



Mercury Effects on Wildlife

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Human vs. Wildlife Health

- Degree of protection
- Effects of concern
- Number of species
- Methodology
- Vulnerability
- Resources available



What Do We Mean By “Wildlife”?

Definitions vary:

- Mammals and birds
- All vertebrates, including fish
- All animals
- All living things, including plants



Mammals and Birds Have Been Harmed by Mercury

- Seed dressings
- Chlor-alkali plants
- Pulp and paper mills
- Mining operations
- Fossil fuels



Diagnostic Mercury Residues (ppm, ww)

Tissue	Mammals	Birds
Brain	8-30	15-29
Liver	20-60	20-60
Kidney	20-60	20-60
Muscle	15-30	15-30



Embryotoxic Thresholds in Birds

Species	Harmful concentrations of mercury in eggs (ppm, wet-weight)
Mallard	0.8 – 1.0
Pheasant	0.5 - 1.5

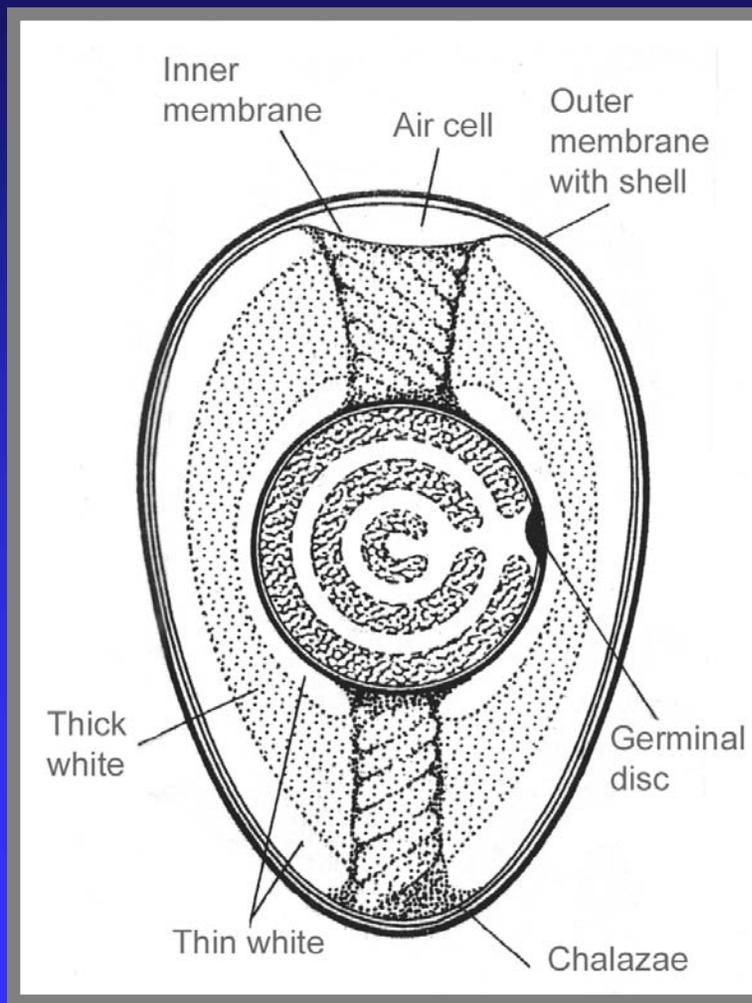


Species tested with egg injections

Order (n = 7)	Species (n = 15)	
Pelecaniformes	Double-crested cormorant	Anhinga
Ciconiiformes	Great egret Tricolored heron	Snowy egret White ibis
Charadriiformes	Herring gull	Laughing gull
Galliformes	Chicken	Ring-necked pheasant
Gruiformes	Clapper rail	Sandhill crane
Anseriformes	Mallard	Canada goose
Passeriformes	Common grackle	



Egg Structure





Egg drilling prior to injection.



Hg injection.



Sealing injection site.

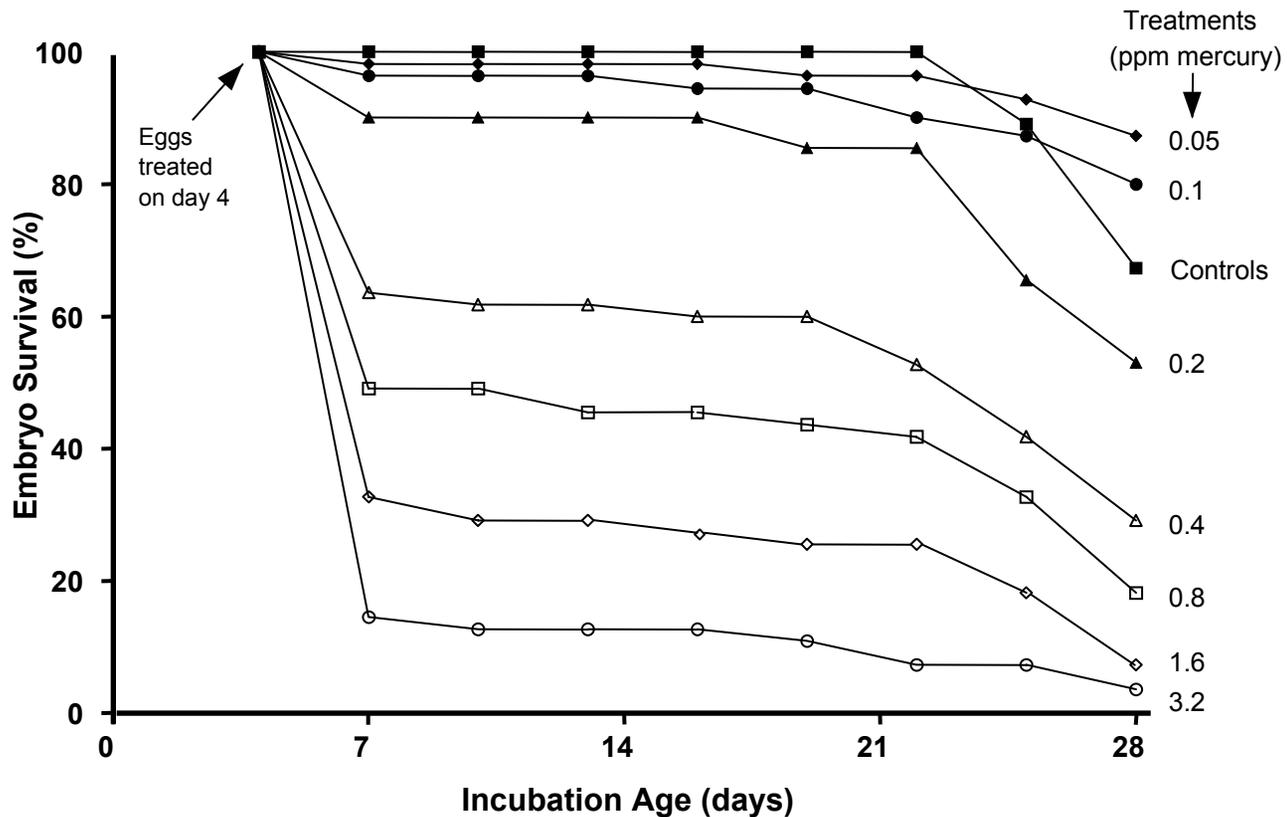


Placing eggs in hatching unit.





Survival of embryos in mallard eggs whose air cells were injected with various levels of mercury





Species whose sensitivity to mercury was tested in controlled reproductive studies as well as injection studies

Mallard
Ring-necked pheasant
Chicken



Embryo survival through 90% of incubation

<i>Species</i>	<i>Controls</i>	<i>0.4 ppm Hg</i>
Mallard	82% (n = 60)	77% (n = 30)
Chicken	100% (n = 60)	63% (n = 30) *
Pheasant	96% (n = 57)	46% (n = 28) *

* *Significantly different from control at $\alpha = 0.05$*



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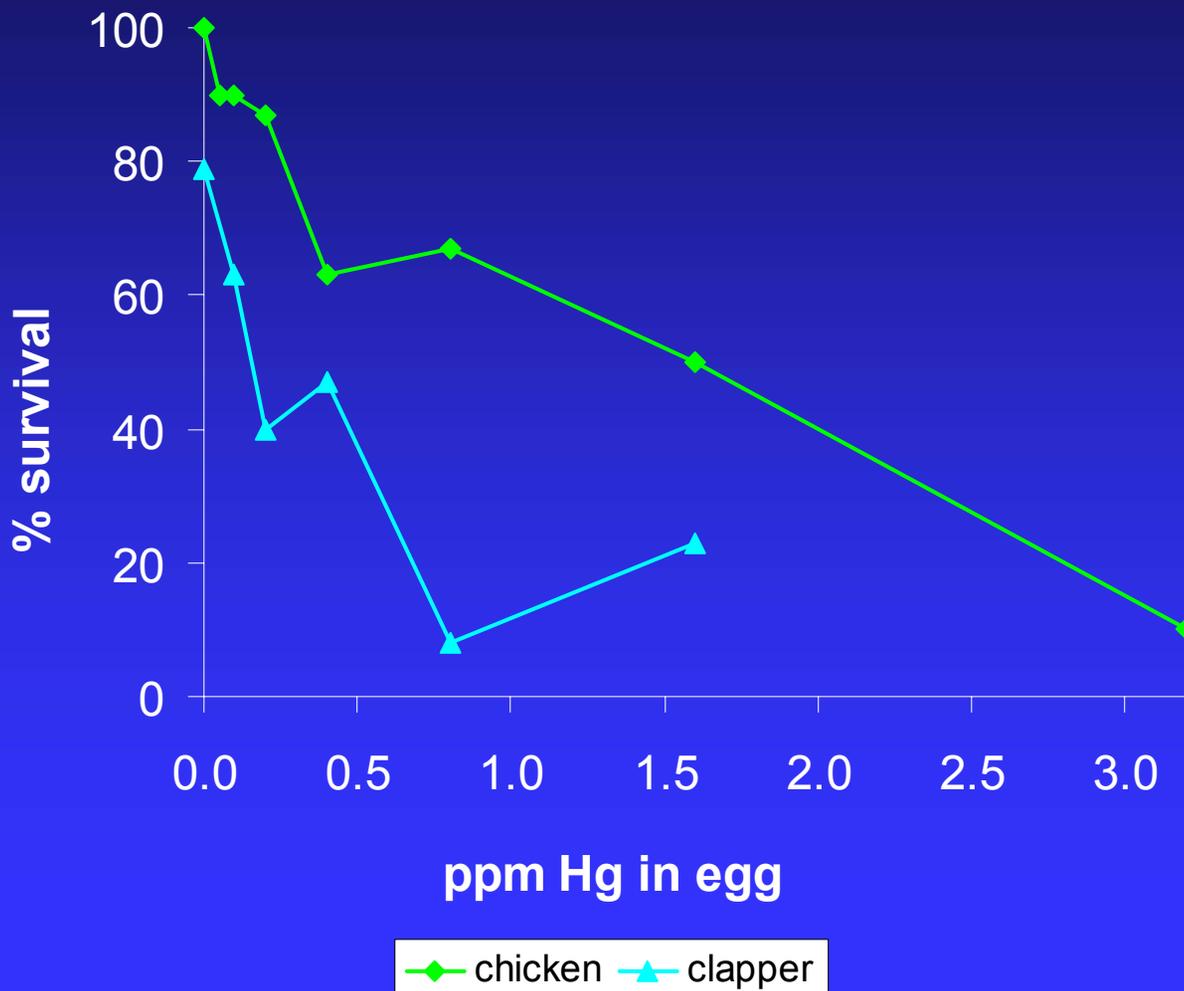
Embryo survival through 90% of incubation for chickens and three species of fish eating birds

<i>Species</i>	<i>Controls</i>	<i>0.4 ppm Hg</i>
Chicken	100% (60)	63% (30) *
Herring gull	69% (26)	29% (17) *
Cormorant	96% (28)	80% (30)
Tricolored heron	80% (10)	20% (10) *

* *Significantly different from control at $\alpha = 0.05$*



Survival of chicken and clapper rail embryos through 90% of incubation





Information Needs

- Which wildlife species are most vulnerable?
- Which endpoints should be measured?
- What are the diagnostic thresholds for harm?
- What environmental levels cause harm?
- Human vs. wildlife thresholds?