

## Quarterly Report April 12, 2016

### MUS Research Initiative Project 51060-MUSRI2015-01: Remediation Technology for Chlorinated Pollutants Based on Natural Product from Soil Bacteria

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This project's objectives address the programmatic goal of growing important research sectors that increase the diversity of Montana's economy and lies within the 'Materials' category. Progress toward specific goals to date are given below.

**Objective 1:** Have verified, chemically pure PDTC sulfonate, polymer-linked PDTC, and their copper complexes: December 10, 2017

- **Hiring:** A search was conducted and a laboratory research technician was hired at MSUB in February 2016. A contract has been signed to support a graduate student and supplies at MSU for synthetic chemistry work.
- **Equipment:** no major equipment is needed for this objective
- **Progress Towards Objective:** The synthetic route for molecules specified under this objective has been successfully employed to produce the original ligand (PDTC)

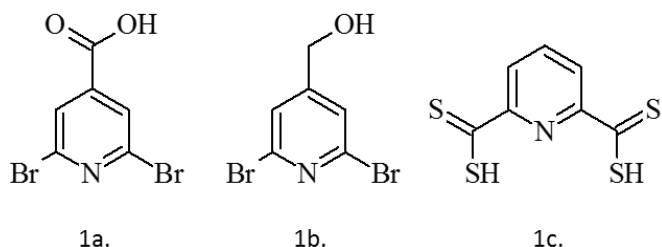


Figure 1 a and b PDTC Precursor ligands, 1c. bis-dithiocarboxylic acid derivative

as well as the two precursors to substituted PDTC derivatives, Figure 1a and b. Work on direct thiocarboxylation of these precursors using carbonyl sulfide has begun. This work shows proof of principle that the synthetic strategy can be employed for the desired derivatives. Experiments

are also being conducted using phenyl lithium and carbon disulfide to synthesize the bis-dithiocarboxylic acid derivative, Figure 1c. This dithiocarboxylic acid in theory would increase stoichiometric turnover of the PDTC ligand during the dechlorination reaction.

**Objective 2:** Have data regarding solubility and dechlorination rates for new derivatives of PDTC: April 1, 2017

- **Hiring:** This work will be performed by the new technician. Training and method development on the new headspace autosampler/GC/MS has begun.
- **Equipment:** An Agilent 7697A headspace autosampler with associated controlling software has been installed and tested successfully.
- **Progress Towards Objective:** A method for quantitation of  $\text{CCl}_4$ ,  $\text{CHCl}_3$ , and  $\text{CS}_2$  is under development.

**Objective 3:** Have initial toxicology assessment of simulated remediation mixtures, refined dechlorination data to include other solvents, effects of aquifer solids: July 1, 2017

- **Hiring:** The laboratory research technician will also contribute toward this objective.
- **Equipment:** no major equipment is needed under this objective
- **Progress Towards Objective:** work on this objective will await deliverables of Objective 1.

**Expenditures to Date**

<b>Category</b>	<b>Budget Total</b>	<b>As of 04/08/2016</b>
<b>Salaries</b>	148,405	6705.97
<b>Equipment</b>	35,000	36007.61
<b>Supplies (MSUB)</b>	5000	2869.95
<b>Subcontracts (MSU)</b>	71,940	4445.18
<b>Travel, Misc.</b>	1600	593.59