RECYCLING

Turning Wallboard Out to Pasture

Building a 2,000-square-foot house leaves about a ton of gypsum wallboard waste from end cuts, window and door cutouts, and broken boards. In the United States, three million tons of gypsum wallboard waste is dumped in landfills each year. In addition to depleting space, microbial action can decompose gypsum to malodorous hydrogen sulfide gas, which at high enough exposures can cause irritation of the mucous linings, headache, dizziness, nausea, convulsions, coma, and death.

A study at the University of Wisconsin at Madison by soil scientist Richard Wolkowski, published in the January–February 2000 issue of *Communications in Soil Science and Plant Analysis*, found that clean scrap gypsum wallboard can be crushed and applied to alfalfa as fertilizer. Alfalfa covers over three million acres in Wisconsin and is fed to dairy cows and other livestock. This crop requires large amounts of sulfur as a nutrient. Although commercial gypsum fertilizer has existed for a long time, says Wolkowski, crushed gypsum wallboard waste provides a way to reduce construction waste while nourishing the soil.

For three growing seasons, crushed wallboard was spread on alfalfa fields at four University of Wisconsin agricultural research stations with different soil types and climates at rates ranging from 1 ton per acre to 16 tons per acre. Alfalfa yields were similar to those from fields treated with commercial gypsum fertilizer. "[Crushed wallboard] had neither a strong positive nor negative agronomic effects on alfalfa production," Wolkowski says. He concludes that there is thus a reasonable alternative to tossing the waste into landfills.

Larger amounts of crushed wallboard were no better for the alfalfa than smaller amounts. Wolkowski explains that the largest amounts of crushed wallboard raised concentrations of soil calcium and sulfur but lowered soil magnesium; the excess calcium from the wallboard displaces magnesium from the soil, allowing it to leach away. Alfalfa grown on magnesium-deficient soil could therefore become magnesium-depleted and potentially cause tetany if fed to cows (the muscular spasms and twitching of tetany result from insufficient minerals such as magnesium). Sandy soils are especially susceptible to magnesium deficiency because they have little natural magnesium and a low soil organic matter content. The magnesium content of alfalfa grown with crushed wallboard should be checked, says Wolkowski.

Richard Wolkowski, University of Wisconsin at Madison

Building better crops. Scientists spread crushed gypsum wallboard on alfalfa fields as a fertilizer.

Finding a source of waste wallboard poses the greatest obstacle. Wolkowski teamed up with a local wallboard distributor who collected scraps from building sites. The material was hauled to a processing site, ground in a hammer mill, and sieved through a 12-millimeter screen. "It came out looking like lumpy flour," says Wolkowski.

Furthermore, state laws may stifle its application. In Wisconsin, for instance, wallboard is classified as a solid waste, and spreading it on agricultural lands requires a permit. Promoting the recycling of wallboard will probably require local effort. The ideal situation, says Wolkowski, would be for a "local fertilizer dealer who's open-minded about waste management to team up with a wallboard dealer." If anyone steps forward and takes up the challenge, Wolkowski's studies prove it can be done. **–Carol Potera**

ENVIRONMENTAL MEDICINE

New Drugs Engineered to Fight Asthma

Environmental allergens such as those associated with dust mites and cockroaches can trigger asthma attacks in predisposed individuals when they overwhelm the immunoglobulin E (IgE) cascade, a system believed to protect the body against parasitic invasion. About 5,000 people die each year from asthma attacks, and doctors believe that all those deaths could be prevented. At the American Academy of Allergy, Asthma and Immunology annual meeting, held 3–8 March 2000 in San Diego, California, doctors detailed how investigational bioengineered drugs target and soak up IgE and interleukin-4 (IL-4), key modulators of the IgE cascade. The drugs may eventually replace corticosteroids, currently the drug of choice, as preventive medication.

Henry Milgrom, a senior staff physician at National Jewish Medical and Research Center in Denver, Colorado, described progress in clinical trials with anti-IgE, a compound developed jointly by the drug companies Genentech, Novartis Pharma AG, and Tanox. "This is a breakthrough—anti-IgE was designed to perform a specific function in suppressing a disease process and it works," Milgrom said.

Among the 268 adult patients suffering from moderate to severe asthma who received injections of anti-IgE in the first phase of a 28-week study, only 14.6% had asthma attacks, compared with 23.3% of the 257 patients on placebo. There were also reduced exacerbations of asthma during the second phase of the study when steroid medication was withdrawn.

In a second study involving 334 asthmatic children, 55% of the children receiving anti-IgE were able to discontinue all steroid medication without suffering asthma attacks, compared to about 39% of patients receiving placebo injections.

"This is an exciting approach to treatment of asthma," said Michael Wein, chief of allergy at Indian River Memorial Hospital in Vero Beach, Florida. "If you found something to remove IgE from the body, you wouldn't have allergies." Milgrom said anti-IgE also has potential for people who have food or latex allergies, atopic dermatitis, and other conditions. He said a new drug application for anti-IgE will be filed with the Food and Drug Administration this summer.

Larry Borish, an associate professor of medicine at the University of Virginia Medical Center in Charlottesville, reported that another new drug, IL-4R (for IL-4 receptor), is effective for 5–7 days with just one inhaled dose. IL-4 is responsible for the respiratory inflammation associated with asthma. Borish said the drug soaks up circulating IL-4 like a sponge.

Borish reported administering either placebo or three different dosages of IL-4R to 15–16 patients per group in 12 weekly inhalations. The patients were all suffering from moderate to severe asthma and had been taking inhaled corticosteroid medication, which was stopped on the first day of the study. The group taking the placebo showed a significant decline in lung function, whereas this decrease in function did not occur in the treatment group, Borish said, demonstrating the efficacy of the experimental drug. Borish said a larger study of IL-4R will be reported this summer.

In almost all chronic diseases, long-term patient noncompliance is probably the major reason why treatment eventually fails. So, says Charles Feldman, an associate professor of pediatrics at Columbia University in New York, the great promise of IL-4R is that if further studies prove its effectiveness, its ease of use should improve patient compliance—a key to keeping asthma in check. **–Ed Susman**