From:	Axelrad, Don
To:	gilmourc@si.edu
Subject:	adding polysulfides to lakes and coastal waters
Date:	Tuesday, March 24, 2009 3:56:52 PM
Attachments:	Polysulfides and mercury.pdf

Cindy,

See the two Emails below, and the attached Jay et al., 2002 paper that "Mike" provided me.

Mike's idea is to add polysulfides in liquid form to lakes and coastal waters to reduce mercury methylation rate and MeHg in fish.
(He obtained this idea from the attached paper)

He wishes to apply for a NOAA grant (http://www.nmfs.noaa.gov/habitat/restoration/ **) to fund this and wants Florida to nominate several sites that he could remediate (of MeHg).**

As discussed, please comment as to feasibility.

Don Axelrad
850-245-8072
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From: mike@arrowscience.net [mailto:mike@arrowscience.net]
Sent: Wednesday, March 11, 2009 5:39 PM
To: Sole, Michael
Subject: Mercury Remediation

We are applying for a grant from the National Marine Fisheries Service (NFMS). We have developed an in situ process for safely remediating halogenated organic compounds (XOCs) and methylmercury from aquatic environments such as coastal shores, lakes, rivers, and streams. Would you be interested in our providing this service in your state as part of this grant? We would employ people from your state and most of the grant funds would be spent there. There would be no charge to you but we would ask that you provide an independent evaluation to NFMS.

Best regards,

Mike

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From: mike@arrowscience.net [mailto:mike@arrowscience.net]
Sent: Saturday, March 21, 2009 2:48 PM
To: Axelrad, Don
Subject: RE: remediating halogenated organic compounds (XOCs) and methylmercury from aquatic environments

Don,

Thank you for your phone call. I have attached the research paper I mentioned. The research paper explains what happens but doesn't explain why. The "why" explanation is the key to mercury remediation. Inorganic mercury is hydrophilic. Organic mercury and methylmercury are lipophilic, and methylmercury is hydrophobic. You should keep in mind, some compounds have more polarity than others, and the presence of other compounds in the environment can affect reactions.

Hydrophilic species of mercury are changed into hydrophobic methylmercury by microorganisms, particularly sulfate-reducing bacteria. Attempts at preventing or remediating methylmercury by adding hydrophilic sulfur to their environment have not worked. **Adding polysulfide does work because polysulfide is amphiphilic. In the presence of polysulfide, sulfate-reducing bacteria either produce less methylmercury or the methylmercury produced by them is changed back into mercury sulfide.**

Unfortunately, the solution to the methylmercury problem is not as simple as going to the middle of the lake and dumping in a bag of polysulfide. The concentration would be harmful to fish and other organisms. The polysulfide must be added as a highly-diluted, aqueous solution. Although polysulfide is amphiphilic, the presence of water can hinder reactions with mercury, particularly where other lipophiles are present. Adding a phase-transfer catalyst to an aqueous, decontaminating formulation is often essential where highly-diluted reactants are used and prompt reactions are desired.

I apologize for our late communication with you. The grant we are applying for was posted on March 6th, but must be turned in by April 6th. The grant is part of the economic-recovery effort intended to quickly add jobs and funds to the economy. Expenses to the State can be funded by the grant. Florida would be a perfect environment for this grant because we could work year-round. Please let me know if you require additional information. If we will be working in Florida, I will need to know before we turn in our grant proposal on April 6th.

Mike

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