

Appendix K - Serum to Tissue Calculations

PFOS Tissue to Serum Ratios in Small Mammals					
	Muscle	Liver	Kidney	Fat	Brain
Rat	0.13	2.3	1	0.9	0.09
		2.4	0.65		0.02
		4	0.5		0.04
		5.8			0.09
		3.1			
		9.3			
		1.3			
		51			
		2.1			
		8.1			
		1.8			
		5			
Mouse	0.07	1.8	0.4	0.07	
		2.1	0.5		
Mean Ratio	0.1	7.15	0.61	0.485	<0.06

These ratios have been based on measurement of PFOS concentrations in serum (or plasma) and various tissues during laboratory animal studies, as summarised in ToxConsult (2016). Rats and mice were selected to best reflect bandicoots and possums assessed in this ERA. The data shows that preferential partitioning occurs to liver and kidneys, and potentially fat. The distribution of serum throughout the body will also contribute to a significant proportion of the whole body concentration of PFAS. To provide a conversion from serum concentration to whole body concentration a weighted average was calculated based on contributions from liver, kidney and serum from typical specimen proportions in laboratory rats.

Wistar Rat Body Weights

	Male	Female	%Bwt male	%Bwt female	PFOS Tissue to serum ratio
Whole Body (g)	519	341			
Brain (g)	2.09	1.97	0.4	0.4	
Hypophysis (mg)	19	29	0.004	0.009	
Thyroid (mg)	38	27	0.007	0.008	
Thymus (g)	0.199	0.141	0.141	0.04	
Heart (g)	1.563	1.125	0.3	0.3	
Liver (g)	15.495	9.905	3	3	7.15
Spleen (g)	1.628	0.907	0.3	0.3	
Kidneys (g)	4.491	2.337	0.7	0.7	0.60
Adrenals (mg)	84	80	0.02	0.02	
Adrenals (g)	3.622	0.127	0.7	0.04	
Prostate (g)	0.557		0.1		
Seminal Vesicles(g)	1.334		0.3		
(Source: IFFA CREDO Laboratory Animals).					
Serum			5	5	1.00

Weighted average (whole body to serum ratio) **0.27**

Calculated based on the weighted contribution of liver, kidneys and serum to overall body burden.

$$R_{b:s} = \frac{R_L * \%_L + R_K * \%_K + R_s * \%_s}{100}$$

where:

$R_{b:s}$ = Ratio of whole body concentration to serum concentration

R_L = Ratio of liver tissue concentration to serum

R_K = Ratio of kidney tissue concentration to serum

$R_s = 1$

$\%_L$ = liver as a percentage of body weight

$\%_K$ = kidney as a percentage of body weight

$\%_s$ = serum as a percentage of body weight

This value may underestimate total body burden where organs accumulate PFOS or PFOA compared to serum. Inclusion of the contribution of serum is expected to reasonably account for most other organs and muscle as serum would be distributed through these body parts.

PFOA Tissue to Serum Ratios in Small Mammals					
	Muscle	Liver	Kidney	Fat	Brain
Hamster	0.05	0.4	0.4	0.09	
Rat		1.4	0.45	0.15	
		2.1	1	0.03	0.01
		0.8	0.7	0.03	0.01
		0.7	0.03		0.009
		1			
	0.04	0.9	0.5	0.04	
Mouse	0.03	1.9	0.1	0.06	
		2.9			
Mean Ratio	0.04	1.34	0.45	0.07	0.01

These ratios have been based on measurement of PFOA concentrations in serum (or plasma) and various tissues during laboratory animal studies, as summarised in ToxConsult (2016). Rats and mice were selected to best reflect bandicoots and possums assessed in this ERA. The data shows that preferential partitioning occurs to liver and kidneys, and potentially fat. The distribution of serum throughout the body will also contribute to a significant proportion of the whole body concentration of PFAS. To provide a conversion from serum concentration to whole body concentration a weighted average was calculated based on contributions from liver, kidney and serum from typical specimen proportions in laboratory rats.

Wistar Rat

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Brain (g)	2.09	1.97	0.4	0.4	
Hypophysis (mg)	19	29	0.004	0.009	
Thyroid (mg)	38	27	0.007	0.008	
Thymus (g)	0.199	0.141	0.141	0.04	
Heart (g)	1.563	1.125	0.3	0.3	
Liver (g)	15.495	9.905	3	3	1.34
Spleen (g)	1.628	0.907	0.3	0.3	
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(Source: IFFA CREDO Laboratory Animals).					
Serum			5	5	1.00

Weighted average (whole body to serum ratio) **0.09**

Calculated based on the weighted contribution of liver, kidneys and serum to overall body burden.

$$R_{b:s} = \frac{R_L * \%_L + R_K * \%_K + R_s * \%_s}{100}$$

where:

$R_{b:s}$ = Ratio of whole body concentration to serum concentration

R_L = Ratio of liver tissue concentration to serum

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$R_s = 1$

$\%_L$ = liver as a percentage of body weight

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