Cooperative Assessment of Vacuolar Myelinopathy in North Carolina: A Case Study

Wildlife Health Workshop
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Overview

What is Vacuolar Myelinopathy?

Cooperative work on VM in NC

- Field assessments (w/ SCWDS and NCWRC)
- Sentinel Studies (w/ USGS and NCWRC)
- Feeding Studies (w/ NCSU and USGS)
- Neurological assessment / Supportive care (w/ NCSU and USGS)
Vacuolar Myelinopathy

Vacuolar – accentuation of cellular swelling
Myelinopathy – disease of myelin (a fatty nerve coating)

- Myelin important for normal nerve function, its alteration can result in neurological impairment
- Unknown cause; something associated with submerged vegetation, but not vegetation itself
- Only known from < 20 impoundments in AR, GA, NC, SC, and TX with nuisance aquatic vegetation
- Birds, fish and turtles have been documented to be susceptible (only birds in the wild)
What VM looks like to the pathologist

VM-negative  VM-positive

USGS-NWHC
What VM looks like in the field

- Abnormal posture (swim tipped to one side with legs or wings extended, in water on their back with feet in the air)
- Erratic flight, crash landing
- Difficulty walking, stagger
- Weakness and paralysis (inability to fly, unable to right themselves, lethargic, isolated from larger flock)
Cause is unknown

- Susan Wilde’s (UGA) working hypothesis is a novel cyanobacteria species grows densely on invasive aquatic plants and produces a neurotoxin.
- Toxin moves in the food chain.

Sick waterfowl are consumed by Bald Eagles

http://www.forestry.uga.edu/swilde/
Status

- Last documented case of VM in NC
  
  2005 – 200-300 dead coots on Woodlake (Moore County); Southeastern Cooperative Wildlife Disease Study (SCWDS) confirms VM

- Most recent case nationally
  
  2013 /2014 – SCWDS confirms VM every year at Strom Thurmond Lake (aka Clarks Hill Reservoir, GA/SC border)

- Lab work to identify causative agent continues
Much of what is known came from local projects

- Local observations by lake residents
- Field reconnaissance of affected areas
- Field experiments
- Laboratory feeding studies
Woodlake, Moore County, NC

- 1130 acre impoundment created in 1973
- Historically forested wetlands; now a lake, homes, golf courses, dam, and pine forests
- Lake had a significant hydrilla problem
History of VM at Woodlake

- **1985/86** - apparently normal coots first seen
- **1989** - sick coots observed by residents
- **1990** - dead and sick coots; birds taken for necropsy and myelin changes noted
- **1995** - coots with paralysis; ~ 300 coots and 7 mallards dead
- **1996** - no dead or sick coots observed
- **1997** - first confirmed diagnosis of VM
  - total coot mortality ~ 100

Value of local birder involvement
History of VM at Woodlake

- **1998** - documented bird mortality >250
  - first confirmation of AVM in ducks

  USFWS did surveys 1-2 x weekly and collected ring-necked ducks, mallards and buffleheads, later diagnosed with VM


*Value of field reconnaissance*
History of VM at Woodlake

- **1999** - one bald eagle with VM w/in 2 miles
  - coot mortality > 50
- **2000** - VM confirmed in Canada goose
  - coot mortality > 125
- **1998 to 2002 Site-specific studies**
- **2005** - VM confirmed in Canada goose and coots
  - coot mortality 200 to 300
Site-specific Study Questions

- Do birds arrive sick or get sick upon arrival?
- When is disease onset and what is its duration?
- Do birds with VM always die, or can they get better?
- What at sites might be affecting birds?
Sentinel Studies

Healthy birds tagged and released at VM+ and VM− reservoirs...

...then recaptured to monitor disease prevalence, and severity
Woodlake Sentinel Mallards - 2000

- 94 birds
Woodlake Sentinel Mallards - 2000

116 birds
Woodlake Sentinel Mallards - 2000

39 birds
Noteworthy Findings

- Exposure to causative agent is site-specific
- Exposure is seasonal, fall to early winter, with affected birds seen later too
- Onset of disease can be rapid, within as little as 5 days post-exposure
- Agent available for relatively short periods of time
- Mallards can be used effectively as sentinels to monitor the disease


*Value of field experiments*
Lab Studies - Feeding Trials

Mallard Ducks

Crows

Coots
VM experimentally reproduced in red-tailed hawks and chickens when fed tissues from VM positive coots.

VM experimentally reproduced in mallards fed hydrilla from a site with active VM outbreak.

VM lesions developed in chickens that ate hydrilla collected at a lake during an VM outbreak, but did not develop in chickens that ate hydrilla from a lake where VM never has been detected.

Value of lab testing.
NCSU CVM Studies

- More complete neurological exams
- Coots with VM clinical signs can recover with supportive care
- Bird to bird transmission not documented

NC WRC, NCSU and FWS expertise and equipment in the field, close to where the birds are affected, made us valuable partners for scientists with a more national (National Wildlife Health Center) or regional (Southeastern Cooperative Wildlife Disease Study) focus.