

# Dynamics of OBT Accumulation in Aquatic Biota

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# Background in Canada

- The aquatic system has gotten less attention than terrestrial ecosystem
  - airborne effluent
  - liquid effluent
- Canada has different sizes of water body
  - River
  - Lake
  - Ocean
- Tritium leaking incident from CRL
- Relate to drinking water standard

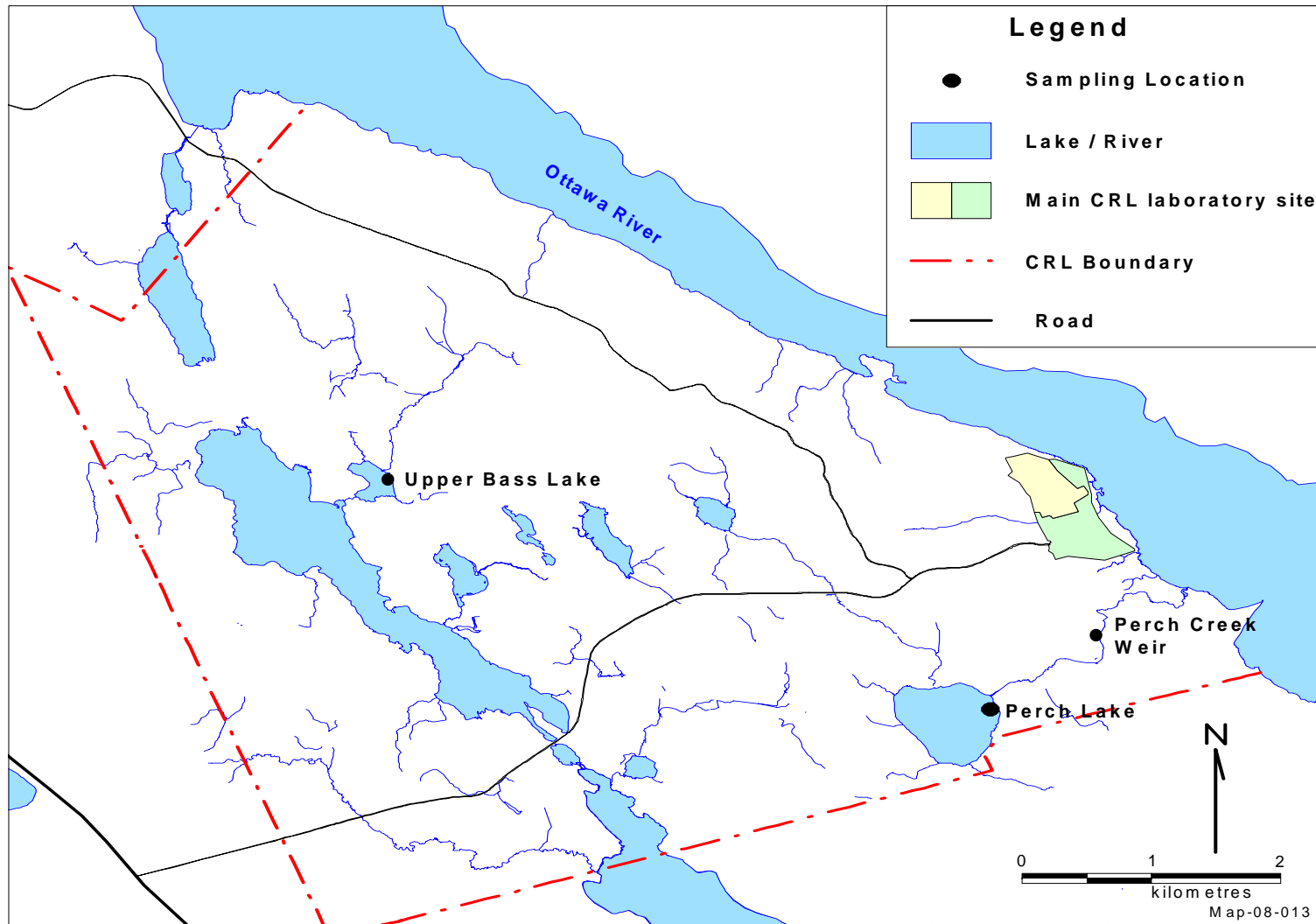
# Experiments

- Mussel (*Elliptio complanata*) experiment: 2006 and 2007
  - Whole body
- Minnow (*Pimephales promelas*) experiment: 2008
  - Whole body
- Rainbow trout (*Oncorhynchus mykiss*) experiment: 2009 ~
  - Organ distribution (muscle, liver and viscera)

# Mussel Experiment

- Lake experiments (Perch Lake and Upper Bass Lake)
  - Uptake (from Ottawa River to Perch Lake)
  - Depuration (from Perch Lake to Upper Bass Lake)
- Provided a scenario to EMRAS
- Tritium uptake and depuration
- Longer term experiment (Perch Creek and Upper Bass Lake)
  - Uptake (from Ottawa River to Perch Creek)
  - Depuration (from Perch Lake to Upper Bass Lake)

# Mussel Experiment (1)



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## Mussel Experiment (2)

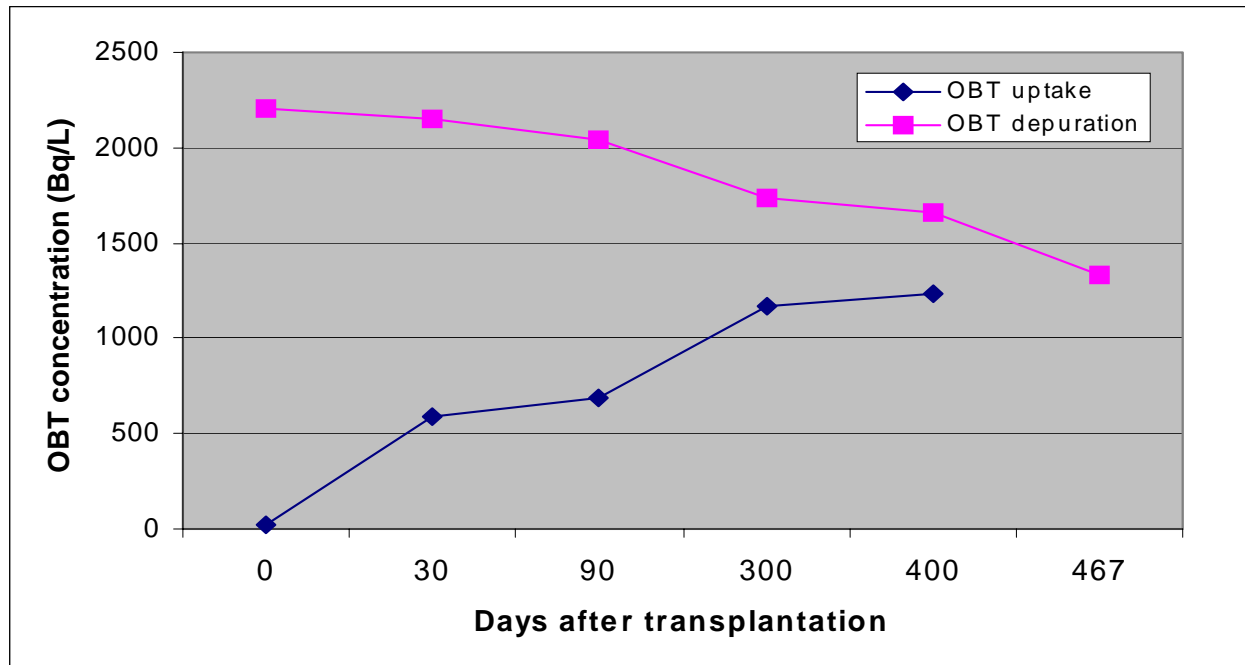
<b>Date of Mussel Harvest</b>	<b>Time after Mussel transplantation</b>	<b>Water HTO Concentration (Bq/L)</b>
July 14, 2006	-	<12
July 15, 2006	0 hour	6,680 ± 52.3
August 14, 2006	30 days	7,524 ± 37.2
October 11, 2006	90 days	4,460 ± 13.6
May 14, 2007	300 days	3,511 ± 76.2
August 30, 2007	400 days	9,530 ± 85.0

Water concentrations varied.

# Mussel Experiment (3)

<b>Date of Mussel Harvest</b>	<b>Time after Mussel transplantation</b>	<b>Water HTO Concentration (Bq/L)</b>
July 15, 2006	(Perch Lake)	2,631 $\pm$ 14.8
July 15, 2006	0 hour	48 $\pm$ 4.9
August 17, 2006	30 days	40 $\pm$ 6.7
October 11, 2006	90 days	53 $\pm$ 3.9
May 14, 2007	300 days	66 $\pm$ 2.5
August 30, 2007	400 days	55 $\pm$ 2.5
October 24, 2007	467 days	62 $\pm$ 2.5

# Mussel Experiment (4)



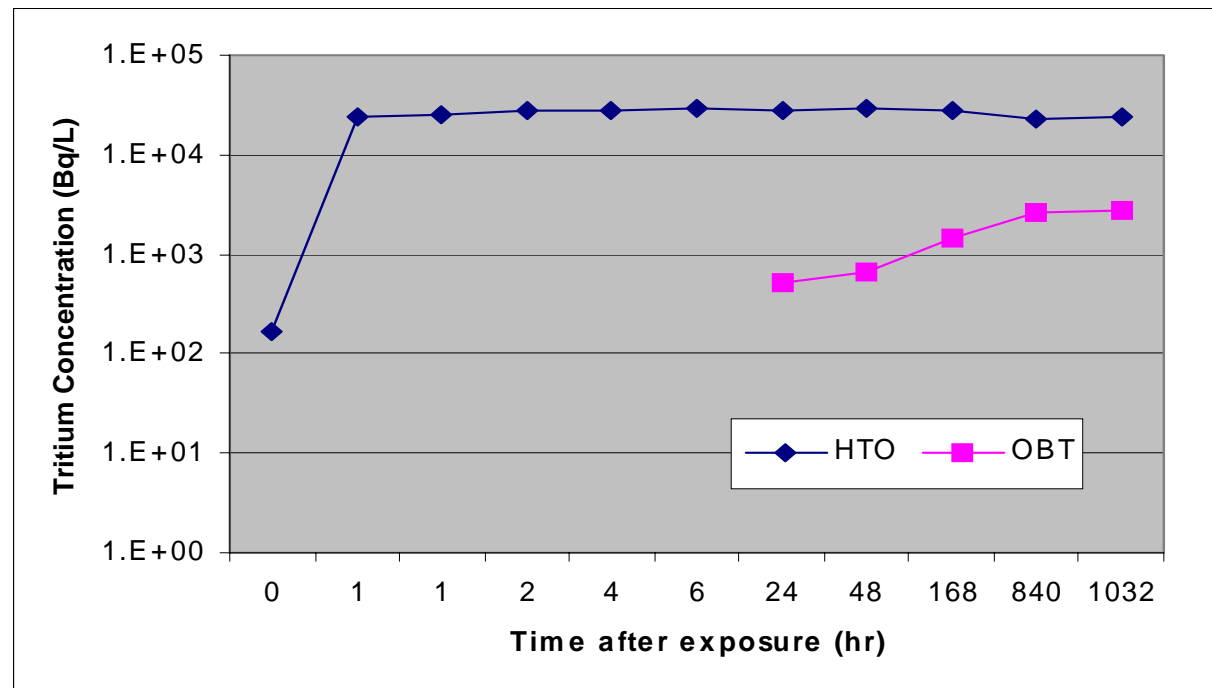
The mussel uptake experiment showed that the OBT concentration reached 7% of the HTO value 30 days after transplantation.



# Minnow Experiment

- Experiment in the small tank (Biological Research Facility)
- Uptake from the water body was about 30,000 Bq/L
- Sampling time was up to 1,032 hours (43 days)
  - Sample was not enough to measure OBT
  - OBT/HTO ratio was 0.11 after 43 days exposure

# Minnow Experiment (1)

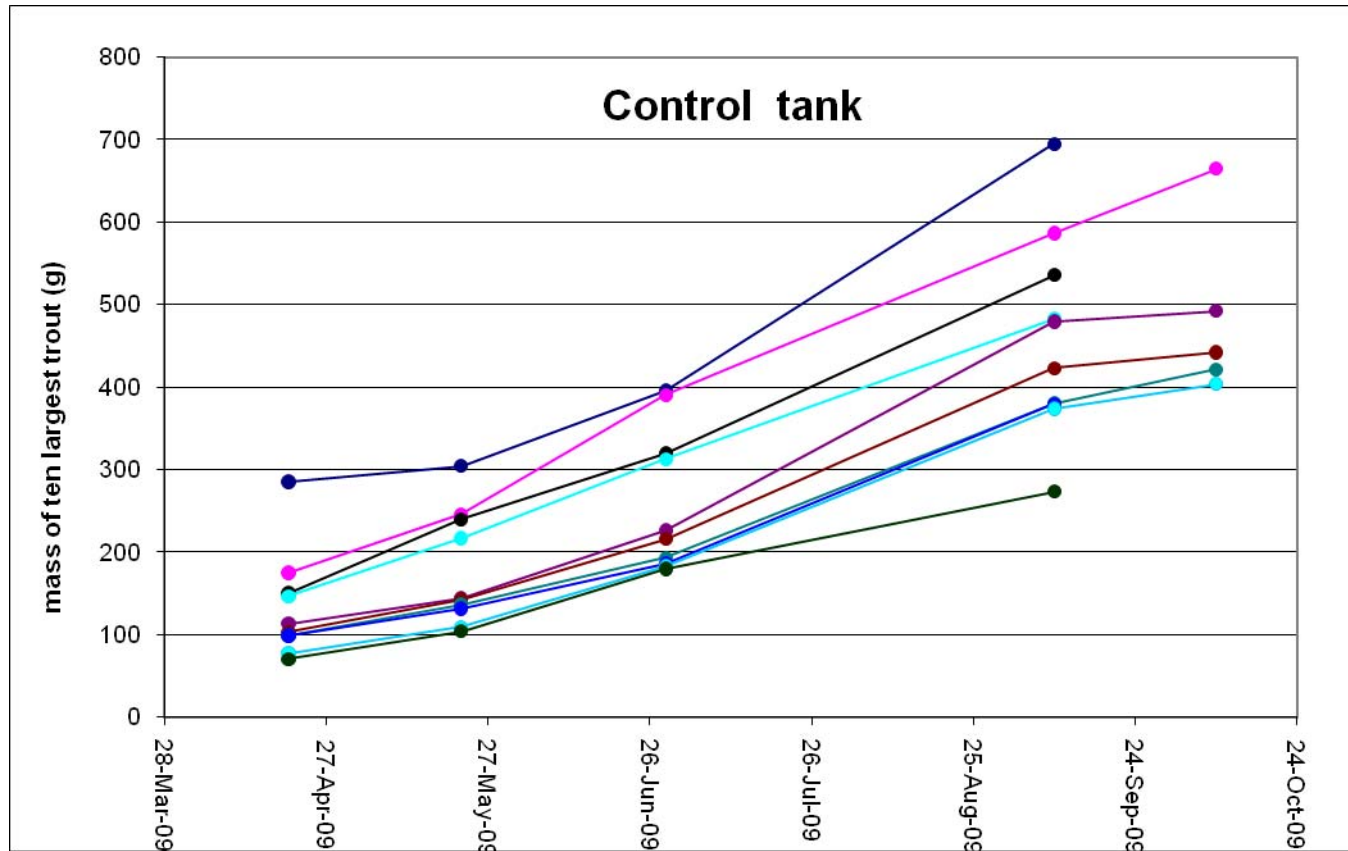


In the aquatic ecosystem, the OBT concentration in fish following an accidental HTO exposure (~30,000 Bq/L) for a month would not deliver a significant dose of tritium.

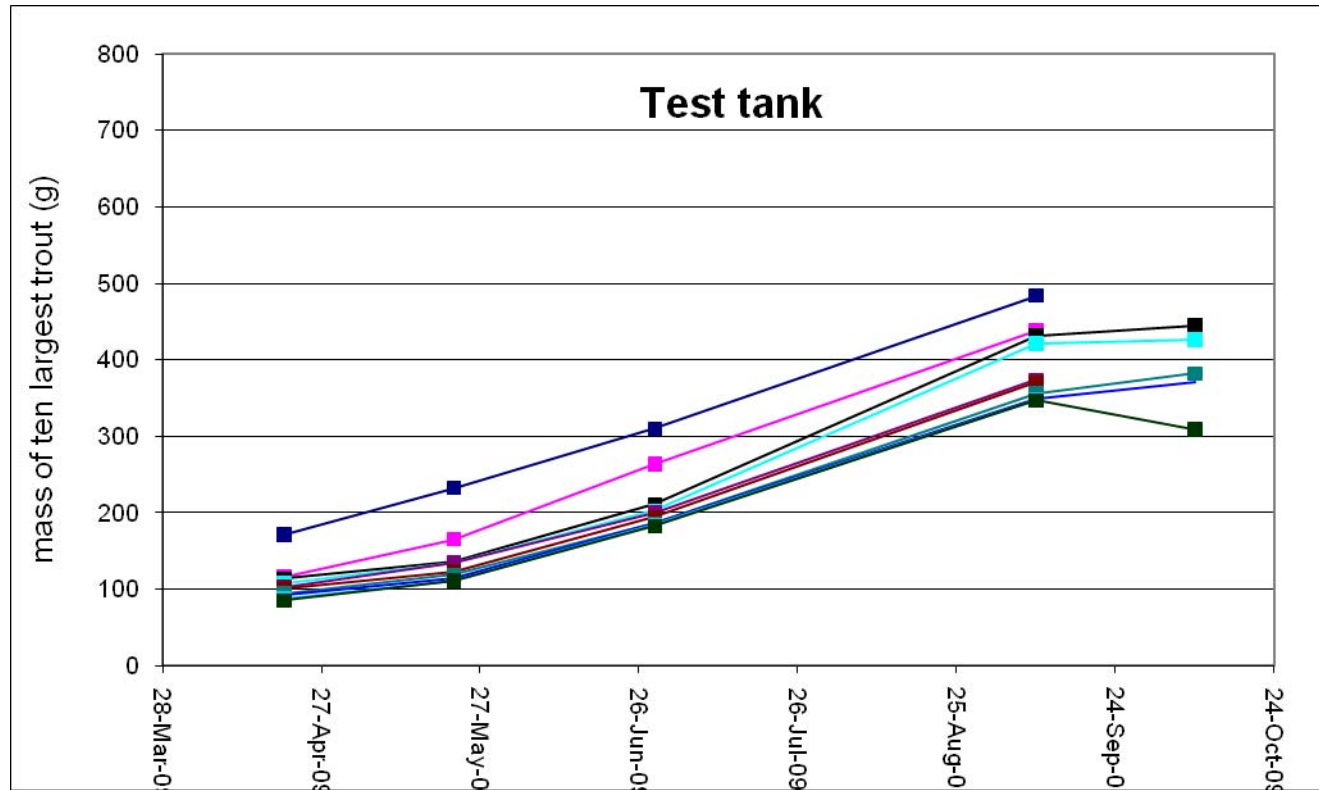
# Rainbow Trout Experiment

- Experiment in tanks (Biological Research Facility)
- OBT formation rate from HTO (7,000 Bq/L)
  - ICRP suggest 3-4%
  - Exercise 2 for EMRAS II
  - OBT measurements are ongoing (March 2010)
- OBT formation rate from OBT-contaminated food
  - Similar to HTO experiment (7 days, 30 days, 70 days, 140 days)
  - OBT-contaminated food

# Rainbow Trout Experiment (1)



# Rainbow Trout Experiment (2)

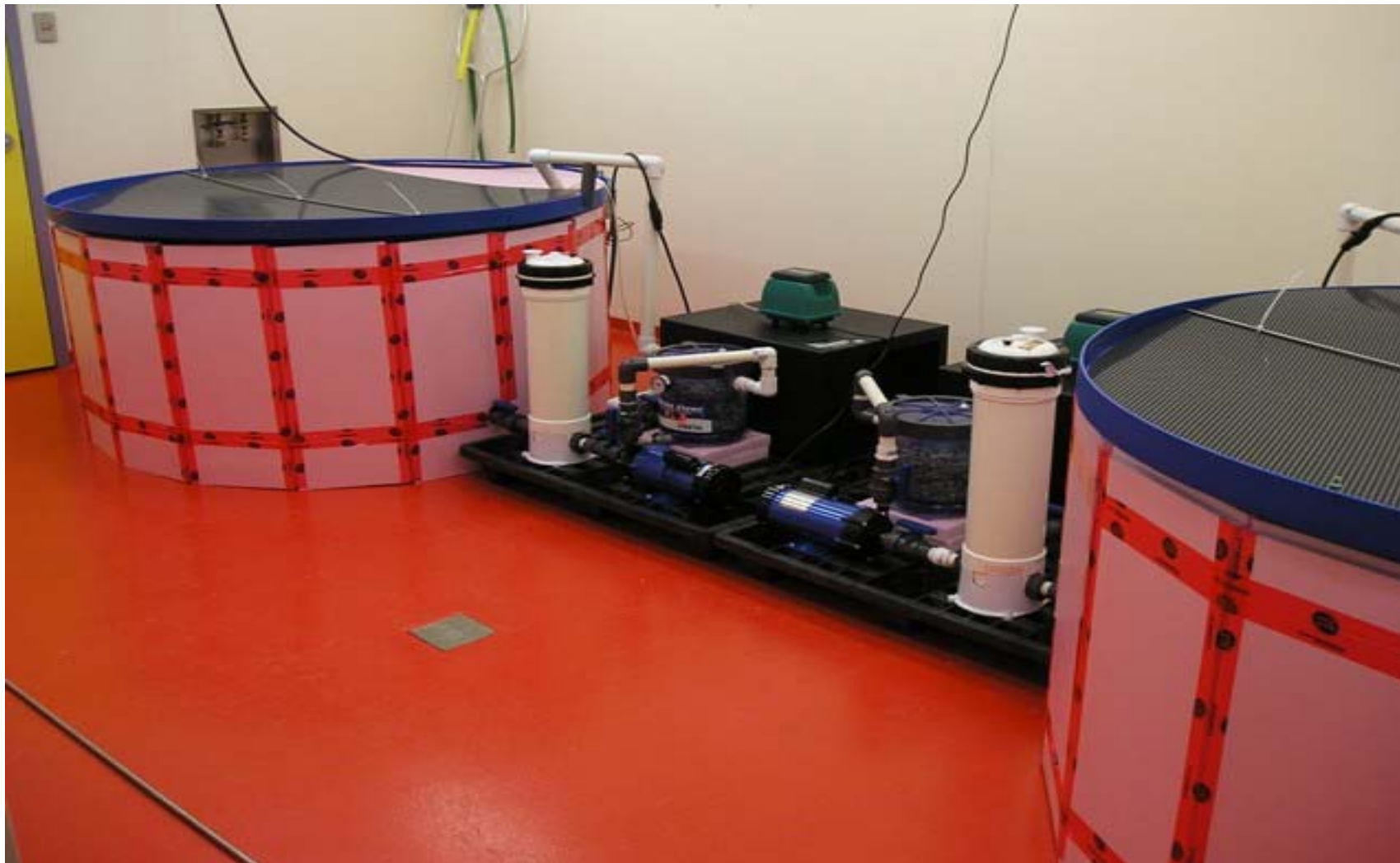


# Rainbow Trout Experiment (3)



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# Rainbow Trout Experiment (4)



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## Rainbow Trout Experiment (5)



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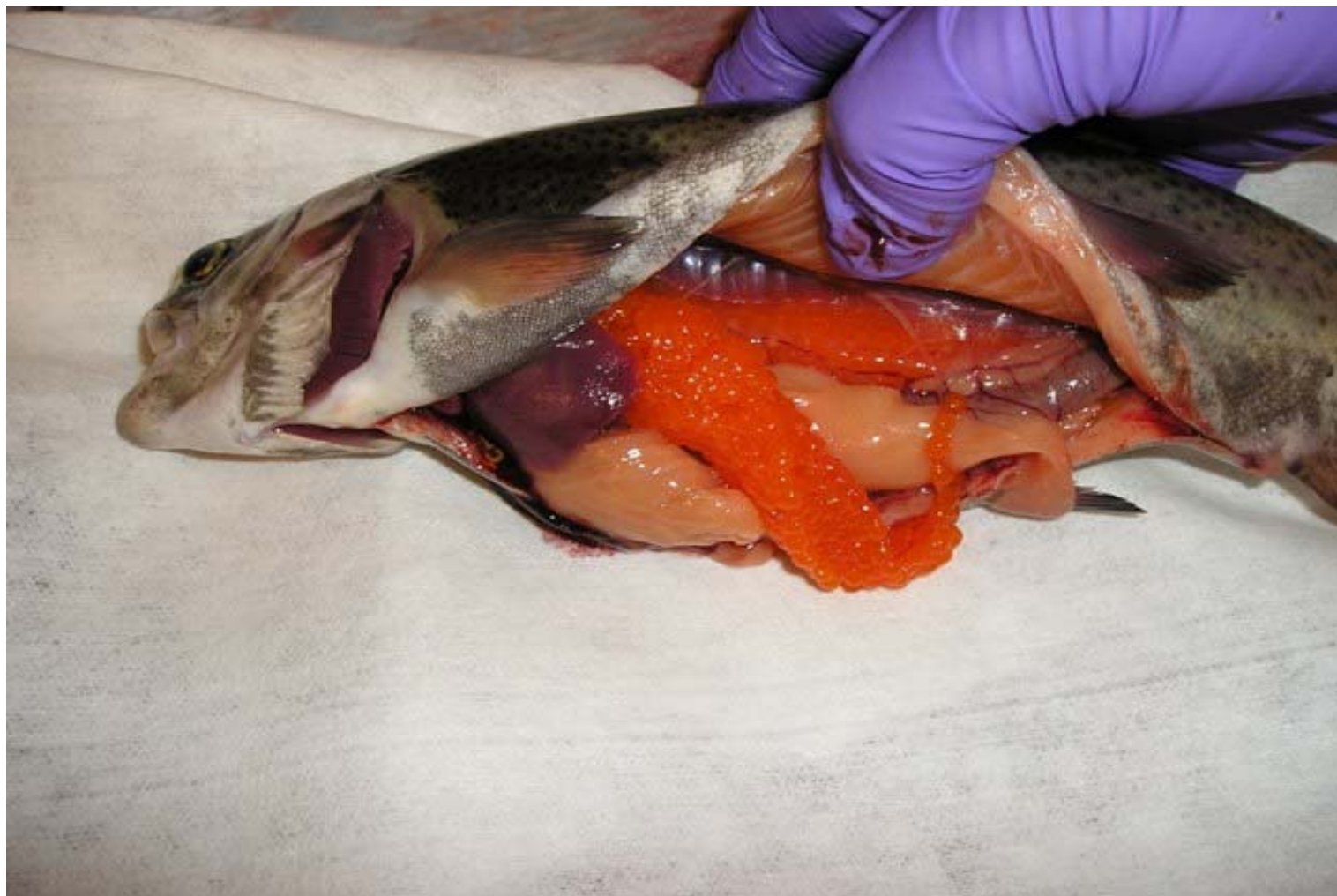


# Rainbow Trout Experiment (6)



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## Rainbow Trout Experiment (7)



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## Rainbow Trout Experiment (8)

- Tissue free water tritium (TFWT) was extracted from the frozen samples using a specially designed freeze-drying vacuum system
- Completely dried sample was grinded and rinsed with tritium depleted water (10 grams with 30 mL)
- Approximately 10g of sample was loaded into a Parr bomb (Model 1121, USA)
- Toluene distillation
- The distilled water made up to 8 mL with tritium depleted water and mixed with 10 mL Ultima Gold XR
- Counting time was 100 minutes



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