



Current MITHE-SN Projects Metadata

A5 Dr. Landis Hare (P.I.) – , INRS-ETE

Metal transfer along aquatic food chains (Aquatic Ecosystems)

Objectives being Investigated

We are studying processes involved in the transfer of Cd, Ni, Se, and Tl and along aquatic food chains to understand how these trace elements reach upper trophic levels, where they can be consumed by top predators (including humans). We are investigating metal speciation in the field to determine the relative importance of various metal species (e.g., Cd, Ni, and Tl) in nature. Such field measurements also allow us to choose realistic trace element concentrations for use in experiments. In the laboratory, we expose several types of organisms (from algae to insects and oligochaete worms) to Cd, Ni, Se, or Tl to determine the forms (protein-bound, granular, etc.) in which these elements are present in their cells. We also determine how storage and detoxification patterns in prey influence the efficiency of contaminant transfer to consumers (invertebrates and fish). In the case of fish, both the relative importance of food and water as contaminant sources and toxicity are being measured. Lastly, field data are being collected on prey taxa to verify the realism of the trace element concentrations that we measure in the laboratory and to assess the extent of variation among congeners in nature. Our data will allow us to model trace element transfer along food chains, especially for the lesser-studied elements Ni and Tl, as well as to estimate the toxic effects that might occur on upper-level consumers such as fish.

Study/Sampling Design

We collected water and sediment from lakes in Ontario and Québec (see section 10). Our measurements of the total trace metal concentrations in these samples have allowed us to set environmentally realistic exposure levels for use in laboratory experiments (see section 12). In the laboratory, we are determining how the distribution of metals within the cells of food organisms determines in part the efficiency with which metals are assimilated by consumers.

In a separate sampling programme, we are measuring total dissolved metal concentrations as well as free metal ion concentrations in lake water samples that are collected by *in situ* diffusion samplers. The various water quality variables needed for the metal speciation calculations are also determined (e.g., pH, alkalinity, conductivity; major ion concentrations; iron and aluminum concentrations). Organic matter quantity and quality are measured as

total dissolved organic carbon (DOC) and optical properties (absorbance and fluorescence), respectively.

Number of projects providing material for study: 0

Location of Field Site(s)

Water and sediment (general survey)

Lakes in the regions of:

1. Rouyn-Noranda, Québec

- Bousquet (48° 13' N, 78° 40' W)
- Dasserat (48° 13' N, 79° 22' W)
- Dufault (48° 17' N, 79° 00' W)
- Opasatica (48° 08' N, 79° 18' W)
- Osisko (48° 14' N, 79° 00' W)

2. North Bay and Deep River, Ontario

- James (46° 06' N, 77° 33' W)
- Nosbonsing (46° 19' N, 79° 21' W)

3. Sudbury, Ontario

- Daisy (46° 27' N, 80° 53' W)
- Hannah (46° 26' N, 81° 02' W)
- Laurentian (46° 27' N, 80° 57' W)
- Ramsey (46° 29' N, 80° 57' W)
- Whitson (46° 16' N, 82° 02' W)

Water (metal speciation modeling)

1. Lakes in the region of Rouyn-Noranda, Québec:

- Adeline (48°12' N, 79°10' W)
- Bousquet (48° 13' N, 78° 40' W)
- Dasserat (48° 13' N, 79° 22' W)
- Dufault (48° 17' N, 79° 00' W)
- Dufay (48°02' N, 79°28' W)
- Joannes (48°11' N, 78°41' W)
- Opasatica (48° 08' N, 79° 18' W)
- Vaudray (48°05' N, 78°41' W)

Human Studies

Outcome or Process Studied

--- none provided ---

Exposure Medium, and Metals/Substances Quantified

--- none provided ---

Biological Endpoint(s) Monitored

--- none provided ---

Biota Studied

Species

algae - *Chlamydomonas reinhardtii*, *Chlorella pyrenoidosa*,
Pseudokirchneriella subcapitata; **invertebrates** - *Chironomus riparius*, *Sialis*
velata, *Tubifex tubifex*; **fish** - *Pimephales promelas*

Metals, etc. Quantified

Cd, Ni, Tl

Biological Endpoint(s)

metal bioaccumulation, metal subcellular distribution, enzyme activities,
mortality

Physical Material(s) Studied

Medium/Media

Water, sediment

Metals, etc. Quantified

Ca, Cd, Cu, Mg, Ni, Se, Tl and Zn; Fe and Al; total dissolved organic carbon

Bibliographic References on-file with Secretariat: No

Data Available: Yes

Data Archived with MITHE-SN: No

Collaborators

Dr. Peter Campbell (Co-Inv.) – , INRS-Eau

Dr. Patrice Couture (Co-Inv.) – , INRS-ETE

Dr. Claude Fortin (Co-Inv.) – , INRS-ETE

Metals in the Human Environment Strategic Network

MITHE-SN Secretariat c/o The Canadian Network of Toxicology Centres Head Office
University of Guelph, Gordon Street, Edmund Bovey Bldg. #80, 2nd Floor, Guelph, Ontario,
N1G 2W1

Tel: 519.824.4120 ext. 52950 | Fax: 519.837.3861 | Email: dwarner@uoguelph.ca

Updated: Jan. 07, 2008 | © [MITHE-SN 2010](#) | www.mithe-sn.org/data_management/project_metadata_details.cfm