Lo et al 2023: Rubber Tire (6PPD-Quinone) and Coho Salmon

Species Information

Common Name: Coho Salmon
Latin Name: Oncorhynchus
Genus: Oncorhynchus kisutch

Stressor Details

Stressor Name: 6PPD-Quinone
Units: (ng/L)
Metric: 6PPD-Quinone Concentration 24-hour
Scale: linear
Function Type: continuous
Vital Rate/Process: Survivorship

Life Stage & Context

Life Stages: Juvenile
Geography: Puget Sound
Activity: Rearing

Descriptions

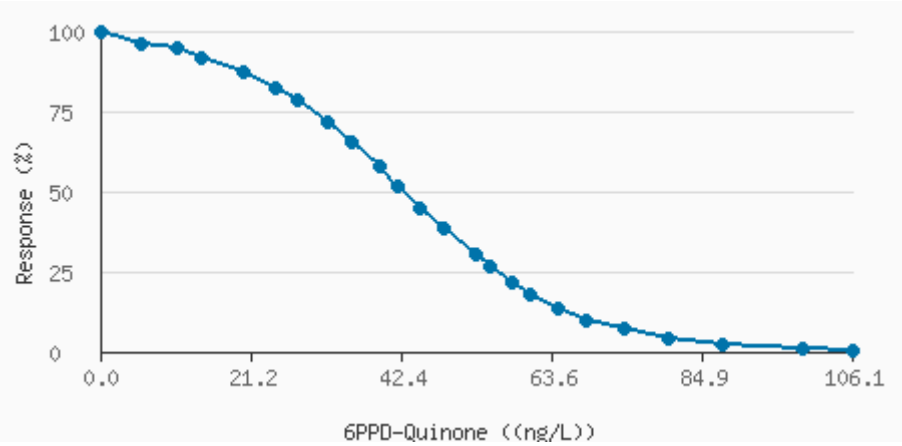
Overview

> Acute Toxicity of 6PPD-Quinone to Early Life Stage Juvenile Chinook (Oncorhynchus tshawytscha) and Coho (Oncorhynchus kisutch) Salmon (Lo et al. 2023).
>
> The breakdown product of the rubber tire antioxidant N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine-quinone (6PPD)-6-PPD-quinone has been strongly implicated in toxic injury and death in coho salmon (Oncorhynchus kisutch) in urban waterways. Less information is known about Chinook Salmon.
>
> Lo et al (2023) investigated the acute toxicity of 6PPD-Q to newly feeding (~3 weeks post swim-up) juvenile Chinook and coho over a 24-h exposure. Mortality-based concentration–response curves were established, and a comparison of species sensitivity was explored. Bonnie et al (2023) results could be used to inform the risk of this prevalent urban contaminant to juvenile Chinook and coho and to aid in the conservation, recovery, and management efforts.
>
> Figure 1 Caption: Concentration–response curves for 24-h juvenile (A) coho salmon and (B) Chinook salmon exposures to 6PPD-quinone. Results confirmed that juvenile Chinook are far less sensitive to 6PPD-quinone than coho. Measured concentrations at test initiation were used to calculate the dose–response curve. The median lethal concentration (LC50) was calculated using a log-logistic model.
>
> See Figure 1: Concentration–response curves for 24-h juvenile (A) coho salmon and (B) Chinook salmon exposures to 6PPD-quinone. Results confirmed that juvenile Chinook are far less sensitive to 6PPD-quinone than coho. Measured concentrations at test initiation were used to calculate the dose–response curve. The median lethal concentration (LC50) was calculated using a log-logistic model.
>
> Curve traced from image - likely to contain errors.

Pathways of Effect

> Road, Cars, Vehicles, Ties, Rubber, Runoff

Stressor Response Data



Stressor (X)	Mean System Capacity (%)	SD	low.limit	up.limit
0	100	0	0	100
5.86	96.03	3	50	100
10.81	94.63	3	50	99.53
14.41	91.82	5	50	99.53
20.27	86.92	10	50	100
24.77	82.48	10	29.67	100
27.93	78.27	15	29.67	100
31.98	71.26	20	29.67	97.2
35.36	65.19	20	29.67	97.2
39.41	57.71	20	29.67	94.39
41.89	51.64	25	29.67	94.39
45.05	44.86	25	29.67	94.39
48.42	38.32	25	0.47	94.39
52.93	30.14	25	0.47	53.04
54.95	26.4	25	0.47	53.04
58.11	21.73	20	0.47	53.04
60.59	17.99	20	0.47	53.04
64.64	13.55	20	0.47	53.04
68.69	9.58	20	0.47	36.68
73.87	7.01	10	0.47	36.68
80.18	4.21	10	0.47	27.34
87.84	2.34	10	0	27.34
99.1	0.7	10	0	20.79
106.08	0.23	10	0.23	20.79

Citations

Lo, B. P., Marlatt, V. L., Liao, X., Reger, S., Gallilee, C., Ross, A. R., & Brown, T. M. (2023). Acute Toxicity of 6PPD?Quinone to Early Life Stage Juvenile Chinook (Oncorhynchus tshawytscha) and Coho (Oncorhynchus kisutch) Salmon. Environmental Toxicology and Chemistry, 42(4), 815-822.

References

Lo et al 2023 - https://setac.onlinelibrary.wiley.com/doi/full/10.1002/etc.5568