WNS Infection Trial – *How is WNS Transmitted?*

David S. Blehert, National Wildlife Health Center, Madison WI

- 3 groups
- Group I – Control (Unaffected bats from WI)
- Group 2 – Fungal treatment

  -abraided wings and unabraided wings
- Group 3 - Bat to bat aerosol test

  -affected NY bats in chamber with WI bats

  -affected NY bats and WI bats in adjacent chambers with no physical contact but sharing air space

- Preliminary results

  – NY bats now dying and on a 3-day arousal cycle

  -WI bats on a 10-day arousal cycle

  -One WI bat with abraided wing and fungal introduction now showing histology indicating fungal infection/invasion of epidermis

  -indicates that fungus is transmissible and invades wing tissue

  -not yet proven as causative agent because other Koch's postulates not yet complete

Wing Membrane Study

Elizabeth Buckles, Cornell University

- Fungus not present during July – Oct. based on histopathology
- In winter, fungus presence ranges from 46% to 100%
- Seeing signs of allergic skin reactions in bat wings

NY Pathology Unit

Ward Stone, NYDEC, Pathology Unit

- Fungus grows on everything
- Only grew on 2 of 3 *Eptesicus fuscus* - found pseudomonas florescens growing on the unaffected bat – bacteria may inhibit growth of the Geomyces fungus

Two Boston University Studies…

I. Are bats immunocompromised? Marianne Moore, Boston University

- Within the same site - asymptomatic bats had a higher immune response/competency than symptomatic bats
- Site to Site – bats in affected sites had significantly higher immune response/competency than bats in unaffected sites
- Aroused bats had a higher immune response/competency than torpid bats
- Lower weight/poorer condition bats show a higher immune response than bats in better body condition
- Preliminary conclusion: WNS bats are immuno-competent, but perhaps this immune response is too expensive

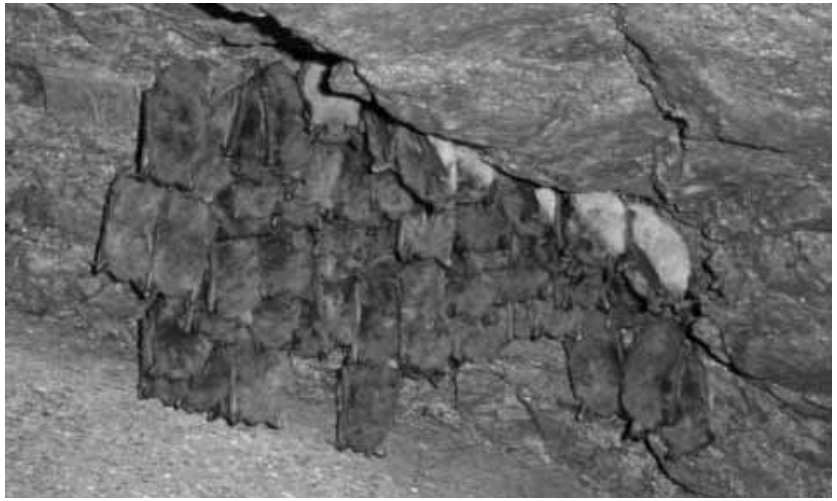
II. Body Condition and Fat Reserves

John Reichard, Boston University

- Is low fat a cause or an effect of WNS?
- Within affected sites - bats with and without visible fungus show similar body fat levels
- Between affected and unaffected sites - bats from affected sites have low fat/poor body condition; bats from unaffected sites show high fat/good body condition
- Comparing pre-WNS samples to post WNS samples - females showed a decrease in body mass compared to pre-WNS baseline data, esp. in spring/early summer
- By end of summer, post-WNS bats almost catch up to pre-WNS bats
- Early summer, wing damage visible, low body mass, low body fat; severe wing damage is not observed after mid-summer
- Poor body condition at ingress COMBINED with rapid fat depletion contribute to winter emaciation

Energy Expenditure During Hibernation in WNS Affected Bats

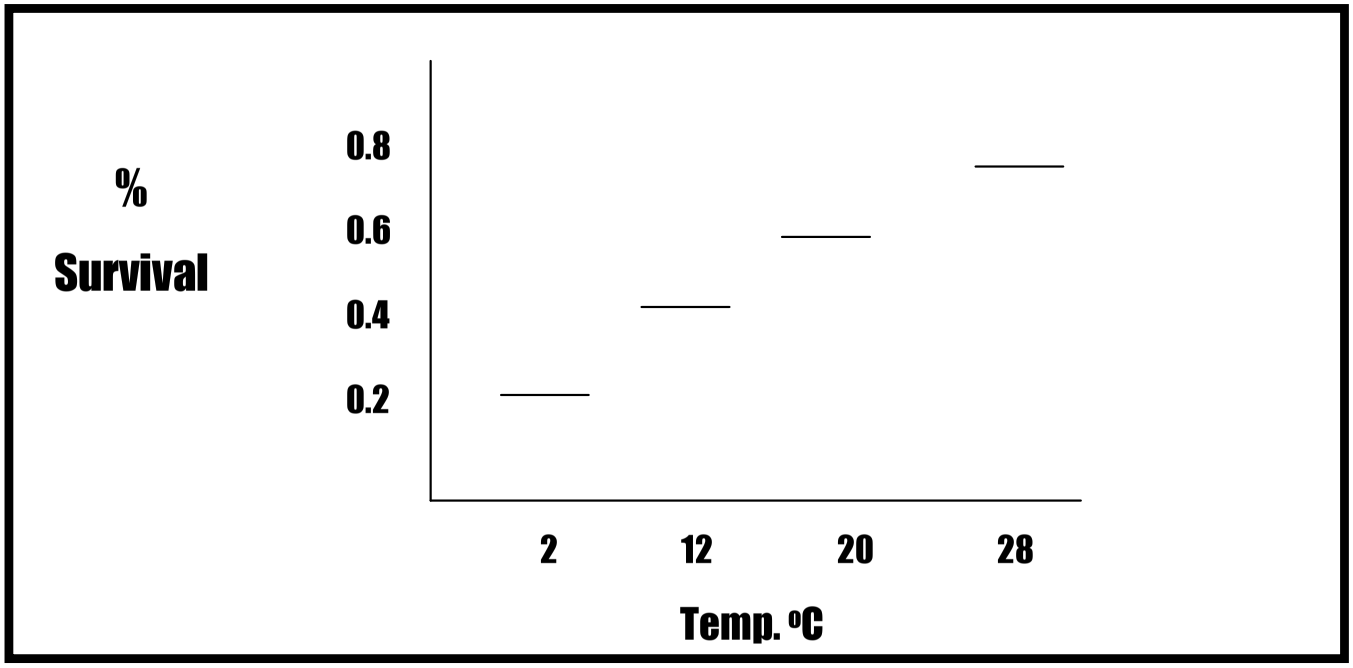
Tom Tomasi, Missouri St. Univ.



- Normal hibernation -
  - Not a static state
  - Interrupted by arousals
  - Costs of torpor
- WNS affected bats had significantly higher metabolic rates than unaffected bats, metabolic rate in unaffected bats was typical compared to baseline data from control bats
- The increase in baseline metabolic rate among WNS bats should not account for the emaciation observed in bats by January, increased arousal frequency is the likely cause of emaciation

Can Thermal Refugia Help Survival in WNS Affected Sites?

- Bats can conserve energy during euthermic phases if they cluster at warmer temps.



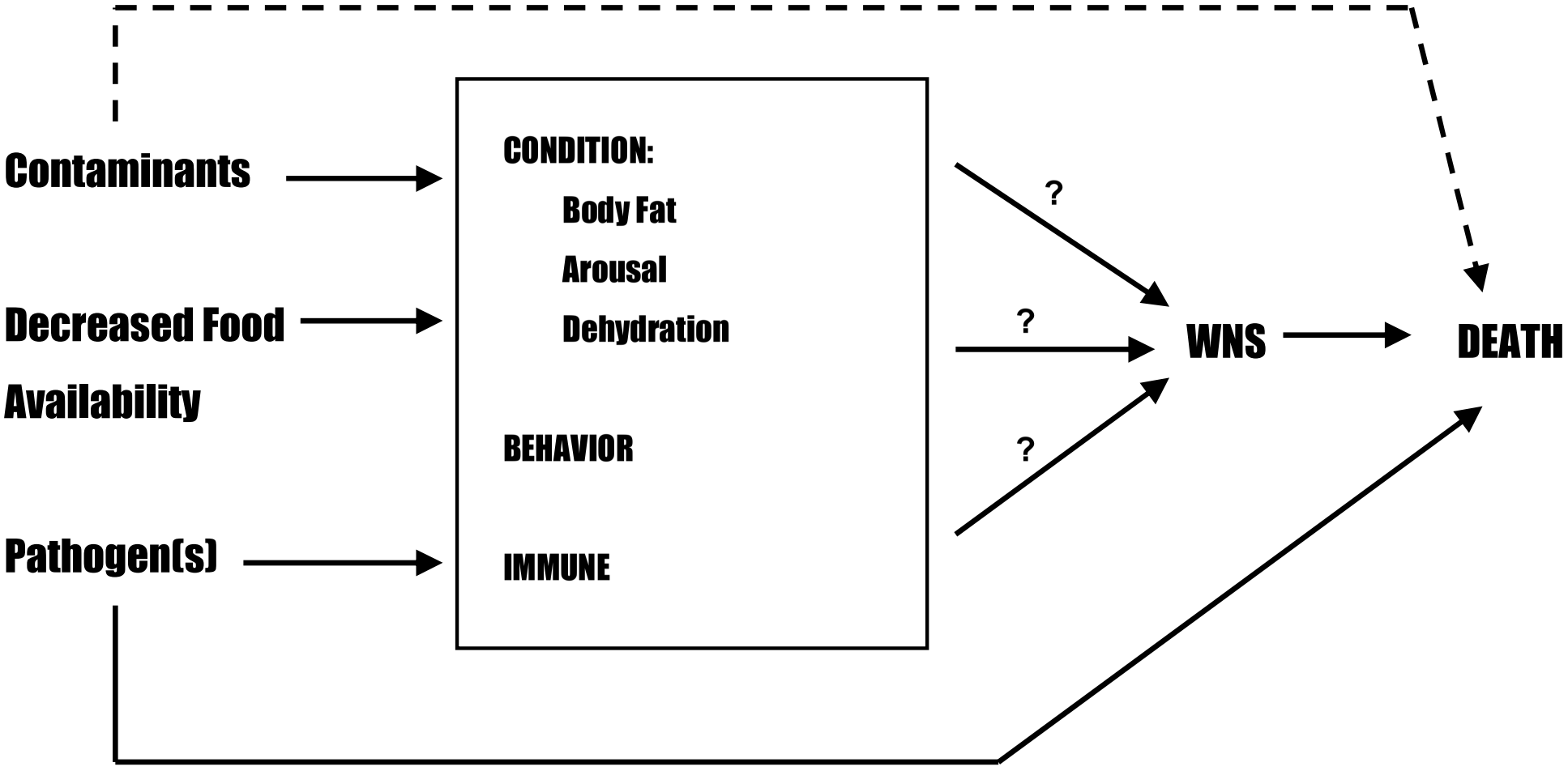
- Thermal refugia can inhibit fungal growth and approaches thermoneutral temps so bats can conserve fat reserves
- Slows mortality does not prevent it

Additional Findings

- Researchers at ISUCNABRC have identified several species of chitinase producing bacteria in control samples that were absent from bats from affected sites
- NY State Dept. of Health researchers found that a dermatitis produced from a fungal infection to the sensory nerve-rich muzzles of hibernating bats may produce frequent irritation that could interrupt hibernation
- A decline in noctuid moth populations has been reported from NY - specifically in the region around Albany

Conclusions:

- while the cause of WNS is still unknown most researchers agree that it is a multi-factorial causation



Current hypotheses:

1. Bats are dying because they are starving or dehydrated
    - 1a. Bats have inadequate quantity/quality of fats as they enter hibernation
    - 1b. Bats have adequate fat stores as they enter hibernation but there is early depletion
    - 1c. Water balance

2. Hypothesis 2: Bats are dying due to direct effects of pathogens (e.g., fungus, bacteria, virus)
3. Bats are dying due to the direct effects of contaminants
4. Many factors working together are causing the deaths

Is There a European Connection?

International Bat Symposium, Germany

- Photo from the Netherlands showing fungus on the muzzle of a pond bat
- Similar observations from Germany and Romania dating back to 1983
- European fungus behaves very similarly to the WNS-assoc. fungus
- Reflective electron microscopy images reveal similarities in appearance to the WNS-assoc. fungus
- Since Jan. ‘09 the fungus has been found in the Czech Republic and France

What's Next?

- Most initial research is still ongoing
- States have suspended survey activities in unaffected sites
  - -Options include automated counters at hibernacula entrances
- Are bats being infected during active seasons?
- Environmental manipulations
  - -temperature, humidity
- Bio-controls
  - -bacteria, tricoderma (fungus)