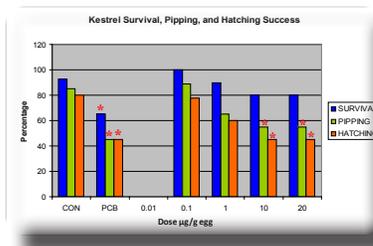


Toxicity of Polybrominated Diphenyl Ether Flame Retardants to Wildlife



- The Challenge:** Polybrominated diphenyl ether flame retardants (PBDEs) are emerging contaminants that bioaccumulate and biomagnify in aquatic and terrestrial food webs. Unlike many contemporary pollutants, these flame retardants have increased in the environment over the past 30 years. Recent studies in Chesapeake and Delaware Bays have documented concentrations of nearly 1 $\mu\text{g/g}$ wet weight of PBDEs in osprey eggs, and even greater levels in peregrine falcon eggs. Very little information is available on the toxicity thresholds of these compounds in wildlife.

- The Science:** We are determining the toxicity of a polybrominated diphenyl ether formulation in various bird embryos (chicken, mallard duck, American kestrel, black-crowned night-heron and common tern) over a wide range of doses. Measurements include embryonic survival, pipping and hatching success, and various biochemical, endocrinological, and immunological endpoints. The goal is to establish adverse-effect threshold for these responses that can be used to interpret concentrations in bird eggs collected from potentially polluted sites.



- The Future:** The penta-BDE formulation decreased pipping and hatching success at concentrations of 10 and 20 $\mu\text{g/g}$ egg in kestrels, but had no effect on survival endpoints in other species. Six congeners or co-eluting pairs of congeners were detected in treated eggs that were not found in the dosing solution suggesting metabolism in the developing embryo, extraembryonic membranes, and possibly even in the air cell membrane. Based on the uptake rate in kestrel embryos, the lowest observable effect level on pipping and hatching success may be as low as 1.8 μg total PBDE/g egg, which approaches concentrations detected in eggs of free-ranging birds. As some PBDE congeners are still increasing in the environment, the toxic effects observed in this study are cause for concern in wildlife.

	Chicken	Mallard	Kestrel
Survival to 90%	-	-	-
Pipping	-	-	+
Hatching	-	-	+
Edema	-	-	-
Deformities	-	-	-
Bone Lengths	-	-	-
Histopathology	+	-	-
EROD Induction	+	-	-
Thyroid Effects	-	-	-