

2007 TAIWAN INTERNATIONAL SCIENCE FAIR

CATEGORY : Environmental Science

PROJECT : A Sphagnum Solution For Safe Water

AWARDS : Environmental Science First Award

SCHOOL : Stelly's Secondary School

FINALISTS : Arielle Garrett

COUNTRY : Canada

ABSTRACT OF EXHIBIT

TAIWAN INTERNATIONAL SCIENCE FAIR

CATEGORY: Environmental Science

TITLE: A Sphagnum Solution For Safe Water

NAME: Arielle Garrett

COUNTRY: Canada

a) Purpose of the Research:

To find out if *Sphagnum* moss could be used as a cheap, reusable filter for poor families with water contaminated by heavy metals.

b) Procedures:

I used a Scanning Electron Microscope and Energy Dispersion X-Ray spectrometer to examine where *Sphagnum* stores metals it absorbs with cation exchange.

Is it possible to remove metals from *Sphagnum cristatum* after absorption? I tested this by placing *Sphagnum* in an acid solution after allowing it to absorb copper.

To find out if *Sphagnum* could remove trace amounts of dissolved arsenic I prepared moss-filtered and control solutions for analysis in an Inductively Coupled Plasma-Mass Spectrometer.

Finally, I applied it as a filter for contaminated water, using metal-rich water from my family's well.

c) Data

I found that copper bound itself all over the surfaces of moss cells. *Sphagnum* samples absorbed up to 95% of the copper from a 20mg/l copper solution. Soaking the moss in a low pH vinegar solution removed 52% of the copper bound to the moss. *Sphagnum* that was

soaked in the copper solution, then low pH solution and then dried absorbed up to 76% of the Cu in solution on every cycle, repeatedly.

Sphagnum only absorbed about 12% of the arsenic from an 0.6mg/l arsenic solution.

Sphagnum performs very well with other metals in well water. *Sphagnum* lowered 3 below drinking water standards, and significantly decreased others.

d) Conclusions

Sphagnum wasn't very effective at removing arsenic, but it did remove other metals at low concentrations, which leads me to the solid hypothesis that it would be very effective at removing Lead, Mercury and Cadmium, all deadly. *Sphagnum* appears to have an elemental preference series.

Sphagnum could be reused as a filter if it was soaked in a simple acid then dried between uses, and would remain effective.

Also, *Sphagnum* reusability means people wouldn't need to continually harvest it and harm the environment to obtain filters.

Sphagnum is very cheap and transportable. I showed that *Sphagnum* is reusable, making it even more cost effective; a single filter could last for years. For many places in the world, where people can't afford the water filters they need, *Sphagnum* could save lives.

評語

本研究無論從實用性以及實驗之深度與創意均屬上乘。