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New, Low-Cost Groundwater Cleanup Technology May Ease Perchlorate Contamination Crisis

SAN CLEMENTE, CA, March 24, 2003 — As concern rises over contamination of groundwater with perchlorate, a toxic substance widely used in arms manufacture, investigators are finding that one of the best remedies is literally under their feet. According to scientists at Penn State University and RegenesiS (San Clemente, CA), many cases of perchlorate contamination can be eliminated simply and very cost-effectively by enhanced bioremediation, using a patented formulation called Hydrogen Release Compound[®], or HRC[®], to speed the action of perchlorate-destroying microbes that occur naturally in soil and groundwater.

A powerful oxidizer, perchlorate has been widely used since the 1950s to make munitions, solid-rocket propellants, airbags, and batteries. It has emerged recently as a health concern because it interferes with the body's production of thyroid hormones, especially in young children and pregnant women. Potential health impacts include thyroid tumors, Graves' disease (hyperthyroidism), autism, and growth or developmental disorders. With the introduction of improved detection methods in the late 1990s, the compound could be detected in extremely low, but still potentially harmful concentrations. To date, the federal Environmental Protection Agency (EPA) has identified more than 75 perchlorate releases in 22 states, most in the South Central and Western U.S. but also as far east as Maryland and Cape Cod. The issue is most acute in parts of the West and Southwest, where perchlorate may affect the drinking water of more than 15 million people in California, Arizona, and Nevada alone. The cost of perchlorate removal has been estimated in the billions of dollars, but RegenesiS's scientists believe that figure may be sharply reduced—by as much as one-third to one-half—with readily available bioremediation technologies.

“Bioremediation is now well-established as a reliable and highly cost-effective *in-situ* remediation technique for many contaminants,” says Stephen Koenigsberg, Ph.D., RegenesiS's Vice President for Research and Development. “Perchlorate in soil and groundwater can be resistant to conventional treatment methods, but it appears to be an excellent candidate for accelerated bioremediation with lactate generated from RegenesiS's Hydrogen Release Compound, which has been shown to reduce high initial perchlorate concentrations to below detectible levels in laboratory tests and in field trials.”

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Hydrogen Release Compound is an all-natural, environmentally safe, food-grade compound designed to release lactate slowly into groundwater and soil. The lactate serves as food for indigenous microorganisms, enabling them to degrade a variety of toxic wastes. HRC's specific ability to reduce perchlorate was demonstrated by Dr. Bruce E. Logan, Kappe Professor of Environmental Engineering at Penn State University, in tests reported in the December 2001 issue of the American Chemical Society journal *Environmental Science & Technology*. His study concluded that lactate from a polylactate compound (HRC) could support complete removal of perchlorate within several days under optimal laboratory conditions. Under field conditions, a perchlorate-contaminated site in Hollister, California showed an 88% reduction in perchlorate concentrations over a 79-day period.

Since its commercial introduction in 1998, HRC has been widely recognized as a groundbreaking technology that causes rapid, complete *in-situ* elimination of anaerobically degradable contaminants, including chlorinated solvents, pesticides, explosives, and dyes as well as perchlorate. A viscous, honey-like fluid, HRC is injected into soil and groundwater with a simple direct-push apparatus. Contact with anaerobic microbes initiates a sequence of chemical processes that cause a slow, steady release of hydrogen. Microbes that flourish in the hydrogen-enriched environment convert the perchlorate or other contaminants into harmless end-products such as ethene or ethane via a process known as reductive dechlorination. In-situ treatment of groundwater contaminants is generally preferred to off-site treatment because there is no need to dig up or transport the soil. In-situ clean-up procedures also tend to be very economical, and they reduce the public's exposure to hazardous chemicals.

Perchlorate contamination of drinking water supplies is particularly troublesome because the compound's chemical stability and high solubility enable it to form underground plumes that can contaminate drinking water supplies many miles distant from a source. Neither the federal Environmental Protection Agency nor any state agency have prescribed a "safe" level for perchlorate in drinking water, but the federal EPA has recommended a maximum of 1 ppb (part per billion) and the California EPA is proposing a limit of 2 to 6 ppb. In the Penn State tests, perchlorate concentration in contaminated soil and groundwater samples fell from as high as 2,600 ppb to below currently detectible levels (< 4 ppb) a few days after application of HRC.

For further information, readers are invited to call Regenesis at 949-366-8000 or visit the Regenesis website at www.regenesis.com. Information on the perchlorate research at Penn State University is available at www.engr.psu.edu/ce/enve/chlorate.htm.

About Regenesis

Incorporated in 1994, Regenesis is the world's leading developer and distributor of products used to restore contaminated groundwater, principally **Oxygen Release Compound (ORC[®])** for remediation of aerobically degradable hydrocarbons; **Hydrogen Release Compound (HRC[®])**, a slow-release electron donor for treatment of anaerobically degradable compounds such as chlorinated solvents; and **Hydrogen Release Compound, Extended Release Formula (HRC-XTM)** for long-term treatment of residual source areas and DNAPLs. These products are sold to hundreds of independent environmental engineering and consulting firms, which provide an independent verification of the products' effectiveness on their clients' sites. To date, Regenesis' products have been used to restore groundwater quality at over 8,500 sites in many countries around the world, including sites owned by oil companies, real estate firms, pipeline companies, refineries, utilities, and transportation companies, among others.

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