

# The human body retention time of environmental organically bound tritium: Preliminary analysis of results from a volunteer study

## Aim

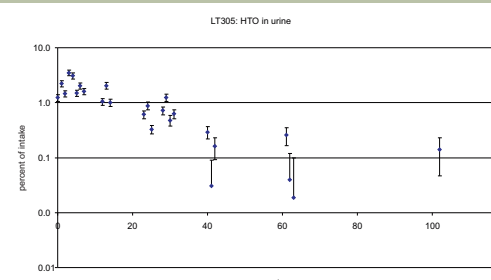
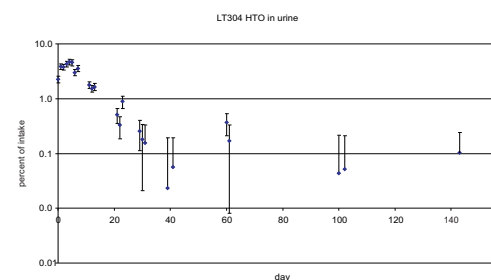
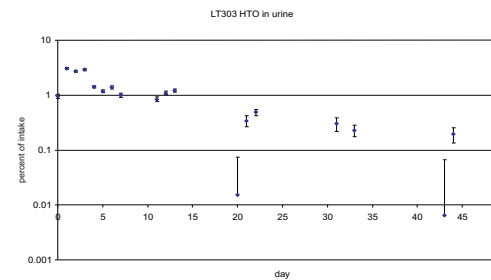
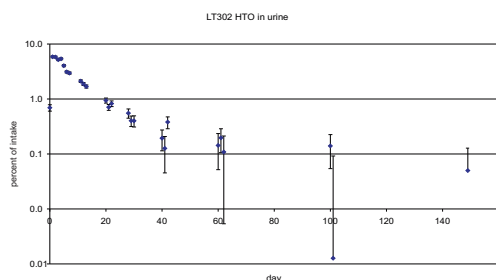
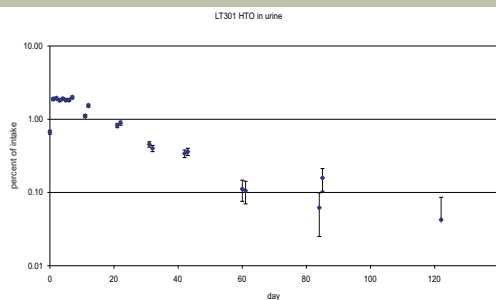
This study was undertaken to improve our knowledge of the human body retention time of organically bound tritium (OBT) in sole (*Solea solea*) from Cardiff Bay, which may contain OBT from discharges from the GE Healthcare Ltd. plant. Five volunteers provided samples of excreta over periods up to 150 days after eating samples of sole.

## Details of volunteers and intakes

Volunteer	Sex	Age	Weight of sole eaten (g)	Tritium concentration (Bq/kg (wet)) <sup>a</sup>	Intake of tritium (Bq) <sup>a</sup>
LT301	M	60	384	15500±600	5900±200
LT302	F	38	367	13000±400	4800±150
LT303	M	42	533	5250±70	2800±40
LT304	F	46	240	10400±1200	2500±300
LT305	M	52	552	4300±500	2400±300

<sup>a</sup> Errors represent ± 1 standard error of the mean of several measurements

## Results



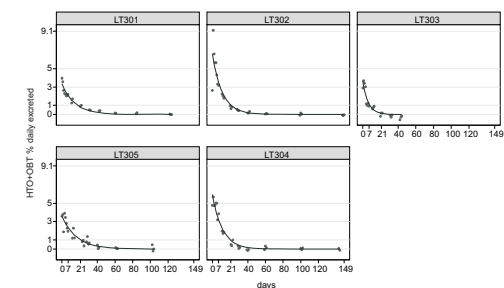
## Curve fitting

We carried out curve fitting to estimate values of excretion parameters. Inspection of the relevant curves shows very little evidence of two components with different time constants, and attempted fits in each case with double exponential functions would not converge. It was concluded that, with the current data and backgrounds, a significant second exponential term could not be detected. Therefore, single exponentials were fitted for each volunteer and the values for the excretion time constant  $\lambda_{TOT}$  were derived:

Fitted values of retention time constant,  $\lambda_{TOT}$ , and related parameters

Volunteer	$\lambda_{TOT}$ (day <sup>-1</sup> )	Std error	$T_{1/2}$ (days)	Observations	R <sup>2</sup>
LT301	0.069	0.009	10	18	0.98
LT302	0.089	0.019	8	23	0.88
LT303	0.164	0.029	4	20	0.91
LT304	0.088	0.013	8	23	0.97
LT305	0.060	0.010	11	24	0.94

This shows the fitted single exponential curves:



## Conclusions

Preliminary analysis suggests retention of total tritium with a body half-time in the range 4-11 days, with no evidence of a significant contribution due to retention with a longer half-time. This timescale is similar to the half-time of 10 days used by the ICRP for tritiated water. The short timescale observed could be due to rapid hydrolysis in body tissues of the particular form of OBT used in this study. Implications for the dose coefficient for OBT are that the use of the ICRP value of  $4.2 \cdot 10^{-11}$  Sv Bq<sup>-1</sup> may be cautious in this specific situation, and the value of  $1.6 \cdot 10^{-11}$  Sv Bq<sup>-1</sup> used by the ICRP for tritiated water might even be more appropriate.

## Acknowledgements

Thanks are due to:

- The volunteers
- The Department of Health and the Environment Agency for funding
- The Suffolk Local Research Ethics Committee