

Heaton et al series of three papers

Guidelines/Criteria			
A single study reported in three parts			
	Reference:	Heaton SN, Bursian SJ, Giesy JP, Tillitt DE, Render JA, Jones PD, Verbrugge DA, Kubiak TJ, Aulerich RJ. 1995a. Dietary exposure of mink to carp from Saginaw Bay, Michigan. 1. Effects on reproduction and survival, and the potential risks to wild mink populations. Arch Environ Contam Toxicol 28:334-343.	Heaton SN, Bursian SJ, Giesy JP, Tillitt DE, Render JA, Jones PD, Verbrugge DA, Kubiak TJ, Aulerich RJ. 1995b. Dietary exposure of mink to carp from Saginaw Bay, Michigan. 2. Hematology and Liver Pathology. Arch Environ Contam Toxicol 29:411-417.
<b>In vivo Study Type</b>		Reproduction study, starting long before mating and ending long after kit birth, with kits on same diet as parents	
Route of Administration		Diet	
Species & age of animals		Adult ranch mink and their kits	
<b>Study Duration</b>		182 days	
<b>Type of Mixture</b>			
Binary		No	
>2 components		Carp from Saginaw Bay, Lake Michigan	
Similar acting or dissimilar		Both	
What Mode of Action was investigated?		Nothing specific	
<b>Parameters/End points Measured</b>			
Target organs/Critical effects		Food consumption and body weight; semen characteristics (the only measurement for adult males); number of kits born dead and alive and kit weights; brain, liver, kidney, heart, spleen, lung, adrenal and thyroid weights, haematology, liver histopathology, thyroid hormones (total and free T4 and T3) and gross abnormalities.	
Pharmacological changes or adverse effects		Depends on magnitude of effects	
<b>Individual Components</b>			
Characterisation of individual compounds		Characterisation is presented in the third paper of the series, though it is of course partial	
Name, exact chemical name, CAS no.		N/A	
Were dose responses established for individual components?		No	
Were no effect levels established?		No	
Were doses below the NO(A)ELs investigated?		N/A	
<b>Mixtures Investigated</b>			
Number of dose levels		One	
How does the mixture make-up compare to individual components? (e.g. low dose) equivalents used?)		The diet included 40% fish, i.e. 0, 10, 20 or 40% carp made up to 40% fish in total using ocean fish.	
No. of technical replicates per exposure condition ( <i>in vitro</i> )			
No. of animals per dose group ( <i>in vivo</i> )		3 males and 12 females	
<b>Observations/Findings</b>		Two females in 40% carp group died and one in 10% carp group, probably treatment related. Dose related reduction in food consumption in females of all groups fed carp, but no effect on body weight. No effects on semen or pregnancies. Great reduction in live kits and no kit survival in 40% carp group. Reduction in kit weight, growth and survival in 10 & 20% carp groups. Many organ weights as % bodyweight were increased in a way related to carp in the diet, including liver, spleen, lung, thyroid and adrenals. Fewer red and more white blood cells in groups fed carp. No effects on thyroid hormones. Liver pathology reported but not convincingly treatment-related.	
<b>Overall opinion</b>			
(e.g. sufficient numbers of groups investigated, group sizes adequate, observations reproducible, low dose levels used investigated)		Clear effects seen. The substitution of carp for ocean fish gives confidence in the effects being due to contaminants. The third paper demonstrates that the toxicity seen can be predicted from the toxicities of 29 measured contaminants in the carp (7 PCDDs, 10 PCDFs and 12 PCBs) assuming additivity. Confirmed using the H4IIE bioassay.	