



Newfoundland and Labrador, Canada

NRPOP LAB
Northern Region Persistent Organic Pollution Control Laboratory

Memorial University Northern Region Persistent Organic Pollution Control Laboratory

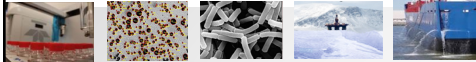
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Professor and Director

become

On the Leading Edge...

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NRPOP Lab



INNOVATION.CA
CONNECTIONS FOR INNOVATION



NSERC
CRSNG

petroleum
RESEARCH
Newfoundland & Labrador



Northern Region Persistent Organic Pollution (NRPOP) Lab

Target Pollutants

- Persistent and toxic waste streams - **spilled/weathered/dispersed oil**, petroleum waste, produced/ballast/bilge water, petrochemical/pharmaceutical/agrochemical wastewater, etc.
- Emerging persistent pollutants (EPPs) - polycyclic aromatic hydrocarbons (PAHs), pesticides, pharmaceutical and cosmetic products, nano-particles, etc.

Environments of Interest

- Marine and coastal areas (incl. deep waters)
- Harsh environmental conditions (cold temp, cold water, rough sea, ice, etc.)
- Cold regions especially arctic and sub-arctic areas, etc.

State-of-the-art Facilities

- Oil, environmental and nano-/bio-tech analysis (GC/MS, GC, IC, HPLC, AAS, TOC, Microtox, etc.)
- Physical & numerical modeling (multi-scale reactors, plume tank, OSCAR, GNOME/ADIOS, etc.)
- Shared/accessible facilities at MUN, C-CORE, and NRC OCRE (CREAIT Network, wave/towing/ice tanks, cold chambers, visualization, AUV/gliders, etc.)

➔ **First of its kind** in Canada with national and international recognitions

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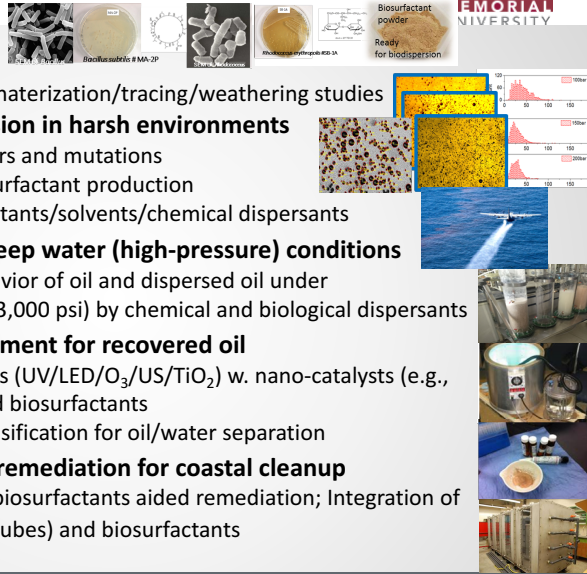


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Oil Spill Research – Experimentation

- **Oil weathering and tracing**
 - Biomarkers and isotope for characterization/tracing/weathering studies
- **Biosurfactant-aided dispersion in harsh environments**
 - 100 + bio-surfactant producers and mutations
 - Low-cost and high-yield biosurfactant production
 - Green dispersants - biosurfactants/solvents/chemical dispersants
- **Oil spill and dispersion in deep water (high-pressure) conditions**
 - Examination of fate and behavior of oil and dispersed oil under high pressure (1,500 psi and 3,000 psi) by chemical and biological dispersants
- **In-situ separation and treatment for recovered oil**
 - Enhanced oxidation processes (UV/LED/O₃/US/TiO₂) w. nano-catalysts (e.g., TiO₂/AC-TiO₂/Fe-AC-TiO₂) and biosurfactants
 - Biosurfactants aided de-emulsification for oil/water separation
- **Nano-surfactant hybrid bioremediation for coastal cleanup**
 - Nanoremediation and nano-biosurfactants aided remediation; Integration of absorbents (AC-FA and nanotubes) and biosurfactants



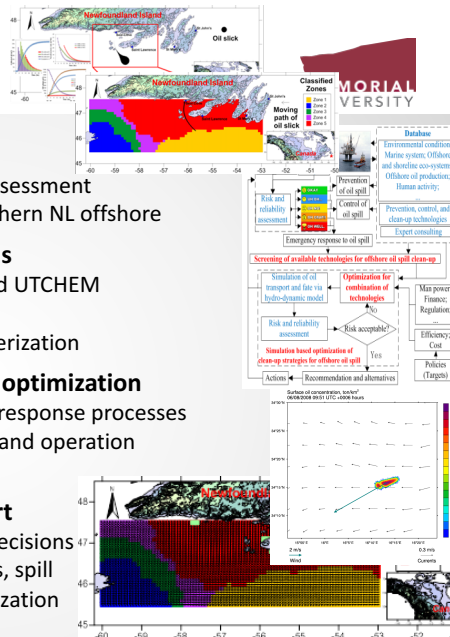
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Oil Spill Research – Modeling

- **Vulnerability/risk analysis**
 - Uncertainty analysis and simulation based assessment
 - Vulnerability/risk index classification → southern NL offshore
- **Oil spill modeling and uncertainty analysis**
 - GNOME, OSCAR and MEDSLIK II; BioSlurp and UTCHEM → marine and inland oil spills
 - DOE aided uncertainty analysis and parameterization
- **Response process simulation and system optimization**
 - Simulation and optimal control of individual response processes
 - Integrated simulation-based process control and operation planning (IS-PCOP) system for spill responses
- **Marine oil spill response decision support**
 - Time + resources + cost + impact → sound decisions
 - DSS - Integration of risk/vulnerability analysis, spill modeling, process control and system optimization
 - Agent based and human factor integration



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