associated with disease in dogs and dogs can serve as a dead end host

**ARTICLE**: Jeong, Dong-Hyuk, Jeong-Jin Yang, and Seong-Chan Yeon. "Fluoxetine therapy to decrease stereotypic behavior in the asiatic black bear (ursus thibetanus)." *Journal of Zoo and Wildlife Medicine* 50.3 (2019): 718-722.

Abstract: The present study evaluated the effects of fluoxetine on decreasing stereotypic behaviors in Asiatic black bears (ABB). Four captive ABB exhibiting stereotypic behaviors were administered fluoxetine (0.25–1 mg/ kg orally every 24 hr) for 91 days. The animals were monitored twice weekly for 213 days (April to October) using a scan sampling method (preadministration, 30 day; administration, 91 days; post administration, 92 days). Five blood samples were collected from the jugular vein of each bear for serum chemistry analysis (one during preadministration; two each during administration and post administration periods). Fluoxetine was safe and effective in decreasing stereotypies, but it may be difficult to decrease long-established stereotypies in ABB using fluoxetine alone. To decrease stereotypies in ABB effectively, it is necessary to identify underlying problems that contribute to stereotypic behavior and apply comprehensive interventions that can include fluoxetine treatment.

Background:

* Stereotypies = repetitive, invariant behavior patterns with no over goal/function
* Ursids have highest incidence of stereotypies within carnivores
* Use of fluoxetine to reduce stereotypies previously reported in polar and brown bear
  + Haloperidol only partially effective in brown bears

Goal of Study: Brief communication evaluating effects of fluoxetine on decreasing stereotypic behaviors in Asiatic black bear (n=4)

* Observed stereotypies weekly (6 hours x 2 days) pre, peri, and post-administration
* Administered fluoxetine powder in edible bees wax: 0.62 mg/kg PO SID x 31 , 1 mg/kg next 30 days, then decreasing every 10 days to 0.75, 0.5, 0.25 mg/kg

Key Points:

* All four bears showed pacing behavior, 1 showed paw sucking
* All bears had significant reduction in pacing behavior/paw sucking both during fluoxetine administration and after fluoxetine was discontinued
  + Stereotypies recurred after 44 and 53 days in 2 bears, but at lower frequency than prior to fluoxetine administration
* Fluoxetine is useful in decreasing stereotypies in Asiatic black bears, but less effective in well-established stereotypies
  + Multi-factorial approach in stereotypy reduction is recommended

**ARTICLE**: Zeid, Zahidah I., et al. "Ursid γ-herpesvirus type 1–related virus in captive bornean sun bears (helarctos malayanus euryspilus) in sabah, malaysia." *Journal of Zoo and Wildlife Medicine* 53.1 (2022): 92-99.  
  
Abstract: The Bornean sun bear (Helarctos malayanus euryspilus) is the smallest subspecies of sun bear. Their numbers are declining, and more research is needed to better understand their health and biology. Forty-four bears housed at the Bornean Sun Bear Conservation Centre (BSBCC) in Sabah, Malaysia, 𝛄-herpesvirus type 1 (UrHV-1) is a herpesvirus that has been detected from swab samples of clinically healthy sun bears and biopsy samples of oral squamous cell carcinoma in sun bears. We detected an UrHV-1–related virus from throat and rectal swabs by molecular viral screening in samples from 15.9% of the sun bears at BSBCC. None of the bears with the UrHV-1–related virus in this study had oral lesions. There is no known report of UrHV-1 detection in the wild sun bear population, and its association with oral squamous cell carcinoma is not fully understood. Finding an UrHV-1–related virus in a rehabilitation center is a concern because conditions in captivity may contribute to spreading this virus, and there is the potential of introducing it into wild populations when a bear is released. This study demonstrates an urgent need to carry out similar surveillance for sun bears in captivity as well as those in the wild, to better understand the impact of captivity on the prevalence and spread of UrHV-1–related viruses. Positive bears also should be monitored for oral lesions to better understand whether there is a causal relationship.

Background:

* Malayan sun bears known as “engineers of forest” due to role in pest control and seed dispersal
* Herpesviridae - three families of viruses (alpha, beta, gamma); gamma are most species specific
* Ursid 𝛄-herpesvirus type 1 (UrHV-1) first detected from sun bears (n=4) with SCC (2013)
* Other viruses of sun bears: canine adenovirus 1, foot and mouth disease virus

Methods: Evaluated 44 sun bears for UrHV-1 as part of screening for infectious disease threats

Key Points:

* Detection of UrHV-1 related virus in 16% (7/44) sun bears; wide age range, no sec predilection
  + PCR positive on throat swab (2), rectal swab (4), throat and rectal combo swab (1)
* All positive bears were clinically healthy with no oral lesions, no significant changes on CBC/chemistry, and negative for all other viruses screened for
  + Previous studies revealed a high prevalence of UrHV-1 with erythematous oral lesions
  + Only one bear in this study had an oral lesion at time of sampling and was negative for UrHV-1; oral lesion resolved without treatment after 4 months
* Association of UrHV-1 with oral carcinoma is still poorly understood and broader studies are needed to identify if there is a causal relationship and to assess impact of captivity on prevalence and transmission of UrHV-1 related viruses

Comparison of isoflurane gas versus a guaifenesin, ketamine, and medetomidine constant-rate infusion for maintenance anesthesia in american black bears (ursus americanus).

Siegal-Willott JL, Bauer KL, Hayek LA, Luensman NM, Cross TN, Sajecki JL, McRuer DL.

Journal of Zoo and Wildlife Medicine. 2019;50(3):570-578.

Published anesthetic protocols for captive and free-ranging bears are limited to injectable inductions with maintenance via inhalants or additional injectable boluses. Though common in other species, intravenous (IV) continuous-rate infusions (CRI) using guaifenesin combinations have not been evaluated in ursids. This study evaluated the use of a CRI compared to an inhalant for maintenance anesthesia. **Seven healthy American black bears (Ursus americanus) were anesthetized in a crossover design** with two different anesthetic maintenance protocols. Bears were **immobilized with ketamine (2.02 ± 0.14 mg/kg) and medetomidine (0.04 ± 0.003 mg/kg) for both protocols. The anesthetic maintenance control protocol consisted of isoflurane gas (ISO)** started at 2% delivered by endotracheal tube; the **experimental protocol consisted of guaifenesin, medetomidine, ketamine (GMK) IV CRI started at 50 mg/kg/hr guaifenesin, 0.01 mg/kg/hr medetomidine, and 1 mg/kg/hr ketamine.** Induction and recovery parameters including **time to first effect, recumbency, and hands on; duration of maintenance protocol; and time from reversals administered to head up, standing on all four feet, no ataxia, and to fully recovered** were recorded and compared between protocols. **Heart rate, respiratory rate, rectal temperature, blood pressure, end tidal carbon dioxide, and hemoglobin oxygen saturation** were recorded at 5-min intervals and compared between protocols. **Venous blood gases** were obtained at the start, middle, and end of the maintenance anesthesia and **compared between protocols.** All bears exhibited hypertension with mild respiratory acidosis throughout procedures. Measured physiologic parameters did not differ significantly between the isoflurane and the GMK CRI maintenance protocols, with the exception of higher endpoint (ISO) pCO2 measurements. No adverse events were recorded with either protocol, and adequate depth of anesthesia was maintained with both protocols. GMK CRI provides a safe, effective, and more portable alternative to inhalant anesthetics for maintenance anesthesia in bears in captivity or in the field.

Background

* Reported adverse effects of alpha-2 agonists in bears: sudden arousal, bradycardia, hypoxemia, hypertension, hyperglycemia
* Guafenesin: centrally acting muscle relaxant

Key Points

* Supplemental ketamine required in over half the inductions
* Light plane of surgical anesthesia achieved in both protocols
  + GMK retained a palpebral despite appropriate plane
* No significant difference between iso and GMK for all parameters
  + At most time points iso bears were hypothermic, temps correlated with environment
  + Both protocols had hypertension (likely induction medetomidine)
  + Both protocols mild respiratory acidosis (iso bears trended higher pCO2 vs GMK)
* No adverse effects, no emesis despite not having an antiemetic
  + GMK did not precipitate out despite env temps <22C
  + Guaifenesin has short shelf life and bears required a small volume so kept a stock solution for 1 wk then replaced so may be prone to waste
  + Bears required low CRI rates so had a lot of variation on the drip set comparing intended vs actual received doses - recommend using a fluid pump if available

Conclusions

* GMK was safe and effective for maintenance of anesthesia in black bears with no difference in anesthesia parameters, vital parameters, or venous blood gas compared to isoflurane.
* May be a less bulky alternative to gas anesthesia in the field.

Pharmacokinetics of a single dose of fluralaner administered orally to american black bears (ursus americanus).

Van Wick P, Papich MG, Hashem B, Dominguez-Villegas E.

Journal of Zoo and Wildlife Medicine. 2020 Nov;51(3):691-5.

Sarcoptic mange continues to impact free-ranging mammal populations, including the American black bear (*Ursus americanus*). Administration of a single oral dose of fluralaner may be a viable treatment option for captive and free-ranging black bears affected by mange. This novel ectoparasitic in the isoxazoline class acts as an inhibitor of c-aminobutyric acid (GABA)-gated chloride channels and L-glutamate–gated chloride channels (GluCls) and is commercially available in the United States as a flea and tick preventative medication for domestic dogs and cats. **Pharmacokinetic parameters of fluralaner were evaluated in clinically healthy American black bear cubs (n =10) administered a single oral dose of fluralaner at a targeted minimum dose of 25 mg/kg. Blood was collected at 24 hr and 7, 14, 21, 28, 35, 42, 49, 56, 63, and 70 days, and harvested plasma was analyzed for drug concentration using high-performance liquid chromatography**. The average half-life (Ke t1/2) was determined to be 4.9 days, which is shorter than that published in domestic dogs. It was estimated that the average drug withdrawal time is approximately 64–72 days in this species.

Background

* *Sarcoptes scabiei* - life cycle varies but takes ~2wk for eggs to morph into adults
  + Reported resistance to ivermectin
* Fluralaner - isoxazoline, administered q12wk in dogs and cats
  + Targets ligand-gated chloride channels in neurons of arthropods
* Black bears are game species so need a withdrawal time before administration in rehab
  + In poultry fluralaner egg withdrawal 0 days, meat withdrawal 14 days

Key Points

* Cubs were 6 mo old - in dogs PK is affected by age, efficacy may be different in <6 mo old
* Target dose 25 mg/kg (actual dose avg 30 mg/kg), collected q1wk for 10 wks
* No adverse effects
* Cmax was higher and T1/2 shorter than dogs
  + Few lower secondary peaks suspected enterohepatic recirculation in dogs
* Withdrawal time in black bears predicted 64-72 days

 Conclusion

* Fluralaner PK showed higher Cmax and short elimination half life compared to dogs
* Withdrawal time is about 2 months

Table

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References:

* Van Wick M, Hashem B. Treatment of sarcoptic mange in an American black bear (*Ursus americanus*) with a single oral dose of fluralaner. J Wildl Dis. 2019; 55(1):250–253