EXTRACTIONS

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SULPHATES DETERMINE ARSENIC LEVELS

Water containing high concentrations of arsenic threatens the health of tens of millions of people, mainly in Bangladesh and the Indian state of West Bengal. The problem exists because certain bacteria gain energy by changing the chemistry of minerals containing both iron and arsenic, and releasing the arsenic into the water as a by-product of the reaction. Without such bacterial activity, the arsenic would remain in an insoluble form, and thus be unable to contaminate the water.

Researchers at the University of Illinois, led by Craig Bethke, say that adding sulphates to contaminated water could encourage different types of microbe to dominate — and halt the release of arsenic. Sulphate salts, such as gypsum, readily dissolve in water and are widely available and cheap.

The researchers analysed 21 wells in central Illinois where arsenic levels were thought to have been uniform because of glacial activity. They were surprised to find that levels of arsenic in wells near each other varied so much that one might have dangerous amounts, while its neighbour's were undetectable. The researchers also found that when arsenic levels were low, levels of sulphate were high, and vice versa. This could make identifying contaminated wells quicker as testing for sulphate is quite straightforward.

"Most groundwaters in Bangladesh are poor in sulphate, but the ones with even modest amounts generally contain little arsenic," says Bethke. "We suspect that the arsenic problem is as widespread as it is there because of the paucity of sulphate."

In February, the US National Academy of Engineering established the Grainger Challenge Prize for Sustainability, a million-dollar challenge to scientists to develop a cheap and sustainable method of removing arsenic from contaminated water. This sulphate treatment process is a strong contender.

[from www.scidev.net/News/index.cfm?fuseaction=readNews&itemid=1702&language=1, nation.ittefaq.com/artman/publish/article_16163.shtml]

PULP AND PAPER AIR QUALITY FORUM

The Forest Products Association of Canada (FPAC) in partnership with Environment Canada launched the inaugural Pulp and Paper Air Quality Forum at PaperWeek International 2005 in Montreal.

This collaborative approach to managing air quality is the first of its kind in any industry. The forum, led by FPAC and with membership drawn from the industry, provincial and federal governments, environmental and aboriginal communities, will consider the air quality and emission issues confronting the industry in the long term, the policy objectives and requirements of federal and provincial governments, the economic and technical plans for the industry and the concerns of communities as expressed by environmental and aboriginal groups.

The forum will be supported by a technical advisory group that will respond to questions, identify shared interests and opportunities, and support the forum in its development of a 10-year cooperative plan.

"Pulp and paper mills have reduced particulate emissions by half, sulphur dioxide by 20 per cent and total sulfur gases by 45 per cent," said Avrim Lazar, president and CEO of FPAC. "An increased use of biomass green energy has significantly reduced the industry's reliance on fossil fuels to power their mills and helped the forest products industry as a whole achieve a 28 per cent reduction in greenhouse gas emissions from 1990 to 2002, surpassing its Kyoto targets by more than three times. These are terrific achievements by any standard, but we know that we need to do more. Our forum members are informed, influential, and committed, and can impact the air quality agenda in a progressive and positive way."

[from money.canoe.ca/News/Sectors/ForestryPulpPaper/Tembec/2005/02/07/923321-cp.html, www.ec.gc.ca/nopp/DOCS/rpt/smartReg/EN/c6.cfm]

DNA TO DETECT LEAD

Lead is a common environmental contaminant that can cause a number of health problems, particularly in children. Current techniques for lead detection require sophisticated equipment or complicated sample treatment. Now, researchers at the University of Illinois have developed a simple and inexpensive method that permits real-time, on-site detection of lead ions.

"A unique feature of our lead sensors is that they consist of small pieces of DNA," said Yi Lu, a UI professor of chemistry.

"This represents a new class of simple and environmentally safe sensors and is the first example of a catalytic DNA-based biosensor for metal ions," Lu said. "It combines the high metal ion selectivity of catalytic DNA with the high sensitivity of fluorescence detection."

Because DNA is stable, cost-effective and easily adaptable to optical fiber and chip technology, the catalytic DNA system is an ideal candidate for real-time, remote sensing of lead in applications such as environmental monitoring, clinical toxicology and industrial process monitoring.

"The principles demonstrated in this work can also be used to obtain DNA biosensors for other metal ions that are toxic (such as mercury and cadmium) or beneficial (such as calcium and potassium) to humans," Lu said.

[from http://www.sciencedaily.com/releases/2000/11/001106060504.htm]

TRANSGENIC MUSTARD ABSORBS SELENIUM

In the first field trial of plants genetically tweaked to absorb more contaminants, researchers from the University of California, Berkeley, and the Agricultural Research Service (ARS) of the U.S. Department of Agriculture found the transgenic plants absorbed two to four times more selenium from contaminated soil than the genetically unaltered, wild-type plants.

They chose Indian mustard because it can grow quickly, is tolerant to many toxic conditions, and is very efficient at absorbing selenate, the bioavailable form of selenium in the soil. The plant absorbs selenate because it is chemically similar to sulfate, an essential nutrient for the plant.

In California, as much as 100,000 cubic meters of sediment contaminated with selenium, salt and boron remain in the San Luis Drain, a wastewater canal from Central Valley farms to the Sacramento River Delta near Antioch. Selenium is considered an essential trace mineral for both humans and animals, but it becomes toxic at high doses.

The researchers say cleaning up the sediment in the San Luis Drain could cost millions of dollars using conventional methods, including soil washing, excavation and reburial. In contrast, they say that using plants to remove contaminants provides one of the most cost-effective methods of cleaning polluted soil available.

And what happens to the plants after they've soaked up their share of selenium? The researchers say that the plants can be harvested, dried and carefully added to animal feed or used as a soil amendment in areas where selenium is in short supply.

[from www.berkeley.edu/news/media/releases/2005/02/01_plantremediation.shtml]

DEVICE CHECKS FOR GROUNDWATER POLLUTION

When groundwater is polluted, it takes time and money to measure the plume or the extent of the pollution. Many different sites must be drilled or dug up and then tested. University of Rhode Island geophysicist Reinhard Frohlich has developed a simpler, less expensive process to determine the extent of groundwater pollution.

He puts two spikes into the ground and runs an electric current between the spikes. The voltage between the spikes is measured to determine the resistivity of the soil. This determines whether the area is polluted. "Resistivity increases significantly in areas where the aquifer is polluted compared to clean areas," Frohlich said. The system works on organic compounds whether or not they conduct electricity.

This system can only determine if an area is polluted, and not the amount of pollution. "It's one thing to identify a clean or contaminated site, but we want to also get a quantitative value for the contaminants," said Frohlich.

[from www.sepuplhs.org/students/modules/groundwater/news.html]

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