

Table B-1. Literature review for tributyltin effects data

REFERENCE	SPECIES	TISSUE CONCENTRATION (REPORTED)	ENDPOINT	ACCEPT/ REJECT	WHY REJECT
Bailey and Davies 1991	Dogwhelk, <i>Nucella lapillus</i>	0.21 µg Sn/g ww	Sterilization due to imposex	ACCEPT	
Batley et al. 1989	Rock oyster, <i>Saccostrea commercialis</i>	80–350 ng Sn/g ww	Shell deformation	REJECT	Inappropriate endpoint; text and table concentrations contradict one another
Bauer et al. 1997	Periwinkle, <i>Littorina littorea</i>	1.4 µg TBT/g dw ^a	60% sterilization due to intersex ^b	ACCEPT	
Becker-van Slooten and Tarradellas 1994	Freshwater bivalve, <i>Dreissena polymorpha</i>	63.23 µg TBT/g dw	No effect observed in growth (shell length or mortality)	REJECT	Freshwater organism, no effects concentration
Becker-van Slooten and Tarradellas 1995	Zebra mussel, <i>Dreissena polymorpha</i>	Up to 63 µg TBT/g dw	No effects endpoint reported	REJECT	No endpoint reported
Borgmann et al. 1996	Amphipod, <i>Hyalella azteca</i>	LC50 - 98 µg TBT/g dw (adults), 32 µg TBT/g dw (young 0–1 week)	Mortality	ACCEPT	
Bryan et al. 1987	Dogwhelk, <i>Nucella lapillus</i>	3.39 µg TBT/g dw 8.52 µg TBT/g dw	Sterilization due to imposex	ACCEPT	
Bryan et al. 1989	Mud snail, <i>Ilyanassa obsoleta</i>	620 ng TBT/g dw	Imposex	REJECT	Inappropriate endpoint
Bryan et al. 1993	Dogwhelk, <i>Nucella lapillus</i>	No tissue concentrations associated with relevant effects endpoints	No effects endpoint reported	REJECT	No endpoint reported
Davies and McKie 1987	Atlantic salmon	No tissue concentrations associated with relevant effects endpoints	No effects endpoint	REJECT	No endpoint reported
Davies et al. 1986	Scallop, <i>Pecten maximus</i> and Pacific oyster, <i>Crassostrea gigas</i>	No tissue concentrations	No effects endpoint	REJECT	No tissue data and no endpoint reported
Davies et al. 1988	Pacific oyster, <i>Crassostrea gigas</i>	0.75–1.95 mg TBT/kg ww 0.17 mg TBT/kg ww	Reduced condition index relative to control stations (tissue weight as a percent of total weight) No effects concentration	ACCEPT ACCEPT	
de Vries et al. 1991	Rainbow trout, <i>Oncorhynchus mykiss</i>	No tissue concentrations	Mortality	REJECT	No tissue data
Espourteille et al. 1993	American oyster, <i>Crassostrea virginica</i>	7.0–5,600 ng TBT/g dw	Not determined	REJECT	No effect data presented
Fent 1991	Minnow, <i>Phoxinus phoxinus</i>	4.35 µg TBT/g, 4.65 µg TBT/g ww	No endpoint reported	REJECT	No endpoint reported

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REFERENCE	SPECIES	TISSUE CONCENTRATION (REPORTED)	ENDPOINT	ACCEPT/ REJECT	WHY REJECT
Fent and Stegeman 1993	Scup, <i>Stenotomus chrysops</i>	202 µg TBT/g ww (liver)	Reduced EROD activity, decreased p450A protein content, microsomal protein degradation	REJECT	Inappropriate endpoint
Gibbs and Bryan 1996	Dogwhelk, <i>Nucella lapillus</i>	0.213 µg TBT/g ww	Sterilization due to imposex	REJECT	Compilation of previous data
Gibbs et al. 1988	Dogwhelk, <i>Nucella lapillus</i>	0.569 µg Sn/g dw 0.189 µg Sn/g dw	100% sterilization due to imposex ^b No effects concentration	ACCEPT ACCEPT	
Gibbs et al. 1990	European sting winkle, <i>Ocenebra erinacea</i>	<0.01–0.948 µg Sn/g dw	Imposex	REJECT	Inappropriate endpoint
Grinwis et al. 1998	Flounder, <i>Platichthys flesus</i>	No tissue concentrations	Mortality	REJECT	No tissue data
Guolan and Yong 1995	Marine mussel: <i>Mytilus edulis</i>	1 µg TBTCI/g ^a ww (gill and viscera) 0.6 µg TBTCI/g ^a ww (muscle and mantle)	Reduced growth, expressed as shell length and whole body weight	REJECT	No whole body tissue data
	<i>Aequipecten irradians</i>	0.7 µg TBTCI/g ^a ww (gill and viscera) 0.45 µg TBTCI/g ^a ww (muscle and mantle)			
Hardiman and Pearson 1995	Oyster, <i>Saccostrea commercialis</i>	1–17 µg TBT/g ww (estimated from figure)	No endpoint reported	REJECT	No endpoint
Horiguchi et al. 1995	6 species of mesogastropods	No tissue concentrations	Imposex	REJECT	No discussion of sterilization or tissue data
Labare et al. 1997	Oyster larvae, <i>Shewanella colwelliana</i>	No tissue concentrations	Mortality	REJECT	No tissue data
Langston and Burt 1991	Clam, <i>Scrobicularia plana</i>	62.5 µg TBT/g dw	Mortality	ACCEPT	
Laughlin et al. 1989	Clam, <i>Mercenaria mercenaria</i>	Not reported	Survival/growth	REJECT	No tissue data
Martin et al. 1989	Rainbow trout, <i>Salmo gairdneri</i>	No tissue concentration associated with effects endpoint	Mortality	REJECT	Endpoint and tissue concentrations not linked

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REFERENCE	SPECIES	TISSUE CONCENTRATION (REPORTED)	ENDPOINT	ACCEPT/ REJECT	WHY REJECT
Meador 1997	Amphipod, <i>Rhepoxynius abronius</i>	59 µg TBT/g dw, 54 µg TBT/g dw	LR50–mortality	ACCEPT	
	Amphipod, <i>Eohaustorius estuarius</i>	59 µg TBT/g dw	LR50–mortality	ACCEPT	
	Amphipod, <i>Eohaustorius washingtonianus</i>	43 µg TBT/g dw	LR50–mortality	ACCEPT	
	Polychaete, <i>Armandia brevis</i>	41 µg TBT/g dw	LR50–mortality	ACCEPT	
	Starry flounder, <i>Platichthys stellatus</i>	49 µg TBT/g dw	LR50-mortality	ACCEPT	
Mercier et al. 1996	Sea anemone, <i>Aiptasia pallida</i>	1.3–1.4 µg TBT/g dw	Bioaccumulation/ metabolism	REJECT	Inappropriate endpoint
Minchin et al. 1987	Scallop, <i>Pecten maximus</i>	0.75–2.08 µg TBTO/g ww	No effects endpoint	REJECT	Inappropriate endpoint
	Pacific oyster, <i>Crassostrea gigas</i>	0.2–1.3 µg TBTO/g ww	Shell thickening		
Moore et al. 1991	Polychaete worm, <i>Neanthes arenaceodentata</i>	2.99 µg TBT/g dw	No effects concentration	ACCEPT	
		6.27 µg TBT/g dw	Significant reductions in fecundity and emergent juvenile production	ACCEPT	
		16.8 µg TBT/g dw	Mortality		
Oehlmann et al. 1996	Snail, <i>Ocenebrina aciculata</i>	0.449 µg Sn/g dw ^a	Sterilization due to imposex	ACCEPT	
Oehlmann et al. 1998a	Snail, <i>Itinia incrassata</i>	0.4–1.6 µg Sn/g dw ^a	Imposex	REJECT	No sterilization observed
Oehlmann et al. 1998b	Periwinkle, <i>Littorina littorea</i>	0.297 µg Sn/g dw ^a	40% sterilization due to intersex ^b	ACCEPT	
		0.124 µg Sn/g dw ^a	No effects concentration for sterilization	ACCEPT	
		Dogwhelk, <i>Nucella lapillus</i>	0.210 µg Sn/g dw	Imposex at VDS Stage 4	REJECT
Osada et al. 1997	Pacific oyster, <i>Crassostrea gigas</i>	2.2 µg TBTO/g in ovaries corresponding to reduced fertilization and development in eggs	Reduced rate of fertilization and development	REJECT	No whole body concentrations
Page and Widdows 1991	Mussel, <i>Arca zebra</i>	1.11 µg TBT/g dw	Reduced scope for growth	REJECT	Inappropriate endpoint
Rice et al. 1989	Blue crab, <i>Callinectes sapidus</i>	0.12 µg TBTCI/g ww	Growth	ACCEPT	
Rice et al. 1995	Channel catfish, <i>Ictalurus punctatus</i>	Not reported	Histopathological effects	REJECT	No tissue concentrations reported

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REFERENCE	SPECIES	TISSUE CONCENTRATION (REPORTED)	ENDPOINT	ACCEPT/ REJECT	WHY REJECT
Ruiz et al. 1995a	Clam, <i>Scrobicularia plana</i>	No tissue concentrations	Survival/growth	REJECT	No tissue data
Ruiz et al. 1995b	Clam, <i>Scrobicularia plana</i>	0.4 µg Sn/g in adults resulted in no effect on survival and development of embryos	Embryo survival and development	REJECT	Parental tissue concentration related to embryo survival is not an appropriate endpoint
Ruiz et al. 1995c	Clam, <i>Scrobicularia plana</i>	No tissue concentrations	Survival/growth	REJECT	No tissue data
Salazar and Salazar 1998 ^c	Blue mussel, <i>Mytilus edulis</i>	6.0 µg TBT/g dw	Growth rate inhibition	ACCEPT	
		4.0 µg TBT/g dw	No effects concentration	ACCEPT	
Salazar et al. 1995	Blue mussel, <i>Mytilus edulis</i>	0.019–0.047 µg TBT/g ww	Reduced growth in juveniles	REJECT	Uncertainties associated with control conditions; analytical uncertainties
Schulte-Oehlmann et al. 1995	Ramshorn snail, <i>Marisa cornuarietis</i>	0.30 µg TBT/g ww	Imposex	REJECT	Inappropriate endpoint
Schwaiger et al. 1992	Rainbow trout, <i>Oncorhynchus mykiss</i>	7 µg TBT/g ww (whole body) ^a	Histopathological effects in spleen, gills, and pseudobranch	REJECT	Inappropriate endpoint
Shimizu and Kimura 1987	Goby, <i>Chasmichthys dolichognathus</i>	1.85 µg TBTO/g ww	Reduced gonadal development in male fish	ACCEPT	
Short and Thrower 1987	Chinook salmon, <i>Oncorhynchus tshawytscha</i>	Liver: 7.44 µg TBT/g ww Brain: 3.46 µg TBT/g ww Muscle: 0.52 µg TBT/g ww	Mortality	REJECT	No whole body concentrations
Skarphédinsdóttir et al. 1996	Dogwhelk, <i>Nucella lapillus</i>	61.9 ng TBT/g ww (mean)	Imposex	REJECT	Inappropriate endpoint
	Mussel, <i>Mytilus edulis</i>	14.7 ng TBT/g ww (mean)	Imposex	REJECT	Inappropriate endpoint
Spence et al. 1990	Dogwhelk, <i>Nucella lapillus</i>	Not reported	Imposex/sterilization	REJECT	No tissue data
Thain 1986	Bivalve spat: <i>Ostrea edulis</i> <i>Ostrea edulis</i> <i>Crassostrea gigas</i> <i>Mytilus edulis</i> <i>Venerupis decussata</i> <i>Venerupis decussata</i> <i>V. semidecussata</i>	0.75 mg TBT/kg ww	Reduced growth in spat	REJECT	Wide range of test TBT concentrations; TBT-contamination of controls
		0.53 mg TBT/kg ww	No effects concentration		
		2.38 mg TBT/kg ww	Reduced growth in spat		
		2.20 mg TBT/kg ww	Reduced growth in spat		
		2.64 mg TBT/kg ww	Reduced growth in spat		
		1.48 mg TBT/kg ww	No effects concentration		
		2.91 mg TBT/kg ww	Reduced growth in spat		
Triebskorn et al. 1994	Rainbow trout, <i>Oncorhynchus mykiss</i>	0.33–1.49 µg TBTO/g ww (head), 0.13–1.98 µg TBTO/g ww (rest of body)	Reduced growth rate and altered swimming behavior; avoidance response measured	REJECT	No whole body concentrations.
Waldock and Thain 1983	Oyster, <i>Crassostrea gigas</i>	No tissue concentration associated with effects endpoint	Shell thickening	REJECT	Inappropriate endpoint and no tissue concentration

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Waldock et al. 1992	Oyster, <i>Crassostrea gigas</i>	0.14–6.35 µg TBT/g ww	Monitoring data	REJECT	Inappropriate endpoint; increased growth seen with decreasing TBT concentrations but, no statistical test of the data
Ward et al. 1981	Sheepshead minnow, <i>Cyprinodon variegatus</i>	No tissue concentration associated with effects endpoint	Mortality, reproductive endpoints	REJECT	Tissue concentrations measured in separate experiment from the effects endpoints
Wester et al. 1990	Guppy, <i>Poecilia reticulata</i>	0.7–1.8 µg TBT/g	Histopathological effects	REJECT	The concentrations were reported without specifying ww or dw
Widdows and Page 1993	Blue mussel, <i>Mytilus edulis</i>	5.44 µg TBT/g dw	Reduced growth rate	ACCEPT	
		9.28 µg TBT/g dw	Reduced clearance rate/lethal effects	ACCEPT	
		3.96 µg TBT/g dw	No effects concentration	ACCEPT	

NOTE: dw - dry weight
 Sn - tin
 TBTCI - tributyltin chloride
 TBT - tributyltin
 TBTO - tributyltin oxide
 ww - wet weight

^a Concentrations had to be estimated from graphs.
^b Refers to the percent of sampled organisms that were found to be sterile because of imposex or intersex.
^c Data presented was originally published in Salazar and Salazar 1988.

