

## A. Supplemental Tables

Table S-1: Physiological Parameters for PBPK Model										
Parameter	Abbreviation	Units	Mice		Source	Rats		Source	Humans	Source
			Male	Female		Male	Female			
Body Weight	BW	kg	0.04	0.04	NTP (1998) time and survival weighted average BW control animals	0.407	0.256	NTP (1998) time and survival weighted average BW control animals	70	USEPA 1988
Alveolar Ventilation	QPC	L/h/kg <sup>0.75</sup>	29.1	29.1	Brown et al. 1997 (Table 31)	22.4	22.4	Brown et al. 1997 (Table 31)	24.0	Clewell et al. 2001 (Table 1)
Cardiac Output	QCC	L/h/kg <sup>0.75</sup>	20.1	20.1	Marino et al. 2006 (QPC/QCC = 1.45)	18.7	18.7	Brown et al. 1997 (Table 22)	16.5	Clewell et al. 2001 (Table 1)
FRACTIONAL BLOOD FLOWS TO TISSUES										
Flow to Liver as fraction Cardiac Output	QLC	unitless	0.161	0.161	Brown et al. 1997 (Table 23)	0.183	0.183	Brown et al. 1997 (Table 23)	0.227	Brown et al. 1997 (Table 23)
Flow to Fat as fraction Cardiac Output	QFC	unitless	0.07	0.07	Brown et al. 1997 (Table 23; Same as rat value)	0.07	0.07	Brown et al. 1997 (Table 23)	0.052	Brown et al. 1997 (Table 23)
Flow to Spleen as fraction Cardiac Output	QSC	unitless	0.159	0.159	Brown et al. 1997 (Table 23); Same as that reported for muscle	0.278	0.278	Brown et al. 1997 (Table 23); Same as that reported for muscle	0.191	Brown et al. 1997 (Table 23); Same as that reported for muscle
Flow to Kidney as fraction Cardiac Output	QKC	unitless	0.09	0.09	Brown et al. 1997 (Table 23)	0.14	0.14	Brown et al. 1997 (Table 23)	0.175	Brown et al. 1997 (Table 23)
FRACTIONAL VOLUMES OF TISSUES										
Volume Liver as fraction Body Weight	VLC	unitless	0.055	0.055	Brown et al. 1997 (Table 4)	0.0366	0.0366	Brown et al. 1997 (Table 5)	0.0257	Brown et al. 1997 (Table 7)

Table S-1: Physiological Parameters for PBPK Model										
Parameter	Abbreviation	Units	Mice		Source	Rats		Source	Humans	Source
			Male	Female		Male	Female			
Volume Lung as fraction Body Weight	VLUC	unitless	0.0073	0.0073	Brown et al. 1997 (Table 4)	0.005	0.005	Brown et al. 1997 (Table 5)	0.0076	Brown et al. 1997 (Table 7)
Volume Fat as fraction Body Weight	VFC	unitless	0.1	0.1	Brown et al. 1997 (Table 10)	0.1	0.1	Brown et al. 1997 (Table 13)	0.27	Brown et al. 1997 (Table 14); Average of total male and female
Volume Rapid Perfused as fraction Body Weight	VRC	unitless	0.08098	0.08098	Brown et al. 1997 (Table 4); Sum of adrenals, brain, stomach, small intestine, large intestine, heart, lungs, pancreas, spleen and thyroid	0.04644	0.04644	Brown et al. 1997 (Table 5); Sum of adrenals, brain, stomach, small intestine, large intestine, heart, lungs, pancreas, spleen and thyroid	0.0533	Brown et al. 1997 (Table 7); Sum of adrenals, brain, stomach, small intestine, large intestine, heart, lungs, pancreas, spleen and thyroid
Volume Slow Perfused as fraction Body Weight	VSC	unitless	0.384	0.384	Brown et al. 1997 (Table 4); Same as that reported for muscle	0.4	0.4	Brown et al. 1997 (Table 5); Same as that reported for muscle	0.4	Brown et al. 1997 (Table 7); Same as that reported for muscle
Volume Kidney as fraction Body Weight	VKC	unitless	0.0167	0.0167	Brown et al. 1997 (Table 4)	0.0073	0.0073	Brown et al. 1997 (Table 5)	0.0044	Brown et al. 1997 (Table 7)

<b>Table S-2: Partition Coefficients for PBPK Model</b>			
	<b>Mice</b>	<b>Rats</b>	<b>Humans</b>
Blood:Air	7.83	7.35	4.54
Lung:Blood	2.38	1.85	2.94
Liver:Blood	1.26	1.58	2.37
Fat:Blood	17.35	16.99	28.65
Muscle:Blood <sup>a</sup>	0.59	0.60	1.00
Kidney:Blood <sup>b</sup>	1.76	2.29	2.67

<sup>a</sup> used for slowly perfused tissues;

<sup>b</sup> used for rapidly perfused tissues

<b>Table S-3: In Vitro Metabolism Parameters</b>			
<b>Sex &amp; Species</b>	<b>Parameter</b>	<b>Source</b>	
		<b>Yang et al. 2012 MCMC Mean</b>	<b>This Analysis Mean (95% Confidence Interval)</b>
Female mouse	Vmax, liver (μmol/h/mg protein)	0.13	0.11 (0.090 - 0.13)
	Vmax, lung (μmol/h/mg protein)	0.03	0.028 (0.020 – 0.039)
	Vmax, kidney (μmol/h/mg protein)	0.004	NA
	Km, liver (μmol/L)	0.88	0.46 (0.31 – 0.69)
	Km, lung (μmol/L)	2.82	2.91 (1.99 – 4.24)
	Km, kidney (μmol/L)	176.11	NA
	KF, kidney (L/h/mg protein)	NA	0.00043 (0.00019 – 0.00071)
Male mouse	Vmax, liver (μmol/h/mg protein)	0.26	0.23 (0.22 – 0.24)
	Vmax, lung (μmol/h/mg protein)	0.14	0.13 (0.12 – 0.15)
	Vmax, kidney (μmol/h/mg protein)	0.01	0.010 (0.008 – 0.013)
	Km, liver (μmol/L)	1.34	0.61 (0.54 – 0.69)
	Km, lung (μmol/L)	2.22	1.72 (1.51 – 2.02)
	Km, kidney (μmol/L)	0.77	0.58 (0.42 – 0.79)
	KF, kidney (L/h/mg protein)	NA	NA
Female rat	Vmax, liver (μmol/h/mg protein)	0.09	0.072 (0.058 – 0.087)
	Vmax, lung (μmol/h/mg protein)	NA	NA
	Vmax, kidney (μmol/h/mg protein)	0.003	0.0035 (0.0027 – 0.0046)
	Km, liver (μmol/L)	0.56	0.74 (0.57 – 0.96)
	Km, lung (μmol/L)	NA	NA
	Km, kidney (μmol/L)	0.60	0.55 (0.40 – 0.76)
	KF, lung (L/h/mg protein)	0.00096	0.00041 (0.000052 – 0.00049)
Male rat	Vmax, liver (μmol/h/mg protein)	0.10	0.071 (0.068 – 0.074)

	Vmax, lung ( $\mu\text{mol/h/mg}$ protein)	NA	NA
	Vmax, kidney ( $\mu\text{mol/h/mg}$ protein)	0.003	0.0041 (0.0031 – 0.0054)
	Km, liver ( $\mu\text{mol/L}$ )	0.56	0.35 (0.32 – 0.38)
	Km, lung ( $\mu\text{mol/L}$ )	NA	NA
	Km, kidney ( $\mu\text{mol/L}$ )	0.76	0.84 (0.61 – 1.18)
	KF, lung (L/h/mg protein)	0.00128	0.00087 (0.000056 – 0.0172)
Humans	Vmax, liver ( $\mu\text{mol/h/mg}$ protein)	0.05	0.052 (0.050 – 0.054)
	Vmax, lung ( $\mu\text{mol/h/mg}$ protein)	NA	NA
	Vmax, kidney ( $\mu\text{mol/h/mg}$ protein)	NA	NA
	Km, liver ( $\mu\text{mol/L}$ )	0.45	0.32 (0.29 – 0.34)
	Km, lung ( $\mu\text{mol/L}$ )	NA	NA
	Km, kidney ( $\mu\text{mol/L}$ )	NA	NA
	KF, lung (L/h/mg protein)	0.00032	2.7E-14 (1.2E-25 – 3.9E-04)

**Table S-4: Metabolism Parameters for PBPK Model**

Sex & Species	Parameter	Source	
		Yang et al. 2012	This Analysis (Table S-3)
Female Mouse	VmaxC, liver (mg/h/kg**3/4)	8.88	8.22
	VmaxC, lung (mg/h/kg**3/4)	0.11	0.16
	VmaxC, kidney (mg/h/kg**3/4)	0.03	NA
	Km, liver (mg /L)	0.08	0.041
	Km, lung (mg /L)	0.25	0.26
	KM, kidney (mg /L)	9.59	NA
	KF, kidney (L/h/kg**3/4)	NA	0.058
Male Mouse	VmaxC, liver (mg/h/kg**3/4)	18.54	17.5
	VmaxC, lung (mg/h/kg**3/4)	0.6	0.76
	VmaxC, kidney (mg/h/kg**3/4)	0.078	0.12
	Km, liver (mg /L)	0.12	0.054
	Km, lung (mg /L)	0.2	0.15
	KM, kidney (mg /L)	0.068	0.051
	KF, kidney (L/h/kg**3/4)	NA	NA
Female Rat	VmaxC, liver (mg/h/kg**3/4)	9.37	6.66
	VmaxC, lung (mg/h/kg**3/4)	NA	NA
	VmaxC, kidney (mg/h/kg**3/4)	0.018	0.029
	Km, liver (mg /L)	0.09	0.066
	Km, lung (mg /L)	NA	NA
	KM, kidney (mg /L)	0.053	0.049
	KF, lung (L/h/kg**3/4)	0.16 <sup>a</sup>	0.030
Male Rat	VmaxC, liver (mg/h/kg**3/4)	9.48	7.30
	VmaxC, lung (mg/h/kg**3/4)	NA	NA
	VmaxC, kidney (mg/h/kg**3/4)	0.018	0.038
	Km, liver (mg /L)	0.05	0.031
	Km, lung (mg /L)	NA	NA
	KM, kidney (mg /L)	0.067	0.074
	KF, lung (L/h/kg**3/4)	0.15 <sup>a</sup>	0.069
Humans	VmaxC, liver (mg/h/kg**3/4)	20.4	13.66
	VmaxC, lung (mg/h/kg**3/4)	NA	0.0029
	VmaxC, kidney (mg/h/kg**3/4)	NA	NA
	Km, liver (mg /L)	0.04	0.028
	Km, lung (mg /L)	NA	0.028
	KM, kidney (mg /L)	NA	NA
	KF, lung (L/h/kg**3/4)	0.05 <sup>a</sup>	NA

<sup>a</sup> (L/h/kg)

**Table S-5: Plethysmography Data**

Pulmonary Function Data Protocol 07039 Summary			Exposure #1
Exposure	Frequency (BPM)	Tidal Volume (ml)	Minute Ventilation (ml/min)
0ppm	Average	Average	Average
Animal 1	193.5	0.247	48.4
Animal 2	168.2	0.284	47.2
Animal 3	251.9	0.212	51.6
Animal 4	201.7	0.311	61.6
Average	203.8	0.264	52.2
Stdev	35.1	0.043	6.5

Pulmonary Function Data Protocol 07039 Summary			Exposure #2
Exposure	Frequency (BPM)	Tidal Volume (ml)	Minute Ventilation (ml/min)
13 ppm	Average	Average	Average
Animal 20	221.9	0.261	57.6
Animal 21	221.0	0.264	57.6
Animal 22	140.9	0.224	32.0
Animal 23	131.2	0.218	28.9
Average	178.7	0.242	44.0
Stdev	49.4	0.024	15.7

Pulmonary Function Data Protocol 07039 Summary			Exposure #3
Exposure	Frequency (BPM)	Tidal Volume (ml)	Minute Ventilation (ml/min)
32 ppm	Average	Average	Average
Animal 54	253.3	0.269	66.1
Animal 55	225.0	0.269	59.4
Animal 56	249.8	0.282	69.5
Animal 57	235.2	0.293	67.9
Average	240.8	0.278	65.7
Stdev	13.1	0.012	4.4

Pulmonary Function Data Protocol 07039 Summary			Exposure #4
Exposure	Frequency (BPM)	Tidal Volume (ml)	Minute Ventilation (ml/min)
90 ppm	Average	Average	Average
Animal 88	216.3	0.276	59.4
Animal 89	178.4	0.242	43.2
Animal 90	217.9	0.277	59.8
Animal 91	166.2	0.278	45.8
Average	194.7	0.268	52.0
Stdev	26.4	0.017	8.8

<b>Table S-6: Arterial Blood Concentrations</b>			
<b>13 ppm Exposure</b>			
<b>Time point</b>	<b>Average [CD]</b>	<b>Std Dev. CD</b>	<b>RSD%</b>
Control	0	0	0%
0.5 hours	1.03	0.18	17%
3 hours	1.93	0.80	41%
6 hours	1.58	0.35	22%
5 min post exposure	0.66	0.07	101%
10 min post exposure	0.70	0.11	157%
15 min post exposure	0	0	0%
<b>32 ppm Exposure</b>			
<b>Time point</b>	<b>Average [CD]</b>	<b>Std Dev. CD</b>	<b>RSD%</b>
Control	0	0	0%
0.5 hours	1.68	0.70	42%
3 hours	2.90	1.15	40%
6 hours	2.44	1.24	51%
5 min post exposure	0.61	0.22	35%
10 min post exposure	0.18	0.09	48%
15 min post exposure	0.30	0.23	78%
<b>90 ppm Exposure</b>			
<b>Time point</b>	<b>Average [CD]</b>	<b>Std Dev. CD</b>	<b>RSD%</b>
Control	0	0	0%
0.5 hours	6.41	1.83	29%
3 hours	7.33	3.52	48%
6 hours	8.00	1.02	13%
5 min post exposure	1.71	0.78	46%
10 min post exposure	0.92	0.33	35%
15 min post exposure	0.68	0.15	23%