Interspecies Toxicity of Type-E Botulinum in Fish: A Bird's-Eye View

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Lake Erie Bird Mortalities

- Type E botulism is considered the primary cause of avian deaths.

The Paradox?

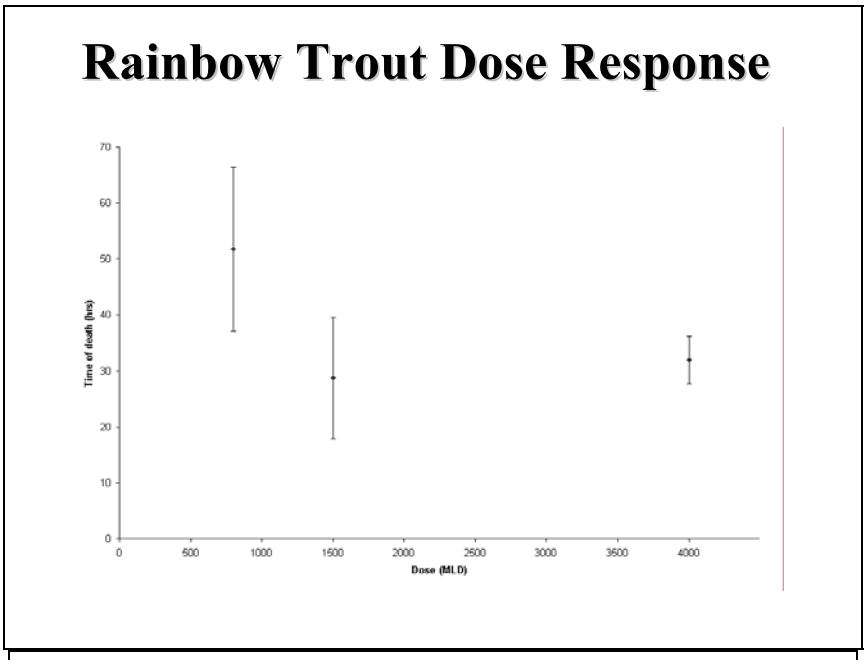
- How to explain the 'fish' pathway of toxin ingestion in birds which feed exclusively on 'live' fish (e.g. loons, common and red-breasted mergansers, grebes)?
- Lack of apparent correlation between fish botulism epizootics and avian mortality patterns.

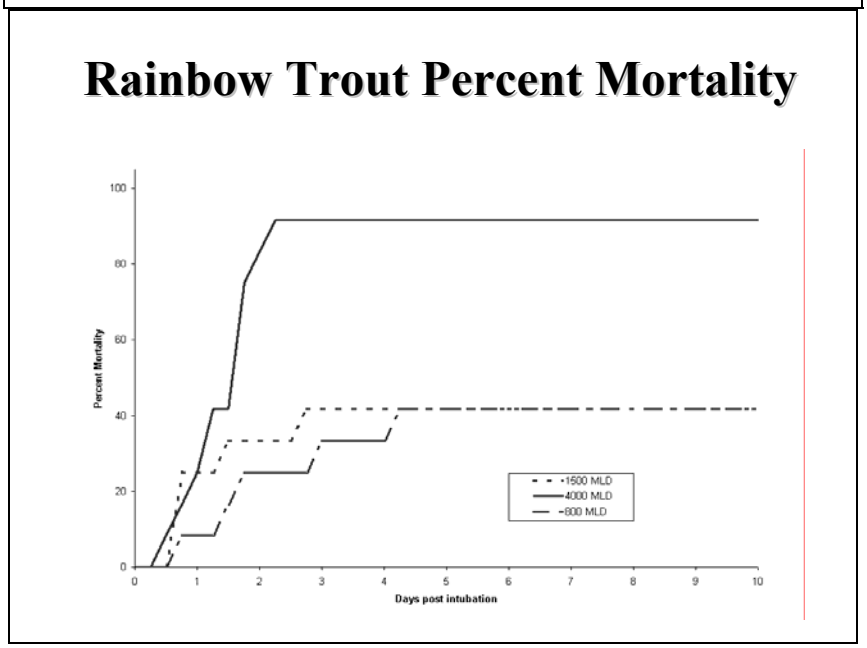
What Are The Questions?

- Are 'living' fish a reasonable transport mechanism moving Botulinum Neurotoxin from point of origin to the bird?
- Is it plausible that live, but moribund, fish are selective prey species?
- Does phylogeny, natural life history or primary feeding habitat influence sensitivity?
- Is there a potential human health hazard to people who consume Botulinum Neurotoxin laden fish?

Research Objectives

1. Develop fish botulism exposure model ('FBEM').
2. Test comparative sensitivity and temporal aspects of clinical intoxication for several candidate fish species.
3. Determine toxin titres in Botulinum Neurotoxin mortalities.



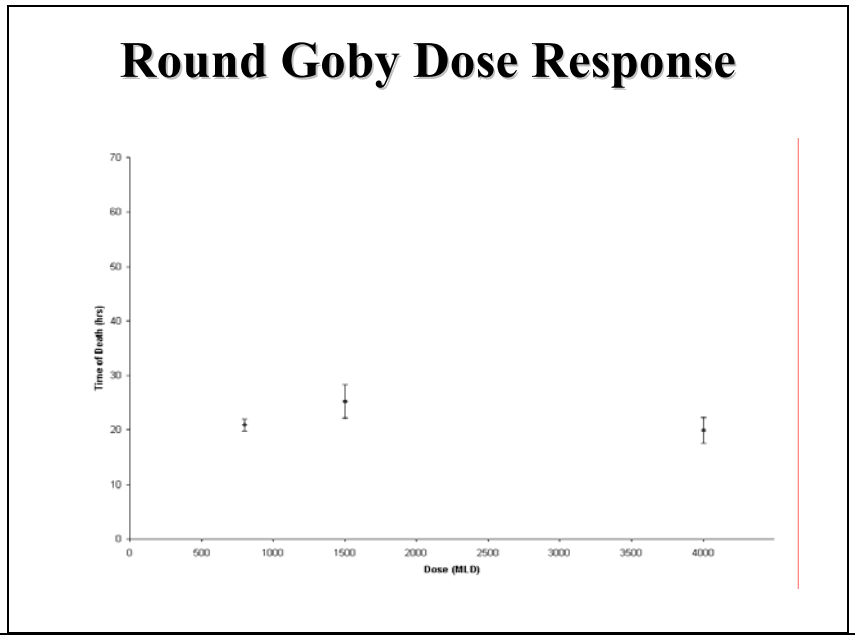


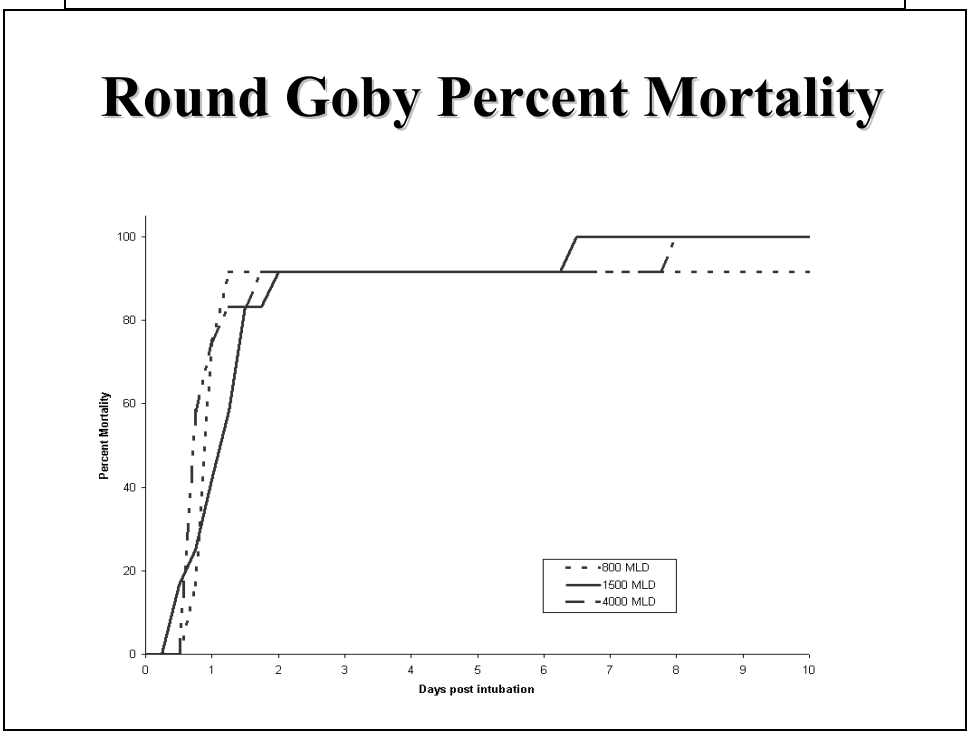
Goby - Onset of Pigment Change

- Normal, pale coloration.
- Very early onset of darkening pattern.

Progressive Discoloration

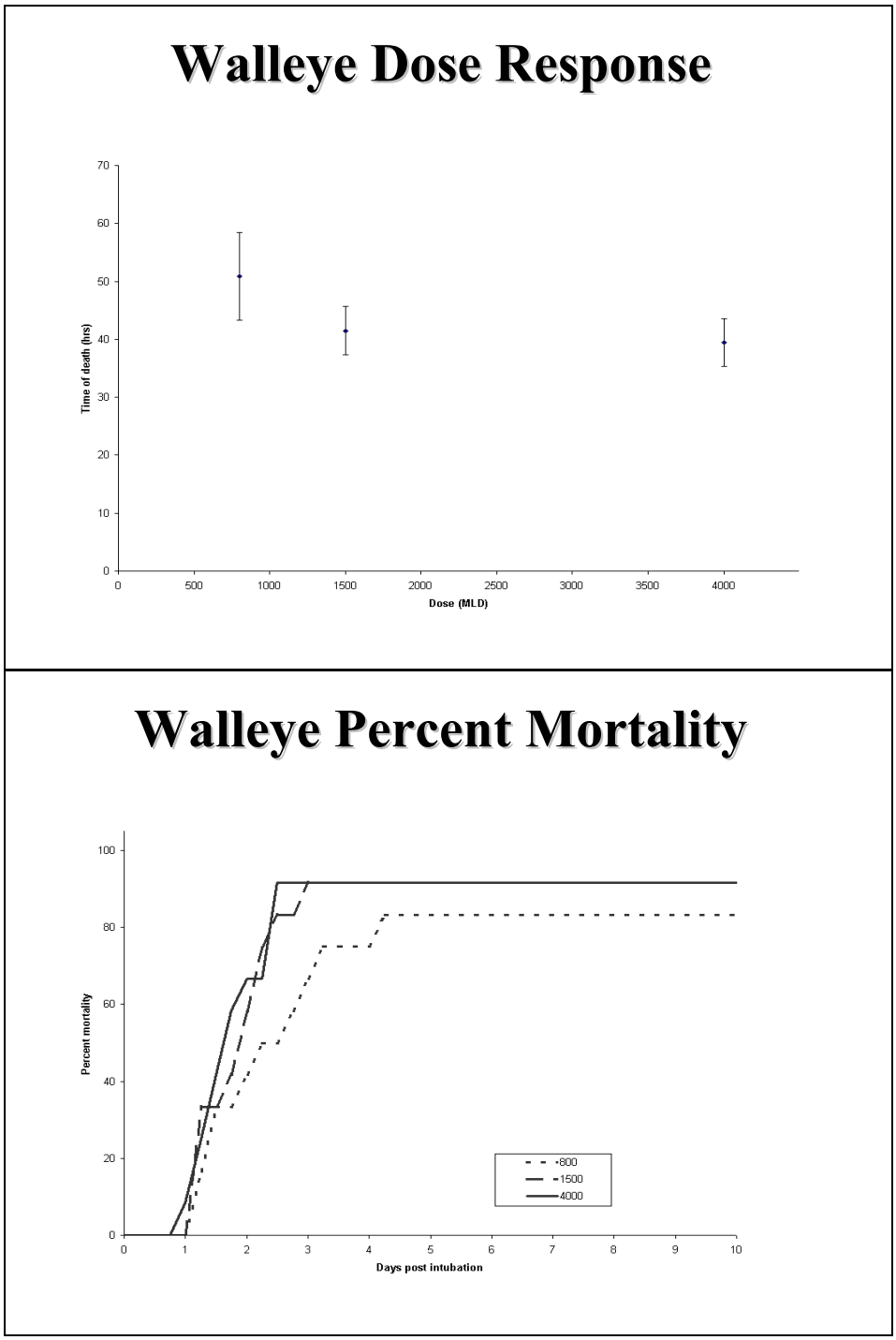
- Formation of the progressive, pigment 'band.'
- Complete pigment change, followed closely by death.





Walleye: Onset of Respiratory Distress

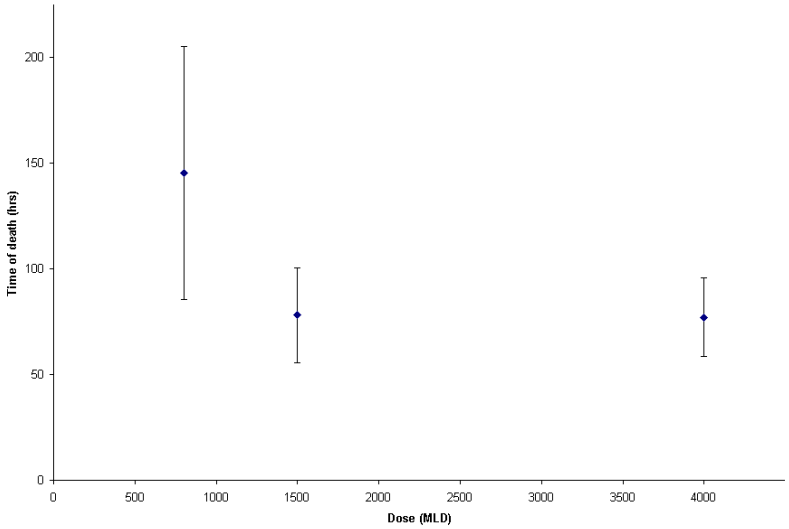
- Severe distention of operculum: erratic swimming behavior (often breaching surface).
- Fish exhibiting the "head up-tail down" orientation.



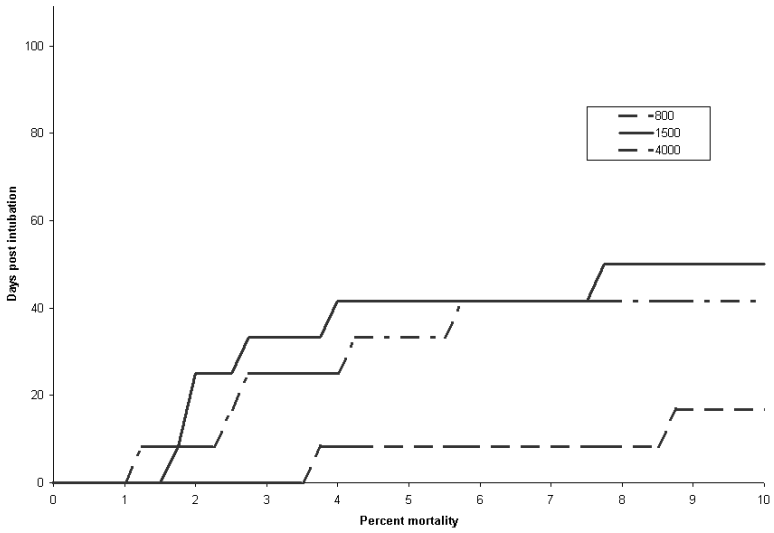
Perch: Onset of Pigment Change

- Slight pigment change (darker).
- Drastic pigment change.
- Equilibrium loss, fish often breaching the surface.

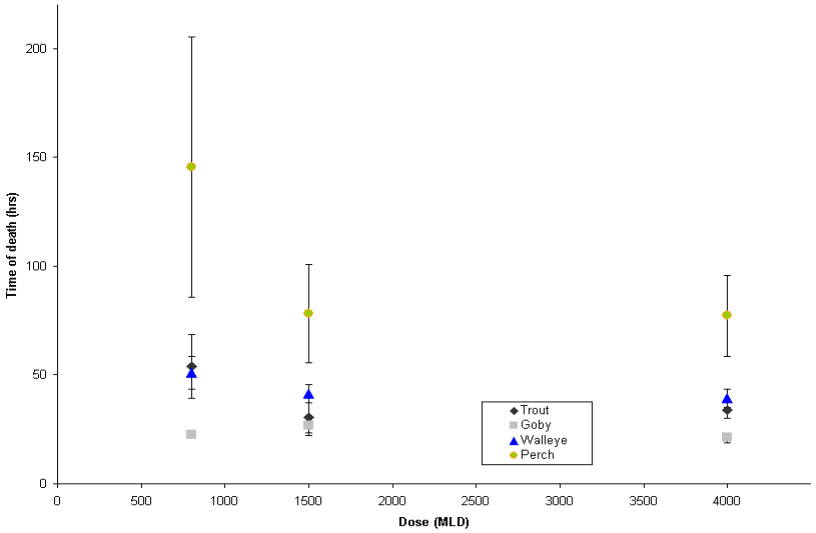
Perch Dose Response



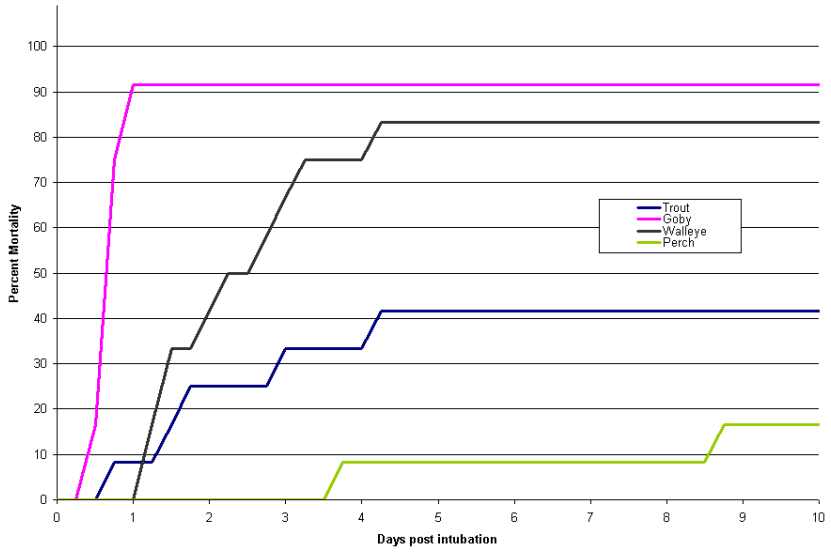
Perch Percent Mortality



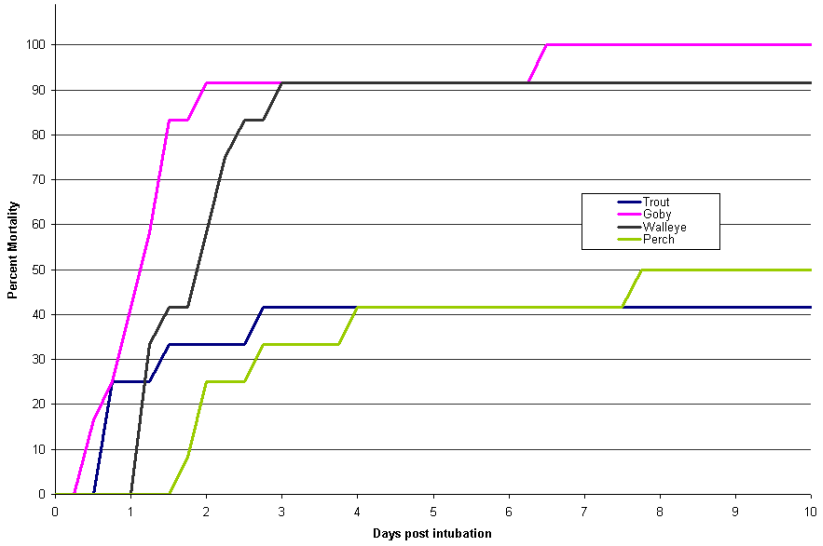
Interspecies Dose Response



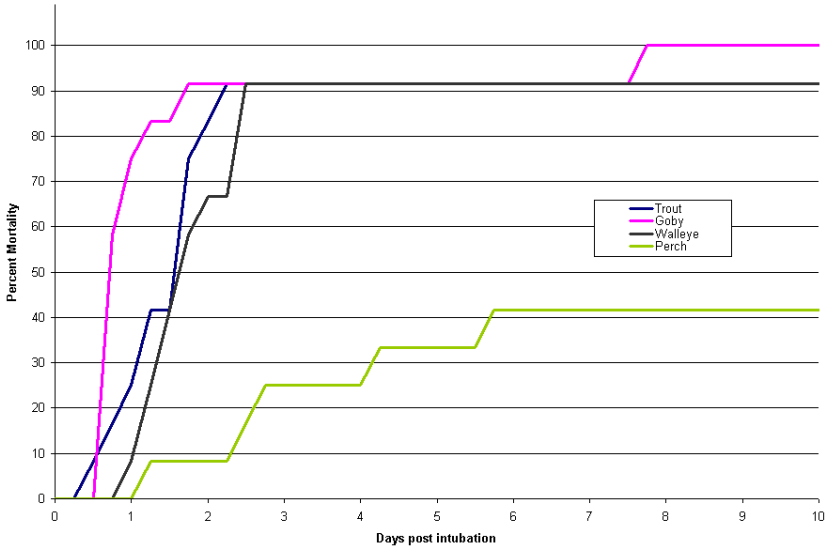
Interspecies Percent Mortality: 800 MLD

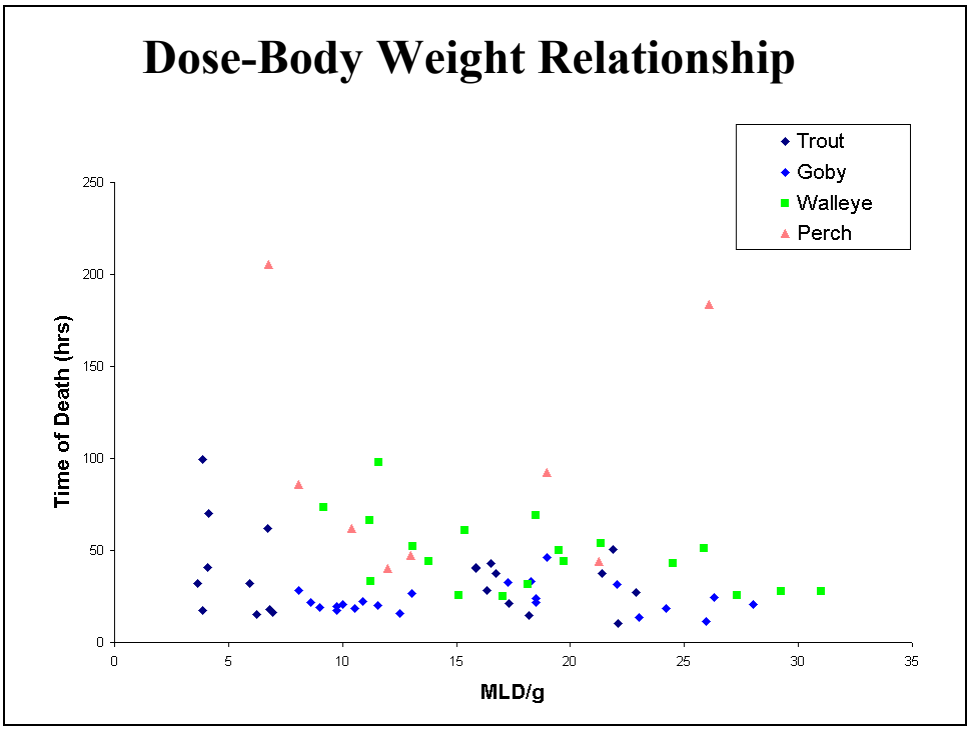


Interspecies Percent Mortality: 1500 MLD



Interspecies Percent Mortality: 4000 MLD





Tissue Titres of Botulinum Neurotoxin

In other words, what's left in a dead fish?

Post Mortem Titre Results:

	Trout	Goby	Walleye	Perch
Fillet				
800 MLD	0%	0%	0%	NA
1500 MLD	0%	0%	0%	NA
4000 MLD	0%	17%	0%	NA
Vicera				
800 MLD	11%	92%	33%	NA
1500 MLD	17%	83%	71%	NA
4000 MLD	25%	83%	NA	NA

-Equilibrium loss, fish often breaching the surface