What Is 'Zombie Deer Disease' or Chronic Wasting Disease ...

This so-called zombie deer disease gets its nickname from the symptoms it causes. A year or so after an animal becomes infected, according to the CDC, it can begin stumbling and acting listless and confused. Infected animals can also lose weight rapidly, hence the "wasting" part of the disease's name.

'Zombie' deer disease is in 24 states and thousands of infected deer are eaten each year, expert warns

Ryan W. Miller, USA TODAY  Published 10:15 a.m. ET Feb 16, 2019 / Updated 2:13 p.m. ET Feb 18, 2019

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Outline

• Who is the Wildlife Health Section
• What we do
• Methods of surveillance
• Case study
  • Walk through necropsy
  • Rule out diseases along the way
• What scientists do with this information
The DNR Wildlife Health Section is responsible for monitoring the health and well-being of wildlife in the State of Michigan.
The Lab Staff

Dr. Kelly Straka DVM, MPH
Veterinarian in Charge (2016)

Dr. Dan O’Brien DVM, PhD
Wildlife Veterinarian/Epidemiologist (1999)

Melinda Cosgrove, MS
Laboratory Scientist Manager (1997)

Tom Cooley, MS
Wildlife Biologist/Pathologist (1977)

Caitlin Ott-Conn, MS
Laboratory Scientist (2015)

Julie Melotti, MS
Laboratory Technician (2001)

Katie Farinosi, BS
Laboratory Assistant (2018)

Cameron Dole, BS
Department Technician (2019)
Why do We Monitor Wildlife Health?

• Value of wildlife
  • Intrinsic
  • Traditional
  • Cultural
  • Economic
  • Ecological

• Maintain healthy populations of wildlife at sustainable levels
Why do We Monitor Wildlife Health?

- Increasing interface among wildlife, humans, and domestic animals
  - Anthropogenic expansion
  - Climate change
  - Habitat degradation and fragmentation

- “Zoonotic EID’s represent an increasing and very significant threat to global health” (Jones et al. 2008)
  - 60.3% EID events are zoonotic
    - 71.8% originate in wildlife

- Not only are we concerned about the impact on wildlife, but also the zoonotic potential.

Active Surveillance

• Designed to detect a specific pathogen in one or more species
• Solicit help from hunters, trappers, etc.
• Specific tissue requested
• Predetermined sample sizes and areas
• Used to obtain statistical data on prevalence, age and sex distribution, and geographic distribution
• Can become costly
Bovine tuberculosis

Highly pathogenic avian influenza

Chronic wasting disease
Passive Surveillance

- Opportunistic collection of specimens
- Sick/dead wildlife reported by the public, federal, state, or local government agencies
- Perform a complete postmortem examination (necropsy)
- May require multiple diagnostic tests to get a diagnosis
Case Study: History

• August 30, 2019 - Barry County
• “Deer observed coming down a hill behind the collector’s house, stumbling, running into trees and foaming at the mouth. It went into a lake and drowned after 40 minutes.”
• Conservation Officer collected deer and brought to nearest Field Office
• Delivered to the lab on 9/12 and necropsied on 9/13.
Necropsy: External Examination

• Weigh animal and examine externally
  • Body condition

• Diseases/conditions to consider:
  • Trauma
  • Fibromatosis
  • Hair loss
Trauma
Fibromatosis

- Viral
- Gray or black wart-like growths on skin (few to numerous)
- Problematic if impairing vision or mobility
Hair loss

- Normal molt
- Congenital anomaly
- Dermatitis (bacterial or fungal)
- Mange
- Pressure necrosis
- Trauma
- Intraspecies competition
Necropsy: Subcutaneous Examination

• Assess physical (body) condition

• Diseases/conditions to consider:
  • Trauma
  • Hydrocyst
  • Abscess
  • Actinomycosis
  • Epizootic hemorrhagic disease (EHD)
Trauma
Hydrocyst or Seroma

- Fluid filled cyst in subcutaneous space
  - Yellow-clear to pink liquid and fibrinous material
- Normally in brisket area as a result of a trauma
- Can impair mobility
Abscess

- Bacterial infection caused by traumatic injury
- Green to yellow paste-like or liquid material
  - Subcutaneous or intramuscular
- Can impair mobility, impact physical condition, spread to other areas, and/or become septic
Actinomycosis (lumpy jaw)

- Bacterial infection caused by penetrating wound from coarse food material

- Swelling of the cheek with food impaction and/or abscess material, loss of teeth, eroded bone (mandible)

- Impairs ability to eat, impacting physical condition
Epizootic Hemorrhagic Disease (EHD)

• Virus transmitted by midge
  • Late summer or early fall

• Characterized by dead deer in or near bodies of water

• Affects the vascular system and can cause acute mortality

• Subcutaneous: serosanguineous (yellow) or hemorrhagic (red) edema
Necropsy: Examination of Viscera

• Examine each organ for gross lesions

• Diseases/conditions to consider:
  • EHD
  • Bovine tuberculosis
  • Pneumonia
  • Pleuritis
  • Pericarditis
  • Peritonitis
  • Abscesses
  • Parasites
Epizootic Hemorrhagic Disease (EHD)

- Internal
  - Extensive blood in body cavities
  - Congestion of organs
  - Hemorrhaging on serosal surface of rumen

- Localized outbreaks can cause significant mortality
Epizootic Hemorrhagic Disease (EHD)

- 2006
  • SW MI 50-75 deer
- 2008
  • SE MI 150-200 deer
- 2009
  • SW/SC 300-450 deer
- 2010
  • SW MI 1,025 deer
- 2011
  • SW MI 300 deer
- 2012
  • SLP 30 counties
  • ~15,000 deer
- 2013
  • SW MI 140 deer
- 2016
  • SW MI < 10 deer
- 2017
  • SLP > 250 deer
- 2018
  • SLP > 5 deer
- 2019
  • SW MI > 5 deer
Bovine Tuberculosis (bTb)

- Bacteria: *Mycobacterium bovis*
- Pea-sized nodules (tubercles) in the lungs and lining of the thoracic cavity
- Chronic infections can cause respiratory distress
- Active surveillance program for TB in MI deer
Bovine Tuberculosis Endemic Area
Northeastern Michigan

Legend
- DMU 452
- 5-County Area
- County Lines

Dave Richey: Detroit Free Press
### Michigan White-tailed Deer TB Surveillance

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<td><strong>Grand Total</strong></td>
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<td><strong>314,077</strong></td>
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As of February 13, 2020
Pneumonia

• Non-specific - bacterial or viral

• Usually caused by trauma (vehicle strike, archery or firearm projectile)

• Lung tissue dark and solid, abscesses and adhesions may be present, impaired lung function

• Deer often in poor body condition, lethargic, and unafraid of humans
Pleuritis

- Non-specific - bacterial or viral

- Usually caused by trauma (vehicle strike, archery or firearm projectile)

- Fibrinous deposits on pleura with adhesions to lungs, lungs may also be pneumonic, impaired lung function

- Deer often in poor body condition, lethargic, and unafraid of humans
Pericarditis

- Non-specific - bacterial or viral
- Usually caused by trauma (vehicle strike, archery or firearm projectile)
- Thickening of pericardial sack, may be adhered to heart or lungs, impaired heart function
- Deer often in poor body condition, lethargic, and unafraid of humans
Peritonitis

• Non-specific - bacterial or viral

• Usually caused by trauma (vehicle strike, archery or firearm projectile)

• Can cause excessive fluid in the abdomen, adhesions and abscesses, impair digestion

• Deer often in poor physical condition, lethargic, and unafraid of humans
Cranial Abscess

• Bacterial

• Introduced into the brain following a penetrating skull fracture

• Normally bucks in good physical condition

• Deer behaving neurologically abnormal, unafraid of humans, circling, head down
Parasites

- Setaria yehi: Abdominal worm
- Echinococcus granulosis: Tapeworm cysts in lung
- Taenia hydatigena: Tapeworm cysts in liver
- Parelaphostrongylus tenuis: Meningeal worm
- Fascioloides magna: Liver fluke
Necropsy

- Non-specific lesions/no lesions

- Diseases to consider:
  - Chronic wasting disease
  - Eastern equine encephalitis
  - West Nile virus
Chronic Wasting Disease

- Prion (misfolded protein)

- Contagious fatal neurological disease

- Causes abnormal neurological behavior, poor body condition, excessive salivation or urination
  - Prolonged incubation period: 18 months
CWD: Transmission

Direct

Indirect

Movement and poor carcass disposal practices can spread the disease to new locations

Feeding and baiting sites concentrate deer and can facilitate spread of disease
West Nile Virus

• Virus transmitted by a mosquito
  • Early to mid summer

• Causes abnormal neurological behavior: lack of fear of humans, stumbling, unable to stand, lethargic, drooling or foaming at the mouth

• Most clinical cases are in wild birds
  • 9 positive deer since 2005
Wildlife Tested and Positive for WNV Year*

*due to financial constraints WNV testing was not routinely performed some years
Eastern Equine Encephalitis

- Virus transmitted by a mosquito
  - Late summer to early fall

- Causes abnormal neurological behavior: lack of fear of humans, stumbling, unable to stand, lethargic, drooling or foaming at the mouth

- Highly fatal
How Do We Make a Diagnosis?

• Review of History:
  • White-tailed deer
  • Neurologically abnormal
  • Late summer
  • Died in water
  • From SW Michigan

• Combine history with necropsy findings

Chronic wasting disease
West Nile virus
Eastern equine encephalitis
Epizootic hemorrhagic disease
Necropsy Findings:

“The pelage has been water-soaked.”
“There is subcutaneous hemorrhagic edema on both rear legs...on the head, neck, and left side of the thorax...frank blood in abdominal cavity.”
“There is a copious amount of frank blood in the thoracic cavity.”
“There is a moderate amount of blood between the pericardial sac and the heart.”
“The liver is congested, the spleen is congested, the kidneys are congested.”
How Do We Make a Diagnosis?

• Review of History:
  • White-tailed deer
  • Neurologically abnormal
  • Late summer
  • Died in water
  • From SW Michigan

• Necropsy findings

Diagnostic testing is expensive and so we start with most likely diagnosis and go from there

Epizootic hemorrhagic disease
Eastern equine encephalitis
Chronic wasting disease
West Nile virus
Confirmatory testing and diagnosis

- Bovine tuberculosis - gross examination of cranial lymph nodes
  - Negative
Confirmatory testing and diagnosis

- Chronic wasting disease - ELISA test on cranial lymph nodes - 9/13
  - Negative on 9/17
Confirmatory testing and diagnosis

• Epizootic hemorrhagic disease - PCR on tissues (lung, liver, spleen, kidney) - 9/13
  • Negative on 9/17
Confirmatory testing and diagnosis

- Histopathological exam - microscopic examination of all tissues - 9/18
Acccession Number: SP-19-0011747
Received Date/Time: 9/18/2019 10:23:00 AM
Verified Date/Time: 9/19/2019 11:02:56 AM
Pathologist: Fitzgerald, Scott D.

History
According to the history provided, this White-tailed Deer was observed stumbling and walking into a lake where it drowned. It tested negative for Tuberculosis and CWD.

Microscopic Description
Multiple sections of brain had mild to moderate perivascular cuffing and meningeal infiltrates of lymphocytes, plasma cells and rare neutrophils.
Sections of one eye had moderate lymphoplasmacytic infiltrates surrounding the optic nerve.
Sections of lung were diffusely edematous.
Sections of heart, liver, kidney and spleen were morphologically normal.

Diagnosis(es)
Moderate lymphoplasmacytic meningoencephalitis, suggestive of viral encephalitis

Comments:
Lesions in this Deer were more suggestive of viral encephalitis than EHD histologically. I recommend submitting fresh brain to Dr. Bolin's laboratory for EEE and West Nile virus PCR testing.

Scott D. Fitzgerald, DVM, PhD, DACVP, DACPV
Confirmatory testing and diagnosis

- **Bovine tuberculosis** - gross examination of cranial lymph nodes - negative
- **Chronic wasting disease** - ELISA test on cranial lymph nodes - 9/13
  - Negative on 9/17
- **Epizootic hemorrhagic disease** - PCR on tissues (lung, liver, spleen, kidney) - 9/13
  - Negative on 9/17
- **Histopathological exam** - microscopic examination of all tissues - 9/18
- **West Nile virus/Eastern equine encephalitis** - PCR on brain tissue 9/19
  - EEE positive on 9/23/19
What can we do with this information?

- Alert MDHHS and MDARD
  - Alert public that EEE viral activity in area
    - Avoid mosquitoes/use mosquito control
    - Vaccinate horses

- 2019 Outbreak
  - 10 human cases (6 fatalities)
  - 14 white-tailed deer
  - 29 horses, 2 canids, 1 goat, 1 sheep
  - 2 wild birds (mute swan, ruffed grouse)
What can we do with this information?

- Determine that the animal is NOT a zombie
- Notify submitter, biologist and supervisor of results
- Action depends on the disease, species and how widespread
  - Treatment in wildlife often not feasible
  - Some diseases we can make recommendations to remove feeders or carcasses
  - Some may lead to regulatory changes
    - CWD, TB, EHD
QUESTIONS?

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