Precursors of Tritium WG

BIOMOVS II

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TRITIUM IN THE FOOD CHAIN

Chairman P.J. Barry.

Third Technical Meeting (TM) on the Environmental Modelling for RAdiation Safety

Working Group 7 “Tritium” Accidents

IAEA Headquarters, Vienna 24-28 January 2011

Tritium transport processes ranked by importance as contributors to ingestion dose and by confidence in ability to model them.
(H = high, M = medium, L = low, - = not needed for modelling, x = important,
* = ranking still unclear

Process	Importance	Status of modelling	Experimental data need
Atmospheric dispersion	H	H	
Atmospheric conversion HT to HTO	L	-	
Wet deposition	M / H	L*	
Condensation / dew	L / M	L	
Dry deposition HTO			
Plants	H	M / H	x
Soil	H	M*	x
Free water surface	L	-	
Dry deposition HT			
Plants	L	-	
Soil	H	M	
Free water surface	L	-	
Re-emission			
Soil surface	M / H	M / H	x
Root / plant uptake	H	M / H	
Synthesis of T into organics			
Plant	H	L / M*	x
Soil	L	-	
Transport through food chain	H	M*	x
Absorption of tritium from			
air in humans HT	L	M	
HTO	H	H	
Translation of exposure to dose	H	M / H*	

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Intercomparison of model predictions of tritium concentrations in soil and foods following acute airborne HTO exposure

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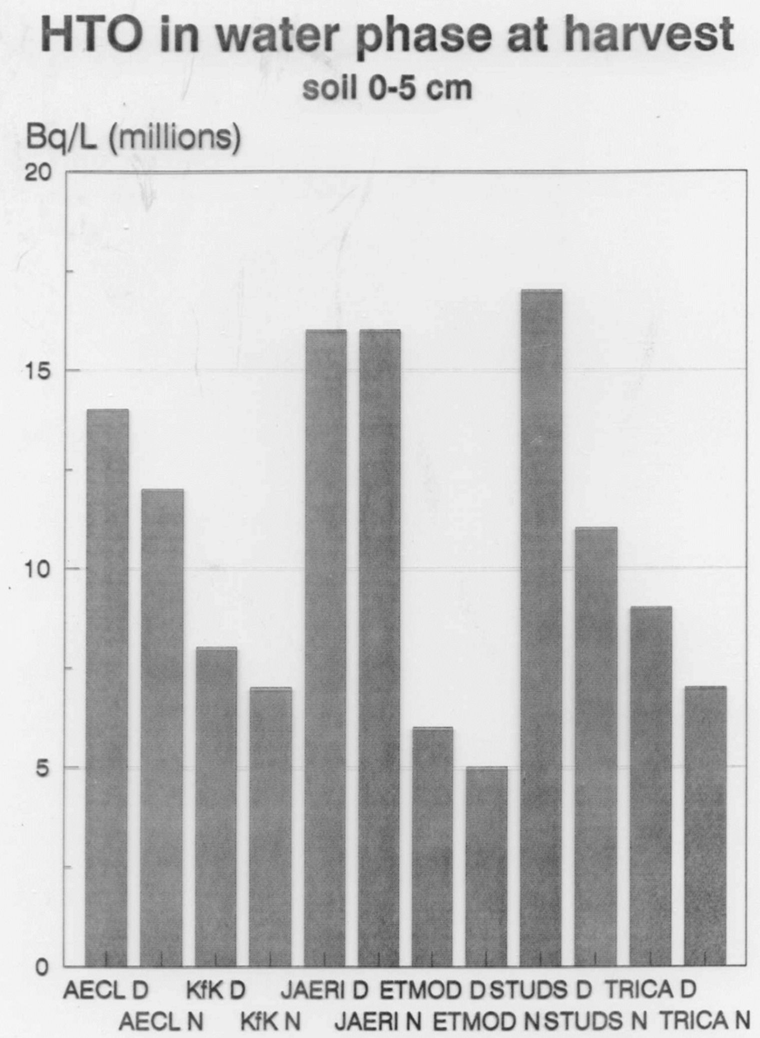
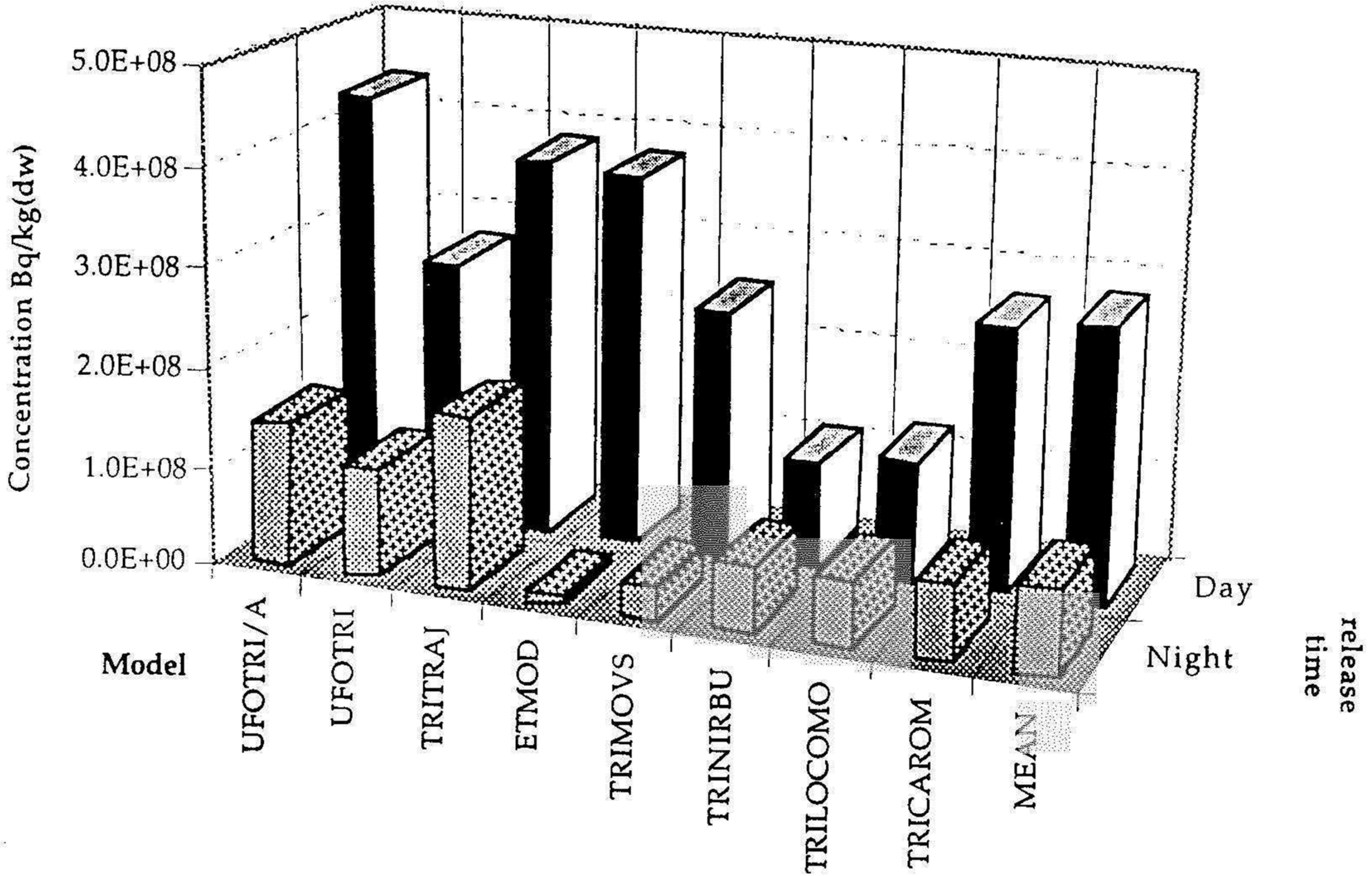
Table 3
Predicted concentrations of HTO in leafy vegetables at selected times after exposure (units: MBq/l)

Model	Prediction end-point					
	After 1 h		After 1 day		After 30 days	
	Release time					
	Day	Night	Day	Night	Day	Night
UFOTRI/A	9.2E + 4	1.7E + 4	4.0E + 3	2.5E + 3	5.6E + 1	4.9E + 1
UFOTRI	9.2E + 4	1.8E + 4	3.9E + 3	2.4E + 3	5.2E + 1	4.5E + 1
TRITRAJ	5.8E + 4	6.7E + 1	1.2E + 4	1.2E + 3	1.6E + 2	1.6E + 2
TRILO'MO	5.4E + 4	6.9E + 3	4.5E + 3	5.7E + 3	6.7E + 1	7.4E + 1
ETMOD	1.7E + 5	≪1.0E + 0	3.5E + 3	6.4E + 2	4.7E + 0	1.6E + 0
TRIMOVS	1.2E + 5	1.3E + 4	1.3E + 4	1.5E + 3	2.1E + 1	2.1E + 1
TRICAROM	7.5E + 4	2.0E + 4	3.9E + 3	1.3E + 3	6.5E + 0	2.0E + 0
TRINIRBU	7.0E + 3	0.0	4.5E + 3	8.2E + 2	6.1E + 1	5.3E + 1


HTO in water phase at harvest
soil 0-5 cm
Bq/L (millions)
20
15
10
5
0
AECL D
AECL N
KfK D
KfK N
JAERI D
JAERI N
ETMOD D
ETMOD N
STUDS D
STUDS N
TRICA D
TRICA N



OBT concentrations in leafy vegetables at harvest time.
Day- and Night-time releases.

Blind test, spring wheat, gains

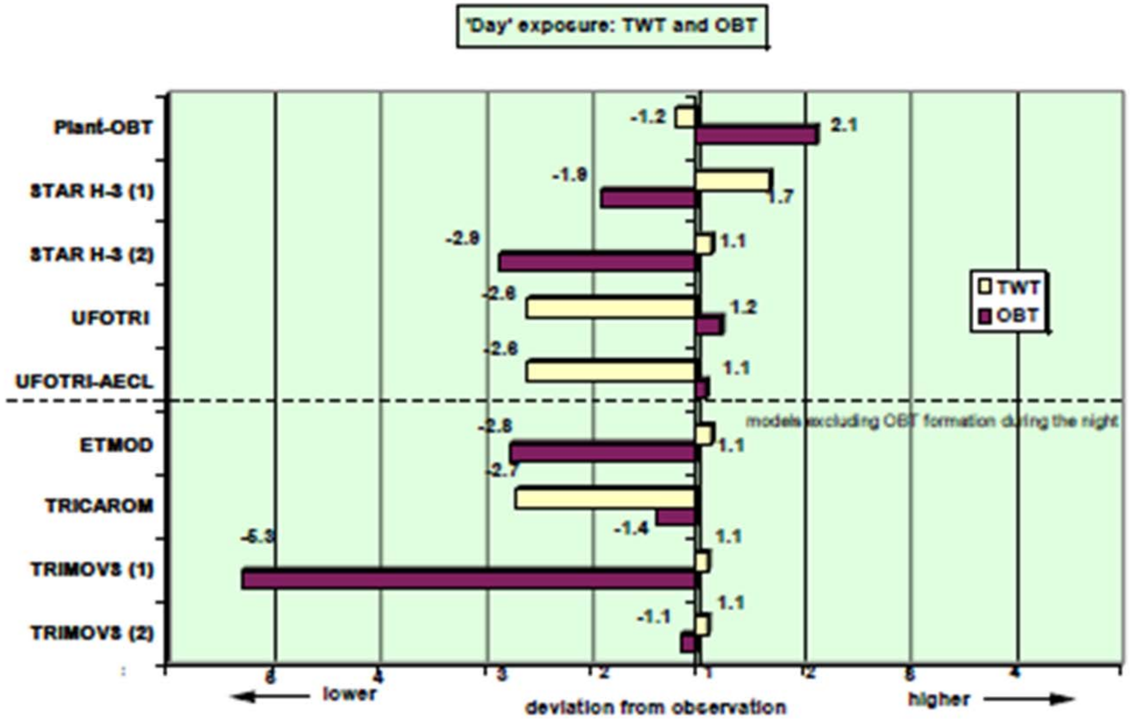


Figure 1 OBT formation following a daytime exposure

Blind test, spring wheat, gains

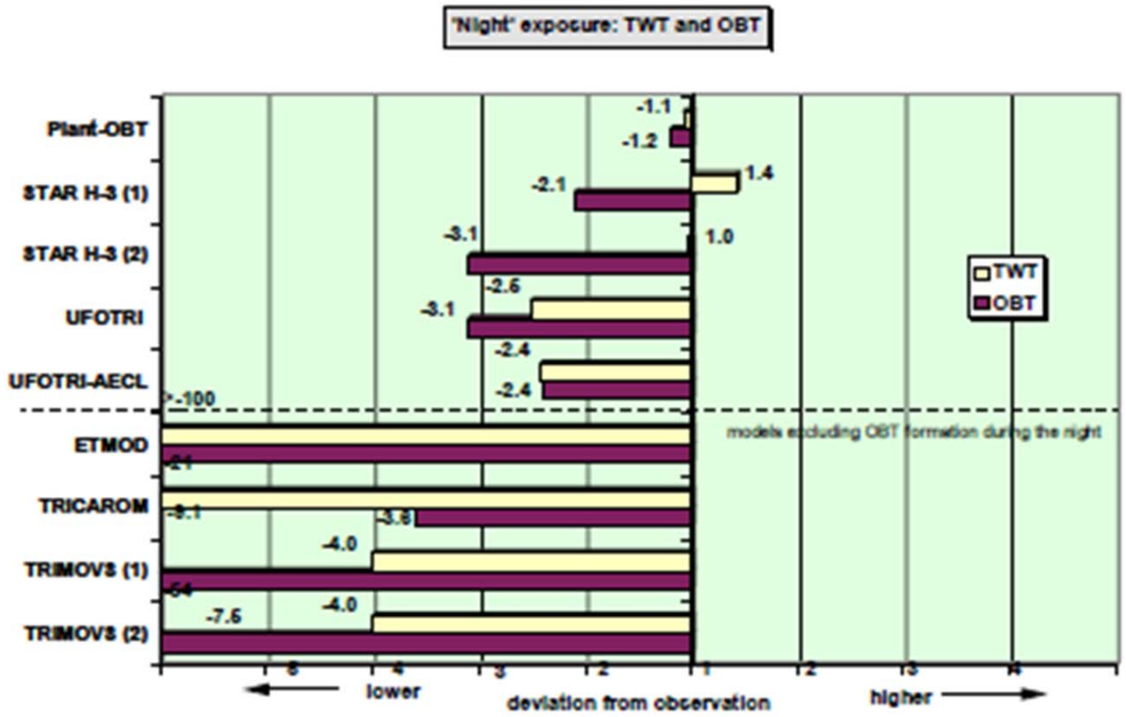


Figure 2 OBT formation following a night-time exposure

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P. J. Barry, first cited paper in 1958, nominated in the history of atmospheric pollution and master in medieval history

- Peter brought a tremendous amount of experience to the BIOMOVS workshops. He was always outspoken, and, not infrequently, he would have quite heated arguments with other participants. Nevertheless, his opinion was always valued. One of the funniest exchanges occurred at one of the workshops. Peter had talked about some issue at great length, and one of the participants asked if Peter would repeat himself. Peter, with a perfectly straight face said, “No, I can’t. I wasn’t listening”, a remark that brought gales of laughter.
- One thing we all learned from Peter was that knowledge and a back-of-the-envelope calculation could easily produce a better result than a complex computer model. This was demonstrated in a scenario that required participants to predict concentrations of mercury in water from measured values in sediments (or perhaps the other way around). Peter’s result was the closest to the observation, and he did not have a computer code to run.
- (Ring Silvie Peterson)