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**From:** Breckenridge Charles USGR <charles.breckenridge@syngenta.com>  
**Sent:** Wednesday, December 21, 2016 2:55 PM  
**To:** charles.breckenridge@icloud.com  
**Subject:** FW: NYT piece on paraquat  
  
**Importance:** High

Attached is an article by investigative journalist Danny Hakim. He focuses on paraquat, Parkinson's Disease and the precautionary principle.

From The New York Times:

Fact-Checking a Claim About a Weed Killer

<http://www.nytimes.com/2016/12/20/business/paraquat-weed-killer-pesticide.html? r=0>

<http://www.nytimes.com/2016/12/20/business/fact-check-paraquat-weed-killer-parkinsons.html?mwrs=Email>

Paraquat, one of many pesticides that can't be used in Europe but is sold in the United States and elsewhere, has been linked to Parkinson's disease in a growing body of research.

By DANNY HAKIM DEC. 20, 2016

HUDDERSFIELD, England — The factory here, set amid a brick campus in a green and hilly industrial town, recently celebrated its centennial.

It produces paraquat, one of the world's most enduring weed killers — but not one that can be purchased in this part of northern England, in the rest of Britain or across the Channel in the rest of the European Union.

So it will be sent to the United States, or another part of the globe that still allows paraquat to be sprayed on weeds.

Paraquat has long been controversial because of its use in suicides in many parts of the world, since drinking one sip can be lethal. But now regulators in the United States are grappling with a wave of research linking paraquat to a less immediately apparent effect — Parkinson's disease.

In a recent, little noticed regulatory filing, the Environmental Protection Agency said, “There is a large body of epidemiology data on paraquat dichloride use and Parkinson's disease.” The agency is weighing whether to continue allowing the chemical to be sprayed on American cropland, although a decision is not expected until 2018, and it is unclear how the incoming administration of Donald J. Trump will view the matter.

[Continue reading the main story](#)

In the meantime, many of the nations that ban paraquat and other chemicals whose use is contentious still allow them to be manufactured as long as they are exported to faraway fields. The Huddersfield plant is owned by Syngenta, the pesticide giant based in Switzerland, which has not allowed paraquat since 1989.

Even the government of China, a nation not known for environmental regulation, said in 2012 that it would phase out paraquat “to safeguard people's lives.” But it still allows production for export.

As Europe and China move away from paraquat, its use is rebounding in the United States. That is particularly true for soybean fields, where the number of pounds used is up more than fourfold over the past decade, according to Department of Agriculture data.

The world's most popular weed killer is Monsanto's Roundup; some 220 million pounds of its active ingredient were used last year in the United States, according to the E.P.A. But weeds are becoming resistant to Roundup, and paraquat has been marketed as an alternative. Last year, seven million pounds of paraquat were used in the United States, on nearly 15 million acres, Syngenta said.

## Uncertain Harvest

Examining the globe-spanning relationship of chemical companies, academics and regulators, and the powerful toxins and genetically modified seeds used to grow food in many parts of the world.

Paraquat is just one of scores of pesticides prohibited in Europe but sold outside it. In 2013, the European Union imposed a moratorium on a widely used group of insecticides made by Syngenta and Bayer, the German giant, that were linked to a decline in bee colonies. In 2003, the European Union banned one of the most popular weed killers in America, Syngenta's atrazine.

Industry officials and academics funded by agrochemical companies often criticize Europe's regulators for taking a precautionary approach to regulation. They frequently claim that the risks of these various chemicals are well understood. But paraquat shows how complex the question of risk can be.

While the possibility of a Parkinson's link has been cited in studies going back more than two decades, research in the past five years has intensified, including a prominent study by the National Institutes of Health and meta-analyses of a large body of research. The studies have looked at the exposure of farmers and others who spray paraquat, as well as people who live near where it is used, which can include nonagricultural settings like those around roads and rail tracks.

**"The data is overwhelming" linking paraquat and Parkinson's disease, said Dr. Samuel M. Goldman, an epidemiologist in the San Francisco Veterans Affairs health system who has studied the connection. "I'm not a farmer, I don't need to kill weeds, but I have to believe there are less dangerous options out there."**

**Freya Kamel, a scientist with a branch of the National Institutes of Health who has also studied the topic, said she found the breadth of the research "about as persuasive as these things can get."**

**"It's not a slam dunk; it never is," Dr. Kamel said. "But to me the weight of the evidence suggests there's a relationship." Personally, she added, she believes paraquat should be banned.**

Syngenta has long rebutted the Parkinson's link, and by no means is paraquat seen as a sole factor in the disease. Philip A. Botham, Syngenta's head of product safety, said, "We would never market or continue to market any chemical which we genuinely felt posed a health risk or an environmental risk."

As for studies drawing a connection between Parkinson's and paraquat, he said, "Our view on those studies is that they are interesting — we don't dismiss them — but they generate an interesting hypothesis which is worth exploring."

## A Question of Risk

Paraquat is more than 130 years old, but it wasn't widely used as a pesticide until the middle of the 20th century. Today, though, it is used on more than 100 crops globally, including oranges, coffee and sugar cane.

It gained notoriety after the United States government paid to have it sprayed on marijuana plants in Mexico in the 1970s, leading to concerns that paraquat-contaminated pot was being sold in the United States. When the stoner character known as the Dude referred to someone as "human paraquat" in the 1998 film "The Big Lebowski," he was essentially calling him a buzzkill since paraquat continued to be used for years to kill marijuana plants.

Determining the acute, or immediate, health risks of such chemicals is easier than assessing chronic, long-term problems. And taking away one weed killer means another is likely to replace it, with its own potential drawbacks.

While paraquat's long-term effects are debated, its acute risks are well known. Sometimes, poisoning results from poor equipment and safety practices, a problem not unusual in developing countries, though farmers have died after being accidentally exposed in developed countries, too. Burkina Faso, in Africa, once sought international regulation of the weed killer, citing research showing it accounted for a fifth of that country's accidental pesticide poisoning cases.

When ingested by humans, paraquat is often fatal. South Korea experienced a 10 percent decline in suicides after it banned paraquat in 2011, according to one study. Researchers in Taiwan have said it causes 160 deaths a year there.

Isabella Blow, a well-known editor at the British magazine Tatler, died after drinking paraquat in 2007, the last year it was legal in Britain. She was not the first person in her family to die from drinking the weed killer.

The Parkinson's question is more complicated. Symptoms of the disease, such as tremors and slowed movement, stem from a loss of nerve cells in part of the brain.

While the causes are not fully understood, it is typically viewed as stemming from a blend of environmental and genetic factors. Some research even draws a connection to gut bacteria. A wide variety of studies have linked paraquat and Parkinson's, including epidemiological reviews that have looked at human disease patterns, studies involving experiments on rats, and research examining toxicity on a cellular level.

Some studies point to a combination of pesticides as a risk factor, and even well water in rural areas. Paraquat and another pesticide, rotenone, which is obtained from plant roots, are the ones most frequently linked to Parkinson's. The use of rotenone in lakes and other water supplies has been contentious.

A 2011 study led by the Parkinson's Institute and the National Institutes of Health drew on a federal survey of farmers and their spouses in Iowa and North Carolina, as well as others who handled pesticides. Those studied were two and a half times more likely to develop Parkinson's if they used paraquat or rotenone. A 2012 study found that those who used paraquat, and who also had a certain genetic variation, were 11 times more likely to develop Parkinson's, suggesting that certain people could be more at risk from exposure than others.

"It's a poison, and we really shouldn't be using this as an herbicide in the way we do," said Dr. Beate Ritz, a professor of epidemiology at the Fielding School of Public Health at the University of California, Los Angeles, who has studied health risks to people living near where pesticides are used.

Syngenta has been known for aggressively defending its products, including engaging in a bitter feud with a scientist whose research it once underwrote. The company argues that studies implicating paraquat do not adequately consider other environmental factors or chemicals that are present. Syngenta also studied the work force at an old British manufacturing site that produced paraquat and found a lower-than-expected rate of Parkinson's, though its study relied on death certificates, which often underreport the disease.

"I do believe paraquat is safe when it's used appropriately," said Dr. Botham of Syngenta. "I will, though, always as a scientist be open to any new findings."

In a filing with the E.P.A. this year, Syngenta said it had hired Dr. Colin Berry to help lead a scientific review of the Parkinson's issue. The review "concluded that the evidence available from epidemiological studies was fragmentary and insufficient to establish whether herbicides and paraquat in particular" increase the risk of Parkinson's, according to Syngenta's E.P.A. filing.

Dr. Berry, an emeritus professor at Queen Mary University of London, was at the center of high-profile civil cases in 1999 and 2000 that led to more than \$1 million in payments to two of his patients who were given misdiagnoses of breast cancer and had needless double mastectomies. His hospital's internal review, which was read in court by the judge

handling one of the cases, cited “a serious and indefensible diagnosis” and raised questions of basic competency, according to [accounts of the case](#).

Dr. Berry has also studied pesticides for many years and has been visible of late as a consultant for both Syngenta and [Monsanto](#). In an interview, he disputed the relevance of the [cancer](#) cases to his work assessing Parkinson’s, and dismissed a link between paraquat and the disease.

“I think the volume of the data suggests that is unlikely,” he said. “You can’t find a consistent association there to suggest that paraquat is particularly important.”

He pointed to a recent study [published in Nature](#) that highlighted genetic factors in causing Parkinson’s.

But the lead author of that study, Dr. Asa Abeliovich of the Columbia University Medical Center, said in an interview that “obviously there’s a bunch of solid epidemiological studies that link paraquat to Parkinson’s disease risk, so I think there’s definitely support for that.” Dr. Abeliovich also said the paraquat studies underscored “that there are certain environmental factors that matter,” which interact “with genetic factors.”

Dr. Vikram Khurana, a neurologist at the Harvard Stem Cell Institute and a clinician at Brigham and Women’s Hospital who studies Parkinson’s, said the body of research drawing a link between paraquat and Parkinson’s had “converged to make a fairly convincing argument that paraquat is truly an environmental exposure that can either increase the risk of Parkinson’s disease or collaborate with other factors, including genetic factors.”

Jack Housenger, director of the E.P.A.’s pesticide programs, said, “In terms of Parkinson’s disease, there’s a lot of data out there.”

“I’m not sure there’s any one study where there’s a direct link that’s been established here,” he added, “but given all the data, we’re incorporating all that in our next risk assessment.”

## Double Standards

The business models of many chemical companies, including those based in Europe, have become predicated, in part, on keeping their products legal outside the Continent. This year, Britain has exported paraquat to Brazil, Colombia, Ecuador, Guatemala, India, Indonesia, Japan, Mexico, Panama, Singapore, South Africa, Taiwan, Uruguay and Venezuela, in addition to the United States, according to the office of Britain’s Health and Safety Executive.

“This is one of the quintessential examples of double standards,” said Baskut Tuncak, a United Nations official who specializes in hazardous substances. “Paraquat is banned in the U.K. and the E.U., but it’s still being used, and resulting in serious harms outside the E.U. where it’s being shipped.”

Mr. Tuncak said he had begun examining practices allowing companies to make pesticides exclusively for use outside their borders, seeing it as a potential human rights issue. He said paraquat would be “one of the issues that I plan to examine” during an official visit to Britain next month.

International efforts to regulate pesticides have been halting. Each year, government officials from around the world convene in Europe to discuss whether to add pesticides to a list of hazardous chemicals maintained as part of an international treaty called the [Rotterdam Convention](#), a designation that creates disclosure requirements for exporting countries. A few countries, including Vietnam and Ecuador, automatically ban or restrict chemicals that are added to the list.

Stark differences in national approaches are typically on full display. At a meeting last year in Rome, European regulators pushed to add atrazine, another Syngenta weed killer, to the list. But a government representative from India — which itself operates a [pesticide manufacturer](#) — was more voluble in defending atrazine than a Syngenta lobbyist who was present. The official even argued over technicalities, including how many weeks ahead of the Rome meeting supporting documents needed to be circulated.

Lobbyists, too, are active at the meetings. In 2013, at a conference in Geneva, delegates debated adding paraquat to the hazardous chemical list. During a meeting on the topic, Enrique Lacs, a representative of a Latin American trade association, took the lead in speaking on behalf of the Guatemalan government delegation. Mr. Lacs has also been an adviser to Gremiagro, a trade group for pesticide producers that opposes action on paraquat.

His presence, on behalf of a national delegation, angered other attendees. Mr. Lacs's credentials to participate in the convention were eventually revoked. Guatemala was among a small group of countries that ultimately prevented paraquat from being added to the hazardous chemical list.

Mr. Lacs said by email that he had simply been acting as a translator. He is now Guatemala's deputy economics minister.

Juliette Voinov Kohler, a legal and policy adviser for the governing body that oversees the Rotterdam Convention, declined to comment on the episode but said credentials were sometimes revoked, "thereby denying access to meeting premises."

In Huddersfield, local environmentalists no longer give much thought to the Syngenta factory. Even a chemical spill last year generated little interest.

Andrew Cooper, a Green Party member who serves on the local governing council, and whose district is a few miles from the plant, said activists were more worried about pollution from cars on a road abutting Syngenta's main building on the site.

"There's no impact that we can determine on the local community," he said. "What they produce and what goes out the door, that's a different matter, but it's not something we campaign on much in recent years." He added, "It has been off our radar."

Hari Kumar contributed reporting from New Delhi. Cao Li contributed research from Beijing.

**This supplement was included in Hakim's reporting as well:**

<http://www.nytimes.com/2016/12/20/business/fact-check-paraquat-weed-killer-parkinsons.html?src=busln>

**FactChecking a Claim About a Weed Killer**

By DANNY HAKIM DEC. 20, 2016

LONDON — Syngenta, the Swiss pesticide giant, claims on its website that data from an influential 2011 study shows that farmers who use the weed killer paraquat are less likely to develop Parkinson's disease than the general population.

However, Syngenta's claim is at odds with the actual findings of the study, according to two of its authors.

The 2011 study, carried out by the National Institutes of Health and researchers from other institutions around the world, found that people who used paraquat or another pesticide, called rotenone, were roughly two and a half times more likely to develop Parkinson's.

The work is known as the **Farming and Movement Evaluation, or FAME, study**. It drew on a sweeping United States government project called the Agricultural Health Study, which tracked more than 80,000 farmers and their spouses, as well as other people who applied pesticides, in Iowa and North Carolina.

The FAME researchers identified 115 people from the Agricultural Health Study who developed Parkinson's, and studied 110 of them who provided information on the pesticides they used.

The study was influential even among some people who had been skeptics of a connection between the chemicals and the disease. **Gary W. Miller**, a professor of environmental health at Emory University, referred to a link between Parkinson's and paraquat as a "red herring" in a 2007 publication. But while Dr. Miller said in a recent email exchange that he had concerns about some previous research making the connection, "the FAME data are strong and should be considered." He said the study "appears to show a connection between paraquat exposure and Parkinson's disease."

Because of the prominence of the FAME study, Syngenta addresses it on one of its websites, paraquat.com. Syngenta claims that the study shows that only 115 people had Parkinson's out of the more than 80,000 people in the broader Agricultural Health Study. Therefore, "the incidence of Parkinson's disease" in the study "appears to be lower than in the general U.S. population," Syngenta says.

But the FAME study was not a comprehensive assessment of the incidence of Parkinson's disease among those in the wider Agricultural Health Study. Rather, researchers picked out a group of people who did have Parkinson's and specifically studied them against a control group.

"We did not study incidence, so the Syngenta statement is not correct," said Dr. **Caroline M. Tanner**, the director of the Parkinson's Disease Research, Education and Clinical Centers at the San Francisco Veterans Affairs Medical Center, and the lead author of the FAME study.

Syngenta, in response to questions, said the FAME study's "initial selection process relied on active identification by the researchers, not voluntary enrollment."

That is not, however, what the study itself says of its methodology, which relied on selfreporting by farmers and state mortality files. Studies of how many people in a population have Parkinson's typically go beyond reliance on self-reporting or death records because both can fail to capture the full picture.

For example, a 2001 Parkinson's incidence study conducted by Kaiser Permanente, one of the largest insurers and health providers, with Dr. Tanner, had a far more detailed approach. It monitored outpatient and inpatient visits, as well as outof-network insurance payments, and it periodically reviewed Kaiser's pharmacy system for drugs used to treat Parkinson's. It also alerted neurologists in its system to refer newly diagnosed patients.

Syngenta, the bestknown manufacturer of paraquat, is in the process of being acquired by the China National Chemical Corporation. In its statement, Syngenta said it "went to significant lengths to attempt to access the data" underlying the FAME study "in order to gain as complete an understanding as possible of the study in the pursuit of scientific rigor."

**Freya Kamel**, a scientist at the National Institute of Environmental Health Sciences, a branch of the National Institutes of Health and a coauthor of the FAME study, said, "The analysis they're suggesting is not appropriate."

"There were probably quite a few people with Parkinson's disease who didn't enroll in our study," Dr. Kamel said.