Backgrounder on Sulfonyl Urea Herbicides

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Sulfonyl Urea Herbicides

Sulfonyl ureas (SUs) are a growing class of herbicides, first created in the mid-1970s and on the market since 1982. Produced by a several manufacturers, SUs are touted as "safe" herbicides, because they are said by their manufacturers to be less likely to cause immediate harm to humans and animals than the chemicals they replace. Sulfonyl urea herbicides are extraordinarily potent, requiring application doses one hundred times smaller than the herbicides they were intended to replace.

The first SU– chlorosulfuron– was formulated by DuPont chemist George Levitt in June 1975. Levitt intended the chemical as an insecticide, for killing spider mites. In the course of testing, it was discovered chlorosulfuron has a devastating effect on plants. Altering the developmental plan for the chemical, DuPont patented it as an herbicide in 1978 and promoted it to wheat farmers as "Glean" in 1982. In its commercial incarnation, chlorosulfuron has been refined to kill the broadleaf weeds in wheatfields, but leave the wheat itself unaffected. Since the introduction of Glean, DuPont has introduced other, specifically targeted SU pesticides for corn, barley, soybeans and rice[1].

Rather than killing plants with chemical burn, as did early herbicides, sulfonyl urea herbicides block synthesis of essential branched chain amino acids (leucine, isoleucine and valine) by inhibiting the enzyme acetolactate synthase (ALS). For this reason, these chemicals are sometimes referred to as SU/ALS herbicides or merely ALS herbicides. Because the ALS enzyme does not exist in animals, makers of SU herbicides claim their products are safe for humans and animals[2].

Medical Effects of Sulfonyl Urea Herbicides

The same sulfonyl urea compounds used as herbicides are configured as pharmaceuticals and prescribed for humans precisely because they do effect our bodies. A class of SUs (carbutamide, chloropropamide, glibenclamide, glipentide, glipizide and tolbutamide) are prescribed for people suffering from non-insulin dependent diabetes mellitus (NIDDM)[3]. The pancreas of a patient suffering from NIDDM produces insulin, but not enough to meet the body's needs. Sulfonyl urea drugs stimulate the pancreas to produce more insulin and assist insulin in getting sugar into the body's cells and out of the bloodstream[4].

Doctors are advised not to prescribe SU pharmaceuticals for pregnant women or nursing mothers (SUs can be passed to the infant through breast milk). Unwanted effects common to patients on SU drugs include convulsions, fainting, unconsciousness, hypoglycemia (low blood sugar), blurred vision, cold sweats, difficulty concentrating, nausea, nervousness, nightmares, slurred speech, tiredness, weakness and unusual weight gain. Less common effects include chest pains, chills, coughing up blood, dark, fluid-filled skin blisters, sweating, sensitivity to sunlight, shortness of breath and unusual bleeding or bruising[5].

Hazards of Sulfonyl Urea Use

Although all pesticides are poisonous, sulfonyl urea herbicides are 100 times more toxic than herbicides used prior to 1982. This is appealing in that farmers can use a smaller volume of herbicides to treat their crops, which is cheaper for the farmer and is claimed by chemical makers to cause less incidental damage to the local environment. It was hoped that SUs could replace such common herbicides as atrazine, which have contaminated groundwater in many areas where it has been used[6].

The use of such potent chemicals also carry some obvious drawbacks. When any pesticide is applied from an airplane or helicopter, there is always some drift of the chemical away from the target crop into other areas. The National Research Council estimates that as much as 60 percent of a given chemical may drift off-target[7]. Residues of drifting pesticides have been found as far as a mile away from target fields[8]. While this problem is serious enough with conventional pesticides, drifting SUs are strong enough to wipe out a neighboring farmer's entire crop.

Shortly after the introduction of DuPont's Glean (chlorosulfuron) for wheat, farmers raising fruit and flowers in the canyons of south-central Washington State suffered crop failures. They suspected the cause to be SUs drifting down from the wheat fields in nearby Horse Heaven Hills. A team of three scientists from the U.S. Environmental Protection Agency (EPA) conducted an experiment in which cherry trees were treated with a dose of Glean 1/500th as large as was applied to wheat crops. While there was no visible damage to the leaves of the exposed branch, it failed to bear any fruit. Also, it was impossible to detect any residual traces of the herbicide.[9] The scientists concluded, "... drifting sulfonyl ureas may severely reduce both crop yields and fruit development on native plants, an important component of the habitat and foodweb for wildlife.[10]" The scientists expressed concern that if the problems in Washington State were the results of the first use of sulfonyl urea herbicides, then nationwide use on a variety of crops might have devastating effects on ecosystems.

The scientists' concerns were echoed by EPA bureaucrats. In the spring of 1989, Gary O'Neal, the Air and Toxics Division director for the Pacific Northwest wrote to his superiors in Washington, DC, "The growers who claim crop damage due to the use of sulfonyl ureas are particularly upset because they cannot establish by chemical analysis that the damage was due to herbicide drift... This issue will likely become more of a problem as sulfonyl ureas are more widely used. Also, even more potent herbicides may be developed in the future[11]."

In fact, EPA employees were raising concerns about the difficulty of detecting SUs even before the herbicides were approved for use. In 1981, as chlorosulfuron (Glean) was being evaluated for approval by the EPA, the Environmental Effects Division recommended that "SUs not be registered" because they "are excessively persistent in the environment and they cannot be detected at low levels[12]."

The regulator's object of frustration is the corporate lawyer's cause for glee. If sulfonyl urea herbicides can wipe out a crop without leaving any detectable residue, it is more difficult for victims of drift, seeking compensation, to prove liability in court.

Sulfonyl Ureas Resistant Weeds Now Widespread

As with other herbicides, a few years after sulfonyl ureas were introduced, new strains of weeds, which resist the effects of SUs, started appearing. Because of their immunity to SUs and the lack of competition from other plants, the new strains of weeds starting spreading rapidly– like weeds.

By 1992– ten years after it was first introduced– DuPont ceased selling Glean in seven Great Plains states and now requires that Glean be mixed with other herbicides to ensure that even resistant weeds are killed[13]. Instead of replacing expensive, poisonous herbicides, DuPont now requires that both the old and new types of weed killers be applied to together. In such cases, chemicals often work synergistically; toxic, carcinogenic and teratogenic effects created by the mixture may be significantly greater than exhibited any of the individual chemicals.

Under this regime, the farmer is burdened with increased costs, while the environment and the people in it are subjected to an uncontrolled experiment in toxic chemistry. The only clear benefit in all this accrues to the makers of herbicides, whose sales have increased once again.

Sulfonyl Urea Herbicides Damage Crops

Although sulfonyl urea herbicides have been on the market less than 20 years, the litigious landscape is already littered with numerous lawsuits.

These lawsuits are founded on incidents of crop damage. Often the victim– a small farmer whose livelihood and personal fortune is now hanging in the balance– turns to DuPont, seeking an explanation and compensation. As a quick review of the cases below shows, DuPont consistently supplies misleading and false information when confronted with damage caused by one of their products.

Sulfonyl urea pesticides were the culprit in DuPont's most embarrassing moment. In 1991, over 2,000 growers in 40 states reported crop damage after using DuPont's Benlate fungicide. DuPont recalled the Benlate and paid out $510 million in damage claims, $400 million of which went to growers in Florida, a state particularly hard-hit. Although the blight was obviously tied to the use of Benlate, victims could not– and DuPont would not– explain what had gone wrong.

In 1993, researchers from the Florida Department of Agriculture initiated a secret project to isolate the components of the tainted Benlate. The project was conducted secretly because the researchers feared attorneys for DuPont would attempt to gain a court order to stop their work if word leaked out. In April 1994, Florida Agricultural Commissioner Bob Crawford announced the team had found eight batches of Benlate contaminated by the DuPont sulfonyl urea Londax. Although DuPont denied the allegation, a few days later the company agreed to pay another $214 million to 220 farmers in compensation for damage caused by the tainted Benlate. In all these settlements, DuPont has accepted no liability[14].

DuPont's troubles in Florida are hardly exceptional. Consider:

- Ruling in a case involving contaminated Benlate in the state of Georgia, U.S. District Judge J. Robert Elliott fined DuPont $115 million and said, "This court found DuPont's conduct to be the most serious abuse in its years on the bench and the most serious abuse reflected in legal precedents. DuPont consciously and deliberately withheld data... and elicited false testimony. DuPont's conduct... was willful, deliberate, conscious, purposeful, deceitful and in bad faith. Put in layperson's terms, DuPont cheated[15]."

- In a Hawaiian Benlate case, a jury awarded growers $23.9 million and the judge added an additional fine of $1.5 million, citing a pattern of abuse and withholding of evidence on DuPont's part[16].

- In a Florida Benlate case, Judge Amy Steele Donner wrote, "DuPont and its lawyers have participated and continue to participate in utter disregard for orders or the court, and for the rules of evidence and ethics... This is a pattern, it is willful, it is deliberate and it is intended to thwart the orders of this court.[17]"

- In 1989, four Colorado farmers won a $7.4 million lawsuit against DuPont after a jury agreed that a DuPont insecticide, Asana, had been contaminated with SUs[18].

Sulfonyl Urea Pesticides in Vermont

According to information obtained from the Vermont Department of Agriculture, an average of slightly more than 198 pounds of sulfonyl urea herbicides were used by registered commercial applicators in Vermont each year from 1994 through 1996. During this period, the greatest quantity of SUs were used on railroad rights of way, followed by agricultural usage on corn (although corn became the top usage category in 1996 with 108.27 pounds compared with 93.39 pounds on railroads). Other uses of SUs reported in Vermont in Vermont include a growing quantity on electrical utility rights of way, field and forage, highways, and a category known as "Grass, Turf, Poison Ivy, Weeds." SUs came to the attention of Vermonters through a widely reported incident at a Shoreham organic farm in July 1997.

In the summer of 1997, Will and Judy Stevens of Shoreham operated the thriving 12-acre organic Golden Russett Farm; their produce appeared in restaurants and a food co-operative, more was sold through a retail farm stand and subscriptions.

As June ripened into July, tragedy struck the farm. All the Stevens's crops, some days away from harvest, died in the fields— onions rotted in the ground, broccoli twisted and yellowed, beans died on the vine[19].

Although organic farmers battle a host of bugs and blights every year, this was eerily different. Every variety of crop was blighted, the only exception being a row of squash which was covered by a plant cloth.

Upon investigation, it was discovered that a few days earlier the Stevens's neighbor had hired an aerial spraying company to treat a field of cow corn with sulfonyl urea herbicides. The chemicals– one hundred times as potent as conventional pesticides– drifted off the neighbor's field and attacked crops at Golden Russett Farm.

"It wasn't a classic case of drift," Will Stevens said recently. "It was more of an inversion. It was dead calm the morning he sprayed, but then it warmed up and I guess everything just lifted and spread out[20]."

Experts from the state Department of Agriculture were called and tests were conducted. Although no traces of sulfonyl ureas were found in the soil at Golden Russett Farm, residue was found on the plant cloth. That, taken in conjunction with the facts that a wide range of plants were suddenly blighted and that only the covered crops were spared was enough to bring a settlement from the cropduster's insurance company.

This year, Golden Russett is once again a certified organic farm. Mr. Stevens said two separate laboratories tested his soil "down to 1.5 parts per billion" and found no trace of chemicals. The farm was re-certified by Vermont Organic Farmers and crops planted on the fields blighted last year are healthy and thriving[21].

As a result of the Shoreham incident, the state suspended all aerial spraying of herbicides. Jim Leland, Agricultural Chemical Program Supervisor for the state's Department of Agriculture said there have been no permit applications for any aerial herbicide spraying this year. "All we've had is Bacillus thuringiensis and fertilizers." (Bacillus thuringiensis, a bacteria, is considered a "biological insecticide.") Mr. Leland said the state will no longer allow aerial spraying of SUs. Any other herbicide "would have to be considered on its own merits," he said.

Sulfonyl urea herbicides continue to be used in Vermont. Mr. Leland said no towns or counties use them for clearing rights-of-way, but the state Agency of Transportation uses an SU herbicide along guardrails[22].

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