

## Fertilizer: Hiding a toxic pollutant?

Perchlorate is hardly a household name. Yet its notoriety is climbing as the presence of this toxic, thyroid-hormone-disrupting salt leads to the closure of drinking-water wells in the western United States.

Until now, waterborne perchlorate ( $\text{ClO}_4^-$ ) has been linked almost exclusively to aerospace activities, since the compound is a major ingredient in rocket fuels. An Environmental Protection Agency study now reports evidence of a far more prosaic and potentially widespread source: garden-variety fertilizers.

Other researchers within EPA and in the fertilizer industry, however, are challenging the new data. More embarrassing, the authors of the new study—scientists at EPA's National Exposure Research Laboratory in Athens, Ga.—told SCIENCE NEWS that they will have to retract some of their positive findings.

Says Steve C. McCutcheon, who heads the Athens EPA team, "We definitely made a few mistakes" in the first analysis. However, he argues, "we do have irrefutable evidence" of perchlorate in all fertilizers tested.

Chilean nitrate—historically a common ingredient in some fertilizers—has been a known natural source of perchlorate for more than a century. The chemical has even turned up in at least one deposit of potash, a common fertilizer ingredient. Finally, the aerospace industry, which is responsible for cleaning up some of the worst perchlorate water problems so far detected, has recently reported data from two studies finding perchlorate in fertilizer, McCutcheon notes.

Against this backdrop, the Athens scientists stepped in to analyze nine fertilizers, most of them intended for lawns and gardens, using three independent techniques. They also assayed eight fertilizer ingredients using one or two of the techniques. In the just-published Oct. 1 ENVIRONMENTAL SCIENCE & TECHNOLOGY (ES&T), the researchers report finding perchlorate in every sample tested.

This universal contamination should have been the first clue that something might be wrong, argues chemist Edward T. Urbansky of EPA's lab in Cincinnati. He notes that some of the ingredients tested, such as urea, have no mineral sources—and therefore should contain no perchlorate.

Having reviewed its disputed results, the Athens team will soon ask ES&T to "correct" the data for five of the eight fertilizer ingredients, acknowledging that it can no longer detect perchlorate in them. However, McCutcheon emphasizes, these retractions will not affect the results for the fertilizers, which were more fully analyzed.

At EPA's National Center for Environmental Assessment in Research Triangle

Park, N.C., "We have real concerns [about the Athens data] that are quantitative and qualitative," notes Annie M. Jarabek. The techniques used to measure perchlorate are still evolving and not yet unambiguous, says Jarabek, who is heading EPA's toxicological risk assessment on the compound. Moreover, she wonders why the Athens team assayed fertilizers that are used by homeowners instead of the brands that farmers use.

Since learning of the Athens data earlier this year, Urbansky has analyzed some 45 fertilizers with what he says is a far more sensitive technique than has previously been used to perchlorate. So

## Kuiper belt may hold fragments of Pluto

Comets and icy debris crowded into a swathe of the outer solar system known as the Kuiper belt once collided much more frequently than they do today. One of the most violent of these collisions gouged an icy moon from Pluto, the largest member of the belt, planetary scientists believe. A new study suggests that some Kuiper-belt residents are shards of that long-ago smashup.

If the hypothesis proves correct, pieces of Pluto and its moon Charon not only roam the belt, but some may have fallen to Earth. Comets and other material leave the belt and visit the inner solar system, and some of these émigrés could be chunks of the solar system's most distant planet and its moon.

Analyzing the orbits of Kuiper belt objects, S. Alan Stern and his colleagues at the Southwest Research Institute's office in Boulder, Colo., found that a small number have several features in common with Pluto and Charon. For instance, some small Kuiper-belt residents and Pluto orbit at nearly the same incline to the plane in which the rest of the planets travel. The orbital velocity and colors of the Pluto-Charon system are similar to those of the objects.

These icy bodies belong to a group of Kuiper-belt residents called Plutinos because like Pluto, they make two orbits about the sun in the time that Neptune makes three. Stern's team estimates that 2 to 20 percent of Plutinos are fragments of Pluto.

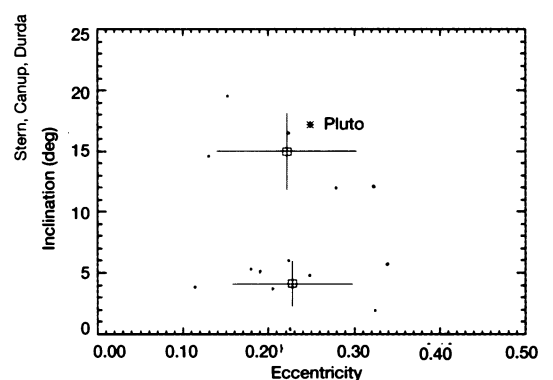
Models suggest that the impact that whacked Pluto created a substantial amount of shrapnel, Stern adds. The expected size of the debris matches estimates for that of the Plutinos. The evidence provides "strong clues, but not a clincher case," he says. Stern, Robin Canup, and Daniel D. Durda described their work Oct. 12 at an American Astronomical Society meeting in Padua, Italy.

If some Plutinos are indeed relatives of Pluto and Charon, the population would

far, he finds "no detectable perchlorate" in anything except a few pure sodium nitrates. Presumably, he says, they contain the infamous Chilean nitrate.

These data lead him to suspect "that the Athens group is almost completely wrong" about fertilizer as a major source of perchlorate. McCutcheon instead argues that perchlorate concentrations are inconsistent in the fertilizers—his lab now witnesses variations—and may trace to seasonal changes in sources of raw materials.

Last month, EPA added perchlorate to its list of contaminants that water utilities must monitor. As the compound's toxicity is better understood, Jarabek says, it might come under federal regulation, perhaps as early as 2003. —J. Raloff



Orbits of Pluto and Plutinos (black dots). One set of Plutinos (average values shown by crosshair closest to Pluto) has orbits similar to Pluto's and may be shards of that planet. Another group (bottom) has similarly elliptical orbits but lower inclinations.

qualify as the first family of objects to be recognized in the Kuiper belt. By contrast, astronomers have discovered some 40 distinct families in the asteroid belt, the reservoir of rocky material that lies between the orbits of Mars and Jupiter.

Although scientists calculate that thousands of Plutinos exist, they've detected only about 50 of them. Just 20 have well-studied orbits. "It is conceivable that some Plutinos are [shards], but the swarm is quite large, and I'm not sure we're at the point where we can tell which ones are . . . derived from the collision," says William B. McKinnon of Washington University in St. Louis.

Stern says his team's assertion could be tested within 2 years, if astronomers detect and track another hundred or so Plutinos. Spectra would also shed light on familial relationships. "Finding Plutinos that have relatively bright, as opposed to dark, icy surfaces that chemically resemble either Pluto or Charon would be suggestive indeed," says McKinnon. —R. Cowen