

Burden of Proof

by JANETTE D. SHERMAN, M.D.

When I was a medical student and intern at Wayne State University, I rotated through Children's Hospital in Detroit. I attended a clinic where we saw children who had abnormal faces, abnormal body parts and often, impaired intelligence. Many of the children required complicated medical care, but I don't recall much discussion as to *why* they had these abnormalities.

Although the neurotoxicity of pesticides has been known for decades, several national publications have recently named the pesticide chlorpyrifos, marketed as Dursban and Lorsban, as causing loss of intelligence as well as birth defects and structural brain damage.

Although in-home use of chlorpyrifos was restricted in the United States in 2000, it is widely used in agriculture and poses a serious risk for people working and living in proximity to fields. Detectable levels of chlorpyrifos in New York City children also raise the question of exposure via food.

Dr. James Hamblin's article in the March 2014 issue of *The Atlantic*, "The Toxins that Threaten Our Brains" lists 12 commonly used chemicals, including chlorpyrifos. The exposures described in the article were urban, so we do not know exactly how widespread this epidemic is, especially if we do not include agricultural areas such as in California, Hawaii and the Midwest.

That same month, *The Nation* published articles by Susan Freinkel, "Poisoned Politics," and Lee Fang, "Warning Signs," reporting adverse effects

from exposure to Dursban and Lorsban. Dr. Hamblin's article cites Drs. Philip Landrigan of Mt. Sinai in New York City and Philippe Grandjean of Harvard that a "silent pandemic" of toxins has been damaging the brains of unborn children."

Dr. Landrigan chaired a 1998 meeting of the Collegium Ramazzini International Scientific Conference, held in Carpi, Italy. In attendance was Dr. Grandjean, whose research found methylmercury to be a hazard to brain development. Dr. Richard Jackson, from the CDC, was also in attendance as well as U.S. governmental and university members.

At that same conference, I presented definitive data in my paper "Chlorpyrifos (Dursban) exposure and birth defects: report of 15 incidents, evaluation of eight cases, theory of action, and medical and social aspects." This

presentation followed my earlier publications beginning in 1994 wherein I reported damage to the unborn from the same pesticide.

A battle is currently ongoing in Hawaii over the use of pesticides, especially by Dow AgroSciences, DuPont Pioneer, BASF Plant Science and Syngenta on the island of Kauai. The pesticides used there include alachlor, atrazine, chlorpyrifos, methomyl, metalochlor, permethrin and paraquat. Paul Koberstein, from *Cascadia Times*, estimates that annually more than 2,000 pounds of chlorpyrifos are used per acre per year in Kauai, compared to less than 0.025 for the U.S. mainland.

In addition to Hawaii, areas in California include workers and families from the Imperial Valley and other in-

tensive agricultural areas where pesticide use is extensive. Using the Koberstein data, annual use of chlorpyrifos in California is approximately 1,500 pounds per acre.

NEUROLOGICAL DAMAGE BEFORE & AFTER BIRTH

Birth defects arise as a result of two mechanisms – damage to a gene prior to fertilization, or damage to the growing cells of the fetus after life in the womb has begun. Differing from genetic damage, such as occurs in Down syndrome or Trisomy-21, the latter damage results from exposure of the developing fetus to agents called teratogens.

Chlorpyrifos is a combination of an organophosphate and a trichloropyridinol (TCP). TCP is not only the feedstock used in the manufacture of chlorpyrifos, but also a contaminant in the product and a metabolic breakdown product that is known to cause central nervous system abnormalities (hydrocephaly and dilated brain ventricles) and other abnormalities (cleft palate, skull and vertebral abnormalities) in fetuses as reported by Dow Chemical Company.

In March 1995, I was asked to fly to Arkansas to see a child whose mother, while working at a bank where spraying occurred, had been exposed to the pesticide Dursban (chlorpyrifos) early in the pregnancy of her daughter. When Mrs. S. was about five months pregnant she had an ultrasound, which showed that her baby had enlarged ventricles in her brain. Further examination revealed the absence of the *septum pellucidum*, a central portion of her brain. Mrs. S. had follow-ups at a university center as well as with her own physician that showed normal amniocentesis and normal chromosomes.

Both Mr. and Mrs. S. said that caring for their daughter A. had been a

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SEE PAGE 82

FROM PAGE 5

severe financial and emotional drain. A. had surgery to repair her cleft lip when she was 6 months old and repair of her cleft palate and left eyelid when she was 1 year old.

Additional diagnostic procedures indicated that A. had a cleft left eye (failure of her eye to fuse during development), and she could not blink her eye or move the left side of her face.

A. was unable to sit up on her own by the time she was 1 year old, had to have food pureed until she was 2. Her parents realized that when A. neared her fourth birthday, she could not hear, so they began a program of sign language with the aid of a speech therapist. A. was a small-boned child who walked with a wide-based, unsteady gait and made audible sounds, but no language content.

Her abnormalities included the following, and were characteristic of findings in other children: low-set, tapering ears, wide-spaced nipples and frequent infections. I evaluated seven more children, two families each having two children with similar, but more severe medical conditions. With the excep-

tion of child #1, the seven children were profoundly retarded, were diapered, could not speak and required feeding.

Ultimately I evaluated eight children and identified seven more, reported by Dow Chemical Company, the manufacturer, to the EPA on November 2, 1994, with reporting delays of as long as seven years from when the corporation first learned of them.

When I saw seven more children, all of whom looked like siblings, it became clear to me that the cause was linked to Dursban, the prenatal exposure common to each. In addition to the children with birth defects, I also evaluated a number of families and a group of adults who had been exposed at their worksite.

In February 1996, my deposition in the first case was taken by three groups of attorneys representing the defendants, two principally defending Dow/Elanco. I was questioned for three 8-hour days. Ultimately a list of 565 exhibits was accumulated that included over 10,000 pages of materials that I supplied and relied upon for my opinion. These materials included Dow documents and correspondence, EPA documents, legal depositions, basic embryology, biochemistry and toxicology of chlorpyrifos, medical records of other exposed children, patents, books, articles, etc.

Chlorpyrifos has not only an organophosphate portion, but also has three chlorine atoms attached to a pyridinol ring. This ring is TCP, a significant hazard, because it is fat-soluble and persistent, up to 18 years as claimed by Dow Chemical Co. TCP also forms the body of trichlorophenoxyacetic acid (2,4,5-T), a component of Agent Orange.

Dow knew in 1987 that TCP caused birth defects but it was not reported

to EPA until 1992. TCP is used to manufacture chlorpyrifos, and as such, comes under regulation of Section 8(e) of the Toxic Substances Control Act (TSCA), rather than the Federal Insecticide, Fungicide and Rodenticide Control Act (FIFRA). Though there was regulatory difference, TSCA states, "any person who (1) manufactures, imports, processes or distributes in commerce a chemical substance or mixture, and (2) obtains information

that reasonably supports the conclusion that such substance or mixture presents a substantial risk of injury to health or the environment, must promptly report the information to EPA ..." From 1976 to 1982, I was a member of a 16-person Advisory Committee to the EPA for TSCA, Chairman of the Risk-Benefit Assessment Group from 1977 to 1979 and a member of the Carcinogen Policy Subgroup from 1977 to

1981. It was clear that risks and benefits do not accrue to the same party. In the case of chlorpyrifos, the risks are to the unaware public and the benefits to the corporation.

LEGAL SYSTEM VERSUS JUSTICE SYSTEM

Bernard P. Whetstone was a well-established attorney who handled the initial birth defects case in Little Rock, Arkansas. I was required to appear in court in Little Rock, where Judge Easley ruled that I was not qualified. It's hard to believe that 10,000 pages of documents is not adequate, but that opinion was softened because he ruled that all the plaintiff's experts were not qualified. Another physician/toxicology expert and I evaluated additional patients (adults) who developed multiple adverse effects, including central nervous system damage, so Dow, employing the Easley decision, argued

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successfully in other court jurisdictions that we were not qualified to give an opinion.

The main Dow law firm was Barnes & Thornburg from Indianapolis, where DowElanco, the co-manufacturer Eli Lilly, is located. Eli Lilly is a manufacturer of both pharmaceuticals and pesticides. Barnes & Thornburg has over 500 attorneys in 12 cities and appeared to be very well-staffed and funded.

A recent news release noted that William W. Wales, who spent more than 30 years in the legal department of the Dow Chemical Company and Dow AgroSciences LLC, had joined Barnes & Thornburg LLP's Indianapolis office as a partner in the firm's litigation and corporate departments. "Bill's depth and breadth of experience in a variety of matters will be a tremendous asset to many of our clients who are dealing with similar issues," said Joseph G. Eaton, vice chair of the firm's Litigation Department and co-chair of the Toxic Tort Practice Group. Eaton is one of the attorneys who took my extensive deposition. They were the most aggressive law firm I had ever encountered, and I have testified in more than 700 depositions and/or court appearances.

In defense of their product, the Dow attorneys argued that there were no reports of levels of pesticides used or existing levels – a questionable tactic since the corporation has never suggested or requested that such records be obtained.

In 2008, the EPA named Dow as an Energy Star Partner of the Year for excellence in energy management and reductions in greenhouse gas emissions. Dow's fleet of skilled lawyers have managed to save Dow from liability, when they achieved a reversal of a \$925 million judgment for the contamination of the area around Rocky Flats, the Colorado facility that produced plutonium triggers for hydrogen bombs. And, a lawsuit filed by Vietnamese damaged by Agent Orange against Dow and Monsanto was dismissed.

Dow is a multinational corporation and the third largest chemical manufacturer in the world with earnings of more than \$57 billion in 2013. In addition to the manufacture of insecticides, herbicides, fungicides and genetically modified seeds, Dow also manufactures multiple plastics, polystyrene, polyurethane and synthetic rubber as well as many other chemicals.

The State of California is considering restrictions on chlorpyrifos use, but is prepared for strong opposition from the pesticide and big agricultural industries. What are the chances that the use of chlorpyrifos will be curtailed in the agricultural areas of Hawaii, California and elsewhere? Given what we know of the financial strength of the Dow Corporation, the weakness of the EPA and our paid-for congress, it does not look promising.

Janette Sherman, M.D., specializes in internal medicine and toxicology with an emphasis on chemicals and nuclear radiation that cause illness, including cancer and birth defects. She graduated from Western Michigan University with majors in biology and chemistry and from the Wayne State University College of Medicine. From 1976-1982 Dr. Sherman served on the advisory board for the Environmental Protection Agency (EPA) Toxic Substances Control Act. She has been an advisor to the National Cancer Institute on breast cancer and to the EPA on pesticides. She is an advisor and speaker for universities and health advocacy groups concerning cancer, birth defects, pesticides, toxic dumpsites and nuclear radiation. For more information visit janettesherman.com.