Triphenyl phosphate (CAS no. 115-86-6)

Tier 1 *in vivo* Test

(1) Results

Fish were exposed to concentrations of 2.13, 7.19, 17.1 and 44.9µg/L (measured). No significant differences were observed in fertility rate, male and female mortality, gonadosomatic index, secondary sex characteristics, male total length, body weight, hepatic vitellogenin and female hepatosomatic Index.

At 7.19µg/L and higher, a significant increase was observed in male hepatosomatic index, while a significant decrease was observed in female hepatic vitellogenin level.

A significant decrease was observed in number of eggs, number of fertile eggs, female total length and body weight at 44.9µg/L.

(2) Summary

From the significant decrease observed in number of eggs, number of fertile eggs, female total length and body weight at 44.9µg/L considered adverse reproductive effects on Medaka.

Estrogenic and/or antiandrogenic activity of triphenyl phosphate have been indicated from literature. In this study, an increase in male hepatic vitellogenin level was not observed at sublethal concentrations to suggest estrogenic effect. It was not concluded that triphenyl phosphate is an estrogenic compound. Regarding antiandrogenic activity, this study is not designed to detect it.

Since a significant decrease was observed in female hepatic vitellogenin level in this study, antiestrogenic activity should be tested in Tier 1 *in vitro* Test.

The adverse exposure level of 44.9µg/L was ca. 180 times as high as the highest environmental water concentration of 0.25µg/L that was measured in MOE’s Environmental Survey and Monitoring of Chemicals in FY1975 (also detected in air in FY2007).

Table 1-A Results

Concentration (µg/L)		Number of fish		Mortality (%)		Total length (mm)		Body weight (mg)	
nominal	measured	male	female	male	female	male	female	male	female
Control		12	12	0	0	38.0±0.51	36.5±0.50	543±45	512±37
20.0	2.13	12	12	0	0	37.9±1.1	35.3±0.65	532±44	449±19
64.0	7.19	12	12	0	0	38.0±1.1	35.5±0.28	544±49	464±27
200	17.1	12	12	0	0	37.7±1.0	35.2±1.0	539±31	468±34
640	44.9	12	12	0	8.3	38.3±1.1	34.4±0.35**	583±68	432±32*

Table 1-B Results (continued)

Measured concentration (µg/L)	Number of eggs (eggs/female/day)	Number of fertile eggs (eggs/female/day)	Fertility rate (%)	Gonadosomatic Index (%)	
				male	female
Control	23.3±3.7	21.7±4.0	93.0±5.3	0.86±0.083	8.0±0.72
2.13	20.4±2.7	18.3±3.1	89.3±4.9	0.87±0.17	7.9±0.47
7.19	18.7±3.1	17.1±3.4	90.8±3.8	0.95±0.092	8.1±0.62
17.1	20.1±2.0	18.6±1.8	92.6±2.2	0.94±0.098	7.7±0.72
44.9	16.4±3.2*	14.9±3.5*	91.0±3.9	0.80±0.067	9.4±1.3

Table 1-C Results (continued)

Measured concentration (µg/L)	Hepatosomatic Index (%)		Vitellogenin (ng/mg liver)		Secondary sex characteristics	
	male	female	male	female	male	female
Control	1.2±0.19	2.7±0.52	9.1±5.4	764±220	88±7.5	0
2.13	1.4±0.12	3.5±0.39	6.9±4.0	542±115	83±7.4	0
7.19	1.7±0.29*	3.1±0.21	8.4±9.0	360±59.6**	84±6.9	0
17.1	1.7±0.24*	3.6±0.46	11.2±9.4	420±76.7*	83±7.2	0
44.9	1.7±0.13*	3.6±0.60	8.8±8.1	417±70.3*	90±8.0	0

Table 1-D Results (continued)

Measured concentration (µg/L)	Other observations
Control	Not found
2.13	Not found
7.19	Not found
17.1	Not found
44.9	Not found

Data show mean ± SD (standard deviation)
Statistically significant differences from control group (**p<0.01, *p<0.05)
nd: not detected (below detection limit of vitellogenin: 1ng/mg liver)
(-): not measured
Secondary sex characteristics: number of papillary processes