

**Study Number:** C03038-04  
**Test Type:** TOX  
**Route:** Dosing in Water  
**Species/Strain:** Mouse/B6C3F1/N

**PA48: Summary of Tissue Concentration**  
**Test Compound:** Sodium Tungstate Dihydrate  
**CAS Number:** 10213-10-2

**Date Report Requested:** 10/11/2019  
**Time Report Requested:** 15:16:04  
**Lab:** Battelle

**C Number:**

C03038-04

**Study Gender:**

Both

**PWG Approval Date**

See web page for date of PWG Approval

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Male: 3 Month Int Male

Phase	Dose (mg/L)	0	500	1000	2000
SD 93	Tungsten Concentration in Kidney (ug/g)	BD	5.71 ± 0.88 (10)	6.50 ± 0.57 (10)	12.15 ± 2.16 (10)
SD 93	Tungsten Concentration in Plasma (ug/mL)	BD	2.62 ± 0.47 (10)	4.11 ± 0.58 (10)	8.10 ± 1.14 (10)
SD 93	Tungsten Kidney/Plasma Ratio (ug/ug)	BD	2.45 ± 0.31 (10)	1.73 ± 0.16 (10)	1.51 ± 0.13 (10)
SD 93	Urine Creatinine (mg/dL)	67.29 ± 6.82 (7)	53.14 ± 10.29 (7)	72.30 ± 4.30 (10)	79.67 ± 4.93 (6)
SD 93	Urine Tungsten Concentration (ug/mL)	0.02 ± 0.01 (7) **	191.56 ± 41.89 (7) **	592.00 ± 69.45 (10) **	1335.33 ± 148.26 (6) **
SD 93	Urine Tungsten/Creatinine Ratio (ug/mg)	0.03 ± 0.01 (7) **	353.16 ± 27.44 (7) **	805.94 ± 70.58 (10) **	1672.99 ± 147.92 (6) **
SD 93	Urine Volume (mL)	0.14 ± 0.03 (7)	0.94 ± 0.58 (7)	0.35 ± 0.09 (10)	0.35 ± 0.13 (8)

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		<b>Male: 6 Month Int Male</b>			
<b>Phase</b>	<b>Dose (mg/L)</b>	<b>0</b>	<b>500</b>	<b>1000</b>	<b>2000</b>
SD 184	Tungsten Concentration in Kidney (ug/g)	0.06 ± 0.01 (10) **	3.79 ± 0.29 (10) **	5.89 ± 1.23 (10) **	12.10 ± 1.39 (10) **
SD 184	Tungsten Concentration in Plasma (ug/mL)	0.02 ± 0.00 (10) **	1.68 ± 0.22 (10) **	2.43 ± 0.57 (10) **	5.82 ± 0.96 (10) **
SD 184	Tungsten Kidney/Plasma Ratio (ug/ug)	3.46 ± 0.42 (10) *	2.40 ± 0.18 (10)	2.58 ± 0.24 (10)	2.24 ± 0.19 (10)
SD 184	Urine Creatinine (mg/dL)	53.78 ± 4.22 (9)	55.25 ± 4.39 (8)	64.71 ± 6.49 (7)	63.86 ± 6.90 (7)
SD 184	Urine Tungsten Concentration (ug/mL)	3.92 ± 2.77 (8) **	204.50 ± 28.06 (8) **	407.89 ± 92.69 (8) **	816.50 ± 144.16 (8) **
SD 184	Urine Tungsten/Creatinine Ratio (ug/mg)	6.43 ± 4.14 (8) **	375.17 ± 45.85 (8) **	709.28 ± 117.50 (7) **	1368.62 ± 149.28 (7) **
SD 184	Urine Volume (mL)	1.10 ± 0.19 (10)	1.01 ± 0.15 (8)	0.81 ± 0.14 (8)	0.61 ± 0.14 (8)

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		Male: 12 Month Int Male			
Phase	Dose (mg/L)	0	500	1000	2000
SD 366	Tungsten Concentration in Kidney (ug/g)	BD	3.67 ± 0.61 (10)	6.69 ± 0.59 (10)	10.45 ± 1.06 (10)
SD 366	Tungsten Concentration in Plasma (ug/mL)	0.02 ± 0.00 (10) **	1.07 ± 0.16 (10) **	2.37 ± 0.33 (10) **	4.84 ± 0.73 (10) **
SD 366	Tungsten Kidney/Plasma Ratio (ug/ug)	BD	3.66 ± 0.48 (10)	3.10 ± 0.27 (10)	2.35 ± 0.18 (10)
SD 366	Urine Creatinine (mg/dL)	41.30 ± 4.94 (10)	41.78 ± 4.25 (9)	38.80 ± 3.17 (10)	54.33 ± 7.03 (9)
SD 366	Urine Tungsten Concentration (ug/mL)	4.00 ± 1.69 (10) **	152.57 ± 27.46 (10) **	349.00 ± 38.70 (10) **	661.09 ± 123.57 (10) **
SD 366	Urine Tungsten/Creatinine Ratio (ug/mg)	15.57 ± 8.39 (10) **	404.82 ± 34.78 (9) **	905.34 ± 65.48 (10) **	1390.13 ± 183.53 (9) **
SD 366	Urine Volume (mL)	2.22 ± 0.46 (10)	3.95 ± 2.16 (10)	1.55 ± 0.22 (10)	3.05 ± 2.22 (10)

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Male: 18 Month Int Male

Phase	Dose (mg/L)	0	500	1000	2000
SD 548	Tungsten Concentration in Kidney (ug/g)	0.06 ± 0.01 (9) **	2.67 ± 0.23 (9) **	5.50 ± 0.73 (8) **	8.71 ± 0.99 (6) **
SD 548	Tungsten Concentration in Plasma (ug/mL)	0.01 ± 0.00 (9) **	1.27 ± 0.19 (10) **	4.95 ± 2.03 (9) **	4.86 ± 0.65 (6) **
SD 548	Tungsten Kidney/Plasma Ratio (ug/ug)	6.28 ± 1.23 (9) **	2.41 ± 0.21 (9) **	2.42 ± 0.34 (8) **	1.85 ± 0.16 (6) **
SD 548	Urine Creatinine (mg/dL)	31.56 ± 1.89 (9)	39.20 ± 4.76 (10)	34.25 ± 2.17 (8)	48.83 ± 6.74 (6)
SD 548	Urine Tungsten Concentration (ug/mL)	0.02 ± 0.00 (9) **	104.52 ± 11.81 (10) **	194.00 ± 14.23 (8) **	661.00 ± 161.34 (6) **
SD 548	Urine Tungsten/Creatinine Ratio (ug/mg)	0.05 ± 0.01 (9) **	278.92 ± 30.45 (10) **	579.75 ± 52.95 (8) **	1279.52 ± 155.83 (6) **
SD 548	Urine Volume (mL)	1.89 ± 0.26 (9)	1.78 ± 0.28 (10)	1.91 ± 0.24 (8)	0.96 ± 0.32 (6)

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		Female: 3 Month Int Fem			
Phase	Dose (mg/L)	0	500	1000	2000
SD 93	Tungsten Concentration in Kidney (ug/g)	BD	3.54 ± 0.27 (10)	5.34 ± 0.49 (10)	11.44 ± 1.22 (10)
SD 93	Tungsten Concentration in Plasma (ug/mL)	BD	1.84 ± 0.23 (10)	3.25 ± 0.49 (10)	8.72 ± 1.25 (10)
SD 93	Tungsten Kidney/Plasma Ratio (ug/ug)	BD	2.05 ± 0.12 (10)	1.86 ± 0.17 (10)	1.43 ± 0.11 (10)
SD 93	Urine Creatinine (mg/dL)	66.33 ± 5.27 (9)	76.10 ± 3.76 (10)	76.43 ± 5.70 (7)	71.70 ± 6.59 (10)
SD 93	Urine Tungsten Concentration (ug/mL)	0.08 ± 0.02 (10) **	442.78 ± 33.39 (9) **	681.00 ± 118.08 (7) **	1470.00 ± 114.30 (10) **
SD 93	Urine Tungsten/Creatinine Ratio (ug/mg)	0.14 ± 0.04 (9) **	596.49 ± 57.37 (9) **	872.11 ± 105.33 (7) **	2149.65 ± 183.59 (10) **
SD 93	Urine Volume (mL)	1.81 ± 0.97 (10)	0.65 ± 0.12 (10)	0.73 ± 0.11 (7)	0.96 ± 0.19 (10)

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Female: 6 Month Int Fem

Phase	Dose (mg/L)	0	500	1000	2000
SD 184	Tungsten Concentration in Kidney (ug/g)	0.08 ± 0.02 (10) **	2.90 ± 0.17 (10) **	5.52 ± 0.40 (10) **	10.00 ± 0.91 (10) **
SD 184	Tungsten Concentration in Plasma (ug/mL)	0.02 ± 0.00 (10) **	1.11 ± 0.13 (9) **	1.95 ± 0.23 (10) **	4.81 ± 0.61 (10) **
SD 184	Tungsten Kidney/Plasma Ratio (ug/ug)	5.50 ± 2.51 (10)	2.79 ± 0.23 (9)	3.19 ± 0.40 (10)	2.19 ± 0.14 (10)
SD 184	Urine Creatinine (mg/dL)	51.11 ± 2.20 (9)	50.00 ± 2.41 (9)	55.10 ± 4.37 (10)	56.80 ± 5.62 (10)
SD 184	Urine Tungsten Concentration (ug/mL)	0.11 ± 0.03 (9) **	217.11 ± 20.48 (9) **	419.60 ± 49.71 (10) **	855.40 ± 106.56 (10) **
SD 184	Urine Tungsten/Creatinine Ratio (ug/mg)	0.21 ± 0.05 (9) **	432.30 ± 32.48 (9) **	788.33 ± 89.19 (10) **	1594.25 ± 192.88 (10) **
SD 184	Urine Volume (mL)	0.93 ± 0.09 (9)	0.82 ± 0.12 (9)	0.79 ± 0.11 (10)	0.74 ± 0.11 (10)

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		Female: 12 Month Int Fem			
Phase	Dose (mg/L)	0	500	1000	2000
SD 366	Tungsten Concentration in Kidney (ug/g)	0.05 ± 0.01 (10) **	2.30 ± 0.23 (10) **	3.64 ± 0.22 (10) **	6.59 ± 0.54 (10) **
SD 366	Tungsten Concentration in Plasma (ug/mL)	0.04 ± 0.00 (10) **	0.58 ± 0.09 (10) **	1.35 ± 0.14 (10) **	4.59 ± 1.25 (9) **
SD 366	Tungsten Kidney/Plasma Ratio (ug/ug)	1.13 ± 0.15 (10)	4.36 ± 0.42 (10) **	2.84 ± 0.18 (10) **	2.05 ± 0.32 (9)
SD 366	Urine Creatinine (mg/dL)	44.90 ± 4.30 (10) **	54.30 ± 4.06 (10)	63.40 ± 8.63 (10)	65.70 ± 4.43 (10) **
SD 366	Urine Tungsten Concentration (ug/mL)	0.13 ± 0.03 (10) **	167.01 ± 26.29 (10) **	397.40 ± 63.15 (10) **	1070.20 ± 182.92 (10) **
SD 366	Urine Tungsten/Creatinine Ratio (ug/mg)	0.26 ± 0.04 (10) **	309.67 ± 42.88 (10) **	645.14 ± 83.24 (10) **	1642.14 ± 306.17 (10) **
SD 366	Urine Volume (mL)	1.12 ± 0.22 (10)	0.84 ± 0.12 (10)	0.74 ± 0.17 (10)	0.64 ± 0.10 (10)

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		Female: 18 Month Int Fem			
Phase	Dose (mg/L)	0	500	1000	2000
SD 548	Tungsten Concentration in Kidney (ug/g)	BD	2.90 ± 0.26 (9)	3.85 ± 0.80 (9)	5.32 ± 0.44 (10)
SD 548	Tungsten Concentration in Plasma (ug/mL)	BD	1.78 ± 0.32 (9)	1.66 ± 0.39 (9)	3.29 ± 1.15 (10)
SD 548	Tungsten Kidney/Plasma Ratio (ug/ug)	BD	1.83 ± 0.16 (9)	2.45 ± 0.16 (9)	2.76 ± 0.60 (10)
SD 548	Urine Creatinine (mg/dL)	28.00 ± 2.47 (5)	30.75 ± 3.12 (8)	36.33 ± 5.52 (6)	31.33 ± 2.33 (9)
SD 548	Urine Tungsten Concentration (ug/mL)	0.04 ± 0.01 (9) **	74.25 ± 15.40 (9) **	106.61 ± 28.16 (9) **	245.04 ± 37.25 (10) **
SD 548	Urine Tungsten/Creatinine Ratio (ug/mg)	0.19 ± 0.04 (4) **	262.73 ± 28.01 (8) **	397.77 ± 38.06 (6) **	851.15 ± 59.51 (9) **
SD 548	Urine Volume (mL)	4.86 ± 1.20 (10)	2.48 ± 1.27 (9)	3.03 ± 1.24 (9)	1.91 ± 0.69 (10)

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## LEGEND

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Data are displayed as mean  $\pm$  SEM (N) unless otherwise noted.

SD – Study Day

If over 20% of the animals in a group are above the limit of detection, then 1/2 the limit of detection value is substituted for values that are below the limit of detection.

When the control group did not have over 20% of its values above the limit of detection, no mean or standard error were calculated; no statistical analysis was done for the endpoint.

No outliers were removed in this study.

Statistical analysis performed by Jonckheere (trend) and Shirley or Dunn (pairwise) tests.

Statistical significance for the control group indicates a significant trend test

Statistical significance for a treatment group indicates a significant pairwise test compared to the vehicle control group

\* Statistically significant at  $P \leq 0.05$

\*\* Statistically significant at  $P \leq 0.01$

No statistical tests were performed on urine volume.

For the kidney to plasma ratio calculation, a plasma density of 1 g/ml was assumed.

The tungsten concentration in kidney value for one male in the 500 mg/L group on SD 548 was excluded from the analysis as an implausible value.

The tungsten concentration in kidney value for one male in the 1000 mg/L group on SD 548 was excluded from the analysis as an implausible value.

The urine tungsten concentration value for one female in the 0 mg/L group on SD 548 was excluded from the analysis as an implausible value.

The tungsten concentration in plasma value for one female in the 2000 mg/L group on SD 366 was excluded from the analysis as an implausible value.

BD - Group did not have over 20% of its values above the limit of detection.

**\*\* END OF REPORT \*\***