Overview of infectious diseases in black bears

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Photo: D. Wagner, MDNRE
Literature search: Method

- Definitive text: *Infectious and Parasitic Diseases of Wild Mammals*
Literature search: Method

• Search engine: Institute for Scientific Information (ISI) Web of Science, through Michigan State University Libraries portal
• Search timespan: 1960-2010
• Search terms:
  (black bears) AND disease

**Results:** 28 peer-reviewed research publications

• Comparison/broader search terms:
  (black bears) OR (Ursus americanus)

**Results:** 1,199 peer-reviewed research publications, of which another 32 were disease-related
Literature search, 1960-2010: Results

• Total: 60 studies or reports, + ref. texts
  – Parasites: 78% of studies; ~38 types reported (protozoa, worms, ticks/mites in ↓ frequency)
    • Prevalence by type varies widely
    • Usually an incidental finding
    • Occasional reports of fatal infections (e.g. cubs) but little evidence of outbreaks with significant population-level sickness or death rates
  – Two most represented parasites (*Toxoplasma* and *Trichinella*) are of zoonotic concern (undercooked game meat), rather than because of their negative effects on bears themselves
Literature search, 1960-2010: Results

- Total: 60 studies or reports, + ref. texts
- **Bacteria & viruses**: 22% of studies; ~14 types reported
  - Prevalence by type varies widely, but typically low
  - Usually found as part of research projects rather than because of obvious disease
- Kinds of diseases (or evidence of exposure) reported:
  - Mosquito/tick-borne (e.g. arboviruses, *Ehrlichia*)
  - Zoonotic and/or of economic significance for livestock (e.g. TB, brucellosis, rabies, tularemia, anthrax, VS, Q-fever, pseudorabies, *Campylobacter*, plague)
  - Other (e.g. warts, canine viruses)

- No evidence that bears play any significant role in any zoonotic or livestock disease
Bacterial or viral disease outbreaks in black bears

- **Infectious canine hepatitis virus (CAV-1)**
  - Two cubs, Georgia, 1983
    - Taken from wild for an “educational institute”, cared for in homes of employees
    - Both sickened, died 2 wks after arrival; CAV-1 isolated
  - Outbreak in a “wildlife park” in So. Dakota, 1983
    - 148 black bears enclosed in three pens; some comingled with coyotes, wolves, brown bears
    - 28 (19%) sickened over 4 weeks, of which 24 (86%) died, along with 1 coyote
    - CAV-1 isolated from bear and coyote tissues

Bacterial or viral disease outbreaks in black bears

- **Infectious canine hepatitis virus (CAV-1)**
  - Bears are susceptible to CAV-1, though overall mortality rates probably low (19% in Collins et al.)
  - Captivity, ‘unnaturally’ high bear density, direct exposure to infected canids were necessary for mortality to occur

Aside: What is an ‘unnaturally’ high bear density?

- Infectious canine hepatitis virus (CAV-1)
  - In So. Dakota “wildlife park”, 148 bears on ~250 acres (0.39 mi²); equivalent to ~380 bears/mi²
  - In New Jersey, considered to have high bear densities for a free-ranging system, estimated density is ~3 bears/mi²
  - Bear densities in 1983 CAV-1 outbreak were more than 100x higher than what would be considered high for free-ranging black bears

Bacterial or viral disease outbreaks in black bears

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  - Bears are susceptible to CAV-1, though overall mortality rates probably low (19% in Collins et al.)
  - Captivity, ‘unnaturally’ high bear density, direct exposure to infected canids were necessary for mortality to occur
  - Risk for free-ranging bears is likely low; exposure via wild canids, in which infection is common
  - Domestic dogs commonly vaccinated, so little threat to them

Bacterial or viral disease outbreaks in black bears

- Pseudorabies virus (Aujeszky’s Disease)
  - Case in a penned black bear on a swine farm
    - Died after a 3 day illness; pseudorabies virus isolated from multiple tissues (and a simultaneously sick pig)
    - 10 cats and 12 - 200 lb. pigs had recently died on farm
  - Outbreak in brown bears (U. arctos) in Italian zoo
    - 100% mortality (4 of 4) within 24 hours of eating uncooked pork offal from a slaughterhouse
    - Pseudorabies virus isolated from bear brains
    - One bear that didn’t eat the offal was fine

Bacterial or viral disease outbreaks in black bears

- Pseudorabies virus (Aujeszky’s Disease)
  - Bears are susceptible to pseudorabies and mortality from it
  - Captivity, direct exposure to infected pigs, offal were necessary for mortality to occur
  - Species other than swine are dead-end hosts
  - Risk for free-ranging bears is likely quite low (pseudorabies in feral pigs in SE states, but no outbreaks in bears); would have to be exposed by scavenging infected swine

Bacterial or viral disease outbreaks in black bears

• Anthrax
  – Outbreak in bison in Northwest Territories, Canada, in July 1993
  – 172 bison and three moose carcasses found
  – Signs of black bear scavenging found on 22 bison carcasses
  – Three black bear carcasses found, but no samples were taken to confirm anthrax; *presumptive diagnosis only*
  – Risk for free-ranging bears is very low; geographically limited distribution

Mycobacterium bovis  
(Bovine TB) in Michigan  
black bears

- Surveillance 1996-2003
- 7 TB+ / 214 tested (3.3%)  
- 6 of 7 (86%) boars; mean age: 1.5 years  
- None had gross or microscopic signs of TB; culture positive only  
- Shedding, infectivity are related to lesion development; unlikely to be highly infectious  
- Spillover hosts; no evidence bears play any epidemiologically significant role in outbreak

Contributioning causes of death: Bear post-mortem accessions 1960-6/2010

<table>
<thead>
<tr>
<th>Diagnosis</th>
<th>Number</th>
<th>% of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trauma Vehicle kill</td>
<td>44</td>
<td>30.1</td>
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<tr>
<td>Gunshot (nuisance)</td>
<td>14</td>
<td>9.6</td>
</tr>
<tr>
<td>Gunshot (unrecovered wounded &amp; poaching)</td>
<td>15</td>
<td>10.3</td>
</tr>
<tr>
<td>Intraspecies &amp; all other</td>
<td>15</td>
<td>10.3</td>
</tr>
<tr>
<td>Chemical immobilization deaths</td>
<td>16</td>
<td>11.0</td>
</tr>
<tr>
<td>Starvation/malnutrition</td>
<td>14</td>
<td>9.6</td>
</tr>
<tr>
<td>Parasites (Sarcoptes, Dirofilaria, etc.)</td>
<td>11</td>
<td>7.5</td>
</tr>
<tr>
<td>Other</td>
<td>8</td>
<td>5.5</td>
</tr>
<tr>
<td>No diagnosis</td>
<td>9</td>
<td>6.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>146</td>
<td><strong>100%</strong></td>
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Photo: D. Wagner, MDNRE

~60%
External review: Outstate wildlife health specialists

- Dr. M. Carstensen, Minnesota DNR
- Dr. J. Langenburg, Wisconsin DNR
- Dr. M. Miller, Colorado Division of Wildlife
- Dr. J. Fischer, SE Coop. Wildlife Disease Study (covers 17 southeastern states)
- Dr. T. Shury, Parks Canada

Consensus opinion: No evidence that infectious diseases are causing significant population-level morbidity or mortality in black bears.
Why so little infectious disease in black bears?

- Ecological role as scavengers increases exposure, has exerted evolutionary pressure towards disease resistance
- Generally solitary behavior, sparse distribution on the landscape limits opportunities for bear-to-bear disease transmission
Summary

• Black bears are susceptible to a wide variety of internal and external parasites (largely due to their indiscriminant diet). These are capable of causing sporadic deaths, but unlikely to cause outbreaks with high morbidity & mortality.

• Black bears can become infected with a wide variety of bacterial & viral diseases that may be zoonotic or of economic significance to domestic animals. In all cases to date, bears appear to be dead-end or spillover hosts, and their exposure is a function of disease presence in the environment.
Summary

• In the few documented cases where diseases have caused outbreaks with significant mortality, bears have been in captive settings where their densities, level of exposure, or both were unnaturally high.

• A variety of sources (scientific literature, WDL necropsy accessions, wildlife health experts) provide little evidence that infectious disease is currently a critical factor necessitating or driving management of black bear populations (in Michigan or elsewhere).
Thank You

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