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Organophosphates, Friend and Foe: The Promise of Medical Monitoring for Farm Workers and Their Families

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ABSTRACT

Millions of farm workers nation-wide who load, mix and/or apply pesticides are exposed to incredible amounts of pesticides on a daily basis. Various inefficiencies and inconsistencies in the regulatory system – including insufficient illness reporting data systems, lack of regulatory compliance and enforcement, and inadequate data and information on the chronic effects of exposure and overexposure to various pesticides – increase the likelihood that these workers will continue to be exposed to dangerous amounts of pesticides.

This Article assesses the existing mechanisms designed to protect farm workers from occupational exposure to pesticides and identifies and analyzes some of the shortcomings of the regulatory system. It focuses on the class of pesticides known as organophosphates and examines the impact that such pesticides can have on farm workers as well as on their families. It then evaluates the State of Washington's medical monitoring rule, and recommends implementation of a federal medical monitoring program as a means of protecting all American farm workers from the dangers of pesticide overexposure.

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I.
INTRODUCTION

In 1999, a healthy fifteen-year-old migrant farm worker named Jose Casillas left his home in Mexico for the orchards of central Utah hoping to earn enough to support his family in Mexico.[1] A few months after his arrival, Casillas was sprayed by an applicator-tractor with Guthion Solupak, a pesticide similar to Sarin.[2] Earlier that same week, Casillas had been sprayed with other pesticides—which he believed to be only water—while he was working in the field.[3] After the first field exposure, Casillas suffered intense headaches. After the second exposure, Casillas began to vomit, sweat excessively and suffer with diarrhea.[4] Despite being ill, Casillas attempted to ride his bike to work the next morning but lost consciousness and collapsed. By the time

1. *See* Keith Cunningham-Parmeter, *A Poisoned Field: Farmworkers, Pesticide Exposure, and Tort Recovery in an Era of Regulatory Failure*, 28 N.Y.U. REV. L. & SOC. CHANGE 431, 433 (2004) (using the Casillas case to argue for greater tort action as a means for catalyzing improved field protection and compensating victims of pesticide-related injuries); *see also* Shawn Foster, *Worker Dies After Pesticide Exposure*, SALT LAKE TRIB., July 5, 1998, at A1 (describing the circumstances of Casillas's death).

2. *See* Foster, *supra* note 1, at A1.

3. *Id.*

4. *Id.*

medical help arrived, he was dead, "with foam streaming from his nose."[5]

There are legal protections that are supposed to prevent tragedies like this. For instance, it is illegal to spray pesticides when workers are in fields, and farmers are supposed to be informed about, and take preventative steps to protect against, pesticide poisoning.[6] Moreover, the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA)[7] requires states to certify pesticide applicators who use restricted-use pesticides and anyone who commercially sells, distributes, or applies pesticide products.[8] Additionally, FIFRA standards require that an individual be deemed "competent" before they can be formally certified to use or handle pesticides.[9] Sadly for Casillas, and many other farm workers across the United States, these "regulatory guarantees" are not enough.

Despite such protections, millions of farm workers nationwide who load, mix and apply pesticides are exposed to incredible amounts of pesticides every day. They can be exposed through direct handling of pesticide products, daily work around recently treated areas, contaminated and often inadequate clothing, and inhalation of airborne pesticides drifting in the winds. Occasionally, farm workers, like Casillas, suffer direct exposure. Direct and indirect exposures occur for various reasons, including lack of regulatory compliance and enforcement, poor training of farm workers and applicators, inadequate clothing and other safety equipment, and the failure of some applicators to follow required procedures. The present regulatory system also lacks any meaningful illness-reporting data systems and has no mechanism for monitoring or collecting information on the chronic effects of exposure and overexposure to various pesticides.[10] No, the system is not broken. It is simply ineffective to protect the workers who

5. *Id.*

6. *See* Worker Protection Standards for Pesticides, 40 C.F.R. pt. 170 (2008). *See also* Cunningham-Parmeter, *supra* note 1, at 433.

7. Act of June 25, 1947, 61 Stat. 163 (codified as amended at 7 U.S.C.A. § 136 (2000)).

8. Federal Insecticide, Fungicide, and Rodenticide Act, 7 U.S.C. § 136(i)(a)(1) (2000); *see also* John Carlucci, *Reforming the Law on Pesticides*, 14 VA. ENVTL. L.J. 189, 222 (1994) (referring to FIFRA §136(i)(a)(1)).

9. 7 U.S.C. § 136(i)(a)(1).

10. *See* MARGARET REEVES, KIRSTIN SCHAFER, KATE HALLWARD, & ANNE KATTEN, CALIFORNIANS FOR PESTICIDE REFORM, FIELDS OF POISON: CALIFORNIA FARMWORKERS AND PESTICIDES 29 (1999), *available at* http://www.panna.org/files/fields.pdf (asserting that "[t]he U.S. EPA acknowledges that most [restricted entry

toil in the fields every day to provide us with the food and fiber we demand. Unless something is done, it is likely that such workers will continue to suffer from exposure to dangerous pesticidal chemicals.

This Article assesses the existing mechanisms designed to protect farm workers from occupational exposure to pesticides and identifies and analyzes some of the shortcomings of the regulatory system. It does so by focusing on the class of pesticides known as organophosphates and the ongoing debate over their safety and utility. It also considers the merits of a federally mandated medical monitoring program and argues that such regulations would enhance farm worker safeguards by providing them with preventative mechanisms for detecting pesticide exposure before serious physical harm results.

Part II of this Article examines the history of organophosphates and describes the importance of these chemicals to the agricultural and agro-chemical communities. This part also details the nature and effects of this class of toxicants as well as the risks posed to human health and the environment. Part III follows by looking at the impact pesticides like organophosphates have on a unique but significant subpopulation—farm workers and their children—that is particularly susceptible to pesticide poisoning. Part IV then evaluates the Washington Supreme Court case of *Rios v. Dep't of Labor & Industries*,[11] which imposed a mandatory medical monitoring rule in the State of Washington. This section evaluates the Washington medical monitoring program, its projected benefits for farm workers and their families, and the impact on farmers and industry that ensued as a result of the rule's implementation. Thereafter, Part V considers the merits of a national medical monitoring rule as well as other regulatory restrictions on pesticides and their uses.

II.
ORGANOPHOSPHATE BACKGROUND

Human beings have used pesticides since they first discovered how to cultivate their environment to yield crops and support

intervals] are set to prevent acute poisoning, but are not designed to protect workers from chronic health effects").

11. 145 Wash.2d 483 (2002).

livestock.[12] However, the development of manmade pesticides during the twentieth century led to the worldwide use of pesticides.[13] The term "pesticide" now encompasses many products, including insect repellants, herbicides, fungicides and swimming pool chemicals designed to prevent, destroy or repel pests of any sort.[14] Although pesticides have greatly aided society in providing and maintaining sufficient food for the world's burgeoning population, they can have grave effects on humans and the environment when used or applied improperly.

A. *Importance of Organophosphates*

During the 1930s, Dr. Gerhard Schrader, a chemist at the Bayer Corporation in Germany, investigated the use of organophosphates (also known as OPs) as an insecticide.[15] While his agricultural research showed considerable promise, the German military soon realized the potential for organophosphates as chemical warfare agents and quickly re-directed Schrader's research toward the Nazi effort.[16] It was not until 1941 that organophosphates became more widely available for their originally intended pesticidal purposes.[17]

Today, organophosphates are extremely popular in the agricultural and agro-chemical industries and are applied in homes and businesses alike.[18] Organophosphates are used on many crops—including peaches, apples, snap beans, pears, corn, cotton and wheat[19]—and are the most widely used pesticide nationwide.[20]

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12. George S. Smith & Barbara Rasco, *The Dose Makes the Poison: Are Pesticides Defective Products?*, 8 DRAKE J. AGRIC. L. 653, 657 (2003) (discussing the growing role of pesticide use in modern agriculture).

13. *Id.*

14. *Id.* at 661.

15. *See* Kenneth D. Katz et al., *Toxicity, Organophosphates: Overview – Critical Care*, http://www.emedicine.com/med/topic1677.htm (last visited Feb. 19, 2009); *see also* Lucio G. Costa, *Current Issues in Organophosphate Toxicology*, 336 CLINICA CHIMICA ACTA 1, 1-2 (2006).

16. Katz et al., *supra* note 15. The Germans were particularly interested in organophosphate-based warfare agents like Sarin, Taubin, and Soman. *Id.*

17. *Id.*

18. *Recognition and Management of Pesticide Poisonings* 34 (J. Routt Reigart & James R. Roberts eds., 5th ed. 1999), *available at* http://npic.orst.edu/rmpp.htm (noting that organophosphates are now "the most widely used insecticides available today").

19. United States Department of Agriculture, Economic Research Service, *Agricultural Chemicals and Production Technology: Pest Management*, *available at* http://www.ers.usda.gov/briefing/AgChemicals/pestmangement.htm#organophosphate (last visited Feb. 19, 2009).

Since the beginning of WWII, the global application of pesticides has increased by 600 percent, with 6.6 billion pounds used annually today.[21] The United Nations Food and Agriculture Organization projects a continued rise in pesticide use worldwide in the foreseeable future.[22]

What is the cause for both the historic and projected increases in pesticide use, including the increasing use of organophosphates? Proponents of pesticides suggest that the simple answer is money. Proponents contend that farmers choose to utilize pesticides "because they make more money when they use them than when they do not. Their willingness to spend substantial amounts, such as $8.5 billion in 1996, is convincing evidence that farmers find pesticide use profitable."[23] In addition, pesticide advocates assert that, when used properly, pesticides can be advantageous to the general public. They argue that pesticide use benefits consumers by lowering the cost of some crops and increasing their availability to low-income consumers.[24] Furthermore, they suggest that "reductions in pesticide use could indirectly have a negative health effect by reducing the consumption of fruits and vegetables that contain many valuable micronutrients."[25]

Organophosphates are, in fact, relatively inexpensive when compared to alternative pesticides[26] such as methyl carbamate and pyrethroid insecticides.[27] Organophosphates can also be

20. Gloria D. Coronado et al., *Organophosphate Pesticide Exposure and Work in Pome Fruit: Evidence for the Take-home Pesticide Pathway*, ENVIRONMENTAL HEALTH PERSPECTIVES, July 1, 2006, *available at* http://www.ehponline.org/members/2006/8620/8620.pdf.

21. David Pimentel, *Overview of the Use of Genetically Modified Organisms and Pesticides in Agriculture*, 9 IND. J. GLOBAL LEGAL STUD. 51, 59 (2001) (summarizing data from the 1990s related to global pesticide use); *see also* TIMOTHY KIELY ET AL., U.S. EPA, PESTICIDE INDUSTRY SALE AND USE: 2000 AND 2001 MARKET ESTIMATES 8 (2004), *available at* http://www.epa.gov/oppbead1/pestsales/01pestsales/market_estimates2001.pdf (suggesting that global pesticide use in 2000 and 2001 was more than 5.3 billion pounds).

22. KIELY ET AL., *supra* note 21.

23. Andrew Morris, *Market Principles for Pesticide*, 28 WM. & MARY ENVTL. L. & POL'Y REV. 35, 40 (2003).

24. MARK METCALFE ET AL., REPORT: THE ECONOMIC IMPORTANCE OF ORGANOPHOSPHATES IN CALIFORNIA AGRICULTURE 7 (2002), *available at* http://www.cdfa.ca.gov/files/pdf/OrganophosphatesCAAgriculture.pdf.

25. *Id.*

26. George Gray & James Hammitt, *Risk/Risk Trade-offs in Pesticide Regulation: An Exploratory Analysis of the Public Health Effects of a Ban on Organophosphates and Carbamate Pesticides*, 20 RISK ANALYSIS 665, 671 (2000).

27. METCALFE ET AL., *supra* note 24, at 14.

used on an array of crops to control various insects such as the cabbage maggot, which damages broccoli,[28] as well as aphids and cabbage loppers.[29] As a result, producers have been able to increase crop yield by preventing pest damage to crops.[30] Pesticide proponents argue that these yield-increasing results help reduce the amount of land and water resources necessary for agriculture, freeing up resources while maintaining production levels.[31] Furthermore, organophosphates have been found to be significantly less persistent in the environment than other pesticides like chlorinated hydrocarbons.[32]

Notwithstanding the apparently abundant benefits of pesticides, there are numerous concerns that undermine the fundamental argument favoring pesticide use—namely, that they do more good than harm. First and foremost, organophosphates are known to affect the nervous system and in various exposure scenarios, both acute and chronic, can cause mild to severe physical ailments, including respiratory failure and death.[33] In addition, according to some pesticide opponents, the agricultural productivity benefits gained by pesticides do not outweigh or even equal the hazards when pest resistance is factored into the equation.[34] In particular, opponents say, the idea that pesticides are absolutely vital to agricultural production has led to inattention to increasing pesticidal resistance.[35] As pests develop greater resistance, growers seek to apply more chemicals, and farm workers who handle pesticides are placed at risk of exposure to even greater amounts of these dangerous toxicants. Yet, growers' reliance on pesticides has lead to an ever-increasing number of pesticide-resistant pests which, in turn, are repelled with even more or more lethal pesticides.[36] Furthermore, escalating pesticide toxicity often unavoidably affects realms outside of the intended targets and can invade the air, water, farm workers' clothes, bodies, and homes. Considering such a holistic perspective, it seems

28. *Id.* at 13.
29. *Id.* at 18.
30. *Id.* at 6.
31. *Id.* at 7.
32. *Id.* at 12.
33. *See infra* notes 37-57 and accompanying text (discussing toxic effects of organophosphates).
34. *See* Shannon Adair Tool, *Farmworkers and FIFRA Laboring Under the Cloud*, 31 Sw. U. L. Rev. 93, 105 (2001).
35. *Id.*
36. *Id.*

reasonable to question whether pesticides really do provide consumers with a healthy food supply.

B. *Concerns Over Organophosphates*

Organophosphates are the most commonly used insecticides in the world.[37] As suggested above, they can provide numerous benefits when properly used. Yet, organophosphates—which are related to forms of nerve gas[38]—are also far more acutely toxic in their short lives than the dangerous organochlorides they replaced.[39] In fact, organophosphates are responsible for 80 percent of reported toxic exposures to insecticides.[40]

Organophosphate exposure is known to cause both acute and chronic effects in humans and wildlife. During human exposure, organophosphates affect the nervous system by reducing the ability of cholinesterase, an enzyme, to properly regulate a neurotransmitter called acetylcholine, a chemical needed to facilitate the transfer of information between neurons and cells in the body.[41] Organophosphate poisoning occurs whenever a person is exposed directly or indirectly to an organophosphate. Depending on the severity of exposure and absorption, the degree of poisoning can be mild, moderate, or severe.[42]

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37. *See supra* note 18, at 34.

38. Frank B. Cross, *Paradoxical Perils of the Precautionary Principle*, 53 WASH. & LEE L. REV. 851, 870 (1996).

39. *Id.* (noting that the switch from pesticides in the organochloride family, such as DDT, to organophosphates transformed "a highly uncertain, long run risk from organochlorines into a more certain, immediate, and significant risk of toxicity from the organophosphates").

40. William Freudenthall & Mark Ralston, *Toxicity, Organophosphates: Overview – Pediatrics*, http://emedicine.medscape.com/article/1009888-overview (last visited Feb. 19, 2009).

41. *See id.*; *see also* Kyle Steenland, *Chronic Neurological Effects of Organophosphate Pesticides*, 312 BRITISH MEDICAL JOURNAL 1312-13 (May 25, 1996), *available at* http://www.bmj.com/cgi/content/full/312/7042/1312 (noting that "[o]rganophosphates inhibit the neurotransmitter acetyl cholinesterase, leading to symptoms related to the autonomous nervous system (abdominal cramps, nausea, diarrhea, salivation, miosis) and the central nervous system (dizziness, tremor, anxiety, confusion)); *see also* Brenda Eskenazi et al., *Exposures of Children to Organophosphate Pesticides and Their Potential Adverse Health Effects*, 107 ENVT'L HEALTH PERSPECTIVES 409, 411 (1999), *available at* http://www.pubmedcentral.nih.gov/picrender.fcgi?artid=1566222&blobtype=pdf (discussing the primary affects of acute organophosphates and carbomates exposure in children).

42. *See* CLINICAL ENVIRONMENTAL HEALTH AND TOXIC EXPOSURES 1152 (John B. Sullivan Jr. & Gary Krieger eds., 2d ed. 2001). Mild organophosphate poisoning is defined as a decline in cholinesterase activity to 20–50 percent of normal, moderate poisoning as a decline to 10–20 percent of normal cholinesterase activity, and

Common symptoms of overexposure to organophosphates include headaches, excessive sweating, muscle weakness, diarrhea, vomiting, salivation, respiratory distress, muscle contractions, blurred vision, cognitive difficulties, seizures and coma.[43] Acute overexposure to organophosphates can be fatal. However, mortality rates depend on several factors, including: the type of chemical used, dose amount, overall patient health, time between discovery and transport, inadequate respiratory observation, and difficulty in weaning off ventilatory support.[44] The most common cause of death resulting from acute overexposure is respiratory failure.[45]

Epidemiologic studies indicate that chronic exposure to organophosphates is associated with significant long-term consequences, including deficits in cognitive and psychomotor function, decreased vibration sensitivity, and impaired nerve conduction.[46] A ten-year study in California found that Hispanic farm workers had a 70 percent greater chance of developing stomach cancer than the comparable nonagricultural Hispanic population. The study also suggested higher risks of brain cancer for male farm workers and increased risks of uterine cancer for female farm workers.[47] Another study approximates "that the incidence of non-Hodgkin's lymphoma among men exposed to a particular herbicide for more than 20 days per year may be as high as six times the incidence rate among those not thus exposed."[48] Although these results are not dispositive, the studies

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severe poisoning as a decline to less than 10 percent of normal cholinesterase enzyme activity. *Id.*

43. *Recognition and Management of Pesticide Poisonings*, *supra* note 18 at 38 (describing signs and symptoms of organophosphate poisoning).

44. Katz et al., *supra* note 15.

45. *Id.*

46. *See* Michael C.R. Alavanja, *Health Effects of Chronic Pesticide Exposure: Cancer and Neurotoxicity*, 25 ANNUAL REV. PUBLIC HEALTH 155, 176 (2004), *available at* http://arjournals.annualreviews.org/doi/abs/10.1146/annurev.publhealth.25.101802.123020 (noting that in some cases "effects were observed 10 or more years after poisoning").

47. Cunningham-Parmeter, *supra* note 1, at 443 (interpreting the findings of Paul K. Mills & Sandy Kwong, *Cancer Incidence in the United Farmworkers of America (UFW) 1987-1997* (Revised May 22, 2001), *available at* http://www.ufw.org/white_papers/cancerfw.pdf, which reported that rates of leukemia, stomach cancer, uterine cancer, and cervical cancer among farm workers were elevated by 59 percent, 69 percent, 68 percent, and 63 percent, respectively).

48. U.S. GEN. ACCOUNTING OFFICE, PUB. NO. GAO/PEMD-94-6, PESTICIDES ON FARMS: LIMITED CAPABILITY EXISTS TO MONITOR OCCUPATIONAL ILLNESS AND INJURIES (1993), http://archive.gao.gov/t2pbat4/150612.pdf.

suggest that high levels of exposure to pesticides may contribute to an elevated level of risk.[49]

Because of inconclusive data regarding both the long-term effects of organophosphate exposure and the relative dose amounts necessary to cause harm,[50] regulating the registration, distribution, and application of these chemicals is difficult at best. Concern and controversy over the use of health risk assessments in the regulatory decisionmaking process is due to a number of factors, including industry's concern over the unwarranted cost of complying with environmental regulations, environmentalists' concern that risk-assessment practices and policies do not properly protect human and environmental integrity, society's wavering confidence in the regulatory decisionmaking process, and growing awareness that the many risk assessments are based on uncertain science.[51]

Despite the disparate views held by opponents and proponents of pesticides like organophosphates, concerns over the general public's exposure to pesticides spurred Congress to adopt the Food Quality Protection Act in 1996.[52] Under the Act, the Environmental Protection Agency (EPA) was required to begin reevaluating existing pesticides to determine their effects on human health and the environment. Because of their widespread use, high toxicity, and known and potential effects to humans and the environment, EPA selected organophosphates as the first group of pesticides for assessment.[53] Between July 2000 and June 2002, EPA held several public briefings to discuss issues rel-

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49. *Id.*

50. *See Organophosphate Pesticides and Child Health: A Primer for Health Care Providers*, *available at* http://depts.washington.edu/opchild/chronic.html (last visited Dec. 12, 2008). Chronic OP toxicity is characterized by subtle, often sub-clinical symptoms (compared to acute toxicity) and variable time lag between exposure and illness (often not immediate). Because of these characteristics, connecting illness to chronic pesticide exposure is difficult. Organophosphates are known to act on the nervous system, thus the research to date has largely focused on determining if chronic OP exposures cause neurodevelopmental effects.

51. George W. Lucier & Arnold Schecter, *Human Exposure Assessment and the National Toxicology Program*, 106 ENVT'L HEALTH PERSPECTIVE (1998), *available at* http://www.ehponline.org/members/1998/106p623-627lucier/lucier-full.html.

52. Pub. L. No. 104-170, 110 Stat. 1489 (1996) (codified as amended in various sections of 7 U.S.C. § 136); *see* METCALFE ET AL., *supra* note 24, at 35. The Food Quality Protection Act of 1996 amended the Federal Food, Drug, and Cosmetic Act, and the Federal Insecticide, Fungicide, and Rodenticide Act by fundamentally changing how EPA regulates pesticides.

53. *See* U.S. EPA and USDA Committee to Advise on Reassessment and Transition (CARAT) National Advisory Council for Environmental Policy & Technology, *Progress in Completing Individual Organophosphate Assessments* 2 [hereinafter

evant to technical guidance documents: hazard, dose-response, and exposure assessments; and preliminary and revised cumulative risk assessments.[54] EPA released its preliminary assessment in 2001 and a revised version in 2002.[55] The 2006 Update to the OP Cumulative Assessment delineates the potential dangers associated with over thirty organophosphates.[56] Unfortunately, this review only considered aggregate exposure from food, drinking water and residential uses—occupational exposure was not addressed.[57]

III.
EXPOSURE BY SENSITIVE SUBPOPULATIONS

Successful pesticide regulation should avoid or curtail the hazards associated with pesticide exposure while maintaining the economic well-being of growers, consumers and the pesticide industry. It should include testing products for potential effects on human nervous, reproductive and immune systems as well as for possible adverse effects to farm workers.[58]

The current exposure database of the National Toxicology Program[59] offers strong evidence that "body burdens"[60] of specific chemicals vary tremendously across the U.S. population.[61] The chief factors influencing these differences are "age, sex, workplace exposures, lifestyle, diet, urban or rural settings, accidental exposures, and social and cultural inequities in environmental and occupational exposures."[62] Scientific investigation of environmental exposures has found that some individuals may be ex-

CARAT OP Progress], *available at* http://www.epa.gov/pesticides/carat/2001/june/progressop.pdf (last visited Feb. 19, 2008).

54. U.S. EPA, *Organophosphorus Cumulative Risk Assessment—2006 Update* 34, *available at* http://www.epa.gov/pesticides/cumulative/2006-op/op_cra_main.pdf (last visited Jan. 23, 2008).

55. *See* CARAT OP Progress, *supra* note 53, at 53.

56. *Id.*

57. *Id.*

58. *See* METCALFE ET AL., *supra* note 24, at 7 (discussing effective pesticide policies in terms of costs and benefits to society).

59. The National Toxicology Program is operated by the United States Department of Health and Human Services. *See* National Toxicology Program, http://ntp.niehs.nih.gov/ (last visited Feb. 19, 2009).

60. "Body burden" refers to the amount of a chemical stored in the body at a given time, especially a potential toxin in the body as the result of exposure. U.S. EPA Terms of Environment Glossary, http://www.epa.gov/OCEPATERMS/ (last visited Feb. 19, 2008).

61. Lucier & Schecter, *supra* note 51.

62. *Id.*

posed to doses as high as 100 times greater than the average person.[63] Studies suggest that the majority of these increased-exposure cases involve farm workers and their children.[64] Thus, we must ask what might be done to decrease such exposure and the risk of side effects that may result.

A. *Concern for Farm Worker Exposure*

Agricultural work is hard and hazardous. Annual rates of work-related deaths among farm workers are two to four times greater than those for the general workforce.[65] Farm workers endure greater exposure to some of the most dangerous pesticides than any other group in the nation.[66] In 2000, EPA announced in a pesticide registration notice that it was "particularly concerned for workers and handlers of pesticides because of the relatively high risks indicated by current assessments, the acute toxicity of these compounds coupled with the large volume of chemicals handled, and the potential for accidental exposure to concentrated products frequently used in commercial applications."[67] This highly vulnerable population can be exposed to pesticides by various routes of exposure, such as through handling pesticide products, performing tasks in recently treated areas, and via contaminated clothing or drift spray.

Between 2001 and 2005, the Washington Department of Health Pesticide Program reported an increase in occupational cases of pesticide-related illnesses among agricultural workers from approximately thirty to more than sixty cases.[68] While

63. GINA SOLOMON, TROUBLE ON THE FARM: GROWING UP WITH PESTICIDES IN AGRICULTURAL COMMUNITIES 12, *available at* http://www.epa.gov/opprd001/nrdc_objections/03-19-attach-D-1-4.pdf (last visited Feb. 19, 2009).

64. *Id.* at 12 (offering examples of workers and poor people who often rely on subsistence fishing for food and, thereby, receive higher levels of exposure to mercury, or often live in old, substandard housing where lead levels may be far above acceptable levels).

65. *Id.* at 1.

66. *Id.*

67. U.S. EPA, PESTICIDE REGISTRATION NOTICE 2000-9: NOTICE TO MANUFACTURERS, PRODUCERS, FORMULATORS AND REGISTRANTS OF PESTICIDE PRODUCTS 4 (Sept. 29, 2000), *available at* http://www.epa.gov/PR_Notices/pr2000-9.pdf (discussing the reason for EPA's approach to mitigating occupational risk of exposure to organophosphates).

68. WASHINGTON STATE DEPARTMENT OF HEALTH, 2005 ANNUAL REPORT: PESTICIDE INCIDENT REPORTING AND TRACKING REVIEW PANEL 70 (May 2007), *available at* http://www.doh.wa.gov/ehp/Pirt/pirt2006rpt.pdf (discussing the trend in reported occupational cases of pesticide-related illnesses in Washington).

these numbers are lower than those reported in the 1990s,[69] some experts contend that these figures are unrealistic and underrepresent the actual number of poisonings. They contend that the low numbers are due, in part, to a failure of many workers to report harmful exposure for fear of losing their jobs or because of their immigration status, as a result of language barriers or a lack of knowledge and understanding about the possible reasons for certain symptoms, and other reasons often endemic to the farm worker population.[70] Farm workers typically have no health insurance or personal transportation, do not speak English, and fear deportation even if they have all of their documentation. As a result, they are unlikely to seek medical care unless they are gravely ill, and they are even less likely to submit a report that could jeopardize their employment.[71] Even when farm workers do seek medical care, they are often misdiagnosed. Many doctors lack exposure to and knowledge of pesticide-related poisonings.[72] Physicians often misdiagnose overexposures as the stomach flu, bronchitis, or asthma.[73] Furthermore, most of the rural medical clinics that serve injured farm workers are not equipped to test blood or urine samples for pesticides after an exposure has occurred.[74] Some experts suggest that undiagnosed cases of farm-worker exposure may outnumber diagnosed cases.[75]

A number of studies also suggest that the number of pesticide poisonings is much larger than that actually reported. A 2002 survey in Colorado found that one-half of the farm workers examined had experienced pesticide exposure injuries, including skin irritation, eye inflammation, headaches, and nose and throat irritation.[76] In 1999, the EPA sponsored a study in Oregon, finding that roughly 66 percent of the state's farm workers had been

69. *Id.*

70. Andrew Garber, *Pesticide Testing Ahead for Many State Farm Workers*, SEATTLE TIMES, Dec. 1, 2003, *available at* http://community.seattletimes.nwsource.com/archive/?date=20031201&slug=pesticide01m.

71. Valerie Gregg, *The Healing Fields*, MOMENTUM (Winter 2000), *available at* http://whsc.emory.edu/_pubs/momentum/2000winter/field.html.

72. *Id.*

73. *Id.*

74. *Id.*

75. *See* J. Blondell, *Epidemiology of Pesticide Poisonings in the United States, with Special Reference to Occupational Cases*, 12 OCCUPATIONAL MEDICINE: STATE OF THE ART REVIEWS 209, 218 (1997).

76. *See* Coleman Cornelius, *Report: Farmworkers Plagued by Pesticides*, DENVER POST, Aug. 19, 2002, at A1 (summarizing the results of a survey conducted by Colorado Legal Services).

directly exposed to pesticides via inhalation and over one-third suffered acute injuries, including headache and joint pain.[77] Another EPA study, conducted nationwide in the early 1990s, suggested that doctors treat approximately ten to twenty thousand cases of pesticide poisoning per year, and possibly as high as forty thousand.[78] As early as 1992, the EPA estimated that, including unreported and misdiagnosed incidents, "each year farmworkers suffer up to 300,000 acute illnesses and injuries from exposure to pesticides."[79]

In addition to underreporting, the lack of reliable statistics on pesticide-related farm-worker poisoning is also due to the absence of a national recording or monitoring system for exposure-related injuries. As a result, regulators must rely on states' public health departments to provide adequate data collection.[80] Yet, despite the 1.1 billion pounds of pesticides sprayed on crops annually nationwide,[81] only two states—Washington and California—have mandatory medical monitoring requirements for workers exposed to pesticides.[82] Furthermore, only about one-half of the nation's states have adopted mandatory reporting systems equipped to provide information on pesticide-related injuries. Most of those states' reporting categories, though, are not tailored to identify exposure among farm workers in the workplace.[83]

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77. Cunningham-Parmeter, *supra* note 1, at 444 (citing a study by the U.S. EPA, OFFICE FOR CIVIL RIGHTS AND ENVIRONMENTAL JUSTICE, OREGON FARMWORKER WORKER PROTECTION STANDARD (WPS) PILOT AND SURVEY 6 (1999)).

78. *See* Blondell, *supra* note 75, at 218; *see also* NATURAL RESOURCES DEFENSE COUNCIL, TROUBLE ON THE FARM: GROWING UP WITH PESTICIDES IN AGRICULTURAL COMMUNITIES Ch. 1 (1998), *available at* http://www.nrdc.org/health/kids/farm/farminx.asp (last visited Feb. 19, 2009) (discussing exposure to dangerous pesticides by farmers, farm workers, and their children and related health threats).

79. *See* U.S. GEN. ACCOUNTING OFFICE, PUB. NO. GAO/HRD-92-46, HIRED FARMWORKERS: HEALTH AND WELL-BEING AT RISK 13 (1992), *available at* http://archive.gao.gov/t2pbat7/145941.pdf (discussing farm worker's exposure to pesticides in the context of determining the extent to which the health and well-being of such laborers are protected by federal laws, regulations, and programs).

80. Cunningham-Parmeter, *supra* note 1, at 445.

81. *See* Pimentel, *supra* note 21, at 59 (summarizing data related to US pesticide use); *see also* KIELY ET AL., *supra* note 21, at 8 (suggesting that the global pesticide use in 2000 and 2001 was more than 1.2 billion pounds).

82. *See* National Institute for Occupational Safety and Health, *Ch. 3 – Case Ascertainment*, *in* PESTICIDE-RELATED ILLNESS AND INJURY SURVEILLANCE: A HOW-TO GUIDE FOR STATE-BASED PROGRAMS, NIOSH Publication No. 2006-102 (2006), *available at* http://www.cdc.gov/niosh/docs/2006-102/2006-102.pdf (describing briefly in subsection 3.10 California's and Washington's medical monitoring programs).

83. *Id.*

In addition, the United States Department of Agriculture recently announced that it plans to cease publishing its national survey tracking pesticide use, notwithstanding opposition from scientists, farming organizations and environmental groups.[84] This is particularly troubling, because even though the data is not publicly available, farmers and consumer advocates are critically dependent on the agency's report for detailed national information on pesticide use. And the EPA uses the data in regulating pesticides and determining public health risks from pesticidal products.[85] Furthermore, under federal law, the application of the vast majority of pesticides—approximately 75 percent of all pesticides registered in the United States—does not trigger any recording or record-keeping requirements, while public access to data generated from applicator records of the remaining 25 percent are severely limited.[86]

B. *Exposure by Children of Farm Workers*

Pesticides pose particular risks to children of farm workers, who are especially susceptible to overexposure due to physical

84. Garance Burke, *USDA Axes National Survey Charting Pesticide Use*, SEATTLE TIMES, May 22, 2008, *available at* http://seattletimes.nwsource.com/html/nationworld/2004431125_apfarmscenepesticidetracking.html.

85. *Id.* (noting that the information contained in the U.S.D.A. reports is otherwise only available from private sources that charge subscription fees of $500,000).

86. The only recordkeeping requirement found in FIFRA relates to restricted-use pesticides, which comprise only about a quarter of all pesticides used in the United States. *See* U.S. EPA, *Pesticides: Health and Safety, Restricted-Use Pesticides*, *available at* http://www.epa.gov/pesticides/safety/applicators/restrict.htm (last visited Feb. 19, 2009). The relevant FIFRA provision mandates that applicators of restricted use pesticides shall:

> Maintain records comparable to records maintained by commercial applicators of pesticides in each State. If there is no State requirement for the maintenance of records, such applicator shall maintain records that contain the product name, amount, approximate date of application, and location of application of each such pesticide used for a 2-year period after such use.

7 U.S.C. § 136i-1(a)(1). Access to such information, however, is limited only "to any Federal or State agency that deals with pesticide use or any health or environmental issue related to the use of pesticides, on the request of such agency." "In no case," however, "may a government agency release data, including the location from which the data was derived, that would directly or indirectly reveal the identity of individual producers." *Id.* at § 136i-1(b). The only exception to this rule is where "a health professional determines that pesticide information maintained under this section is necessary to provide medical treatment or first aid to an individual who may have been exposed to pesticides for which the information is maintained." *Id.* at § 136i-1(c). Restricted use pesticides are those pesticides that, under FIFRA, require special handling because of toxicity concerns and that may be applied only by trained, certified applicators or those under their direct supervision. *See* U.S. EPA, *supra.*

immaturity.[87] Organophosphates, in particular, have been shown to act as developmental toxicants and can have a detrimental impact on the normal development of fetuses, infants and children, even at levels that have heretofore been considered too low to produce symptoms of pesticide poisonings.[88] Moreover, children often detoxify chemicals at substantially different rates than adults, in part because children's organs and physiologic systems are constantly growing, maturing and changing until the end of adolescence. Accordingly, their ability to detoxify and eliminate toxics depends greatly on their level and extent of development.[89] Additionally, children usually experience greater exposure to environmental pollutants due to activities that involve contact with dirt, floor surfaces and oral behavior.[90] Also, because children tend to have high energy demands that relate to their rate of growth, they typically consume more food and water and breathe more air per pound of body weight than adults.[91] As a result, children tend to receive relatively higher quantities of toxic contaminants through their intake of food, water and air.[92]

87. *See* Michael Schon, *Susceptible Children: Why the EPA's New Risk Assessment Guidelines for Children Fail to Protect America's Future*, 36 ARIZ. ST. L.J. 701, 708-710 (highlighting the greater vulnerability of children as compared to adults to exposure from pesticides and other chemicals).

88. *See* Frederica P. Perera et al., *Effects of Transplacental Exposure to Environmental Pollutants on Birth Outcomes in a Multiethnic Population*, 111 ENVT'L HEALTH PERSPECTIVES 201 (2003), *available at* http://www.ehponline.org/members/2003/5742/5742.pdf (discussing a study that found that prenatal exposure to certain organophosphates was associated with low birth weight and smaller head circumference, and which evidenced a correlation between pesticides and fetal development); Stephen Brimijoin and Carol Koenigsberger, *Cholinesterases in Neural Development: New Findings and Toxicologic Implications*, 107 ENVT'L HEALTH PERSPECTIVES 59-64 (1999), *available at* http://www.ehponline.org/members/1999/Suppl-1/59-64brimijoin/brimijoin-full.html (discussing study that notes recent observations indicating that organophosphorus exposure can affect DNA synthesis and cell survival in neonatal rat brain); Brenda Eskenazi et al., *Organophosphate Pesticide Exposures and Neurodevelopment in Young Mexican-American Children*, 115 ENVT'L HEALTH PERSPECTIVES 702, 711 (2007) (discussing study showing a correlation between exposure to organophosphates and other pesticides and lower performance in gross motor, eye-hand coordination, draw-a-person, and delayed recall and, generally, with mental retardation and pervasive developmental problems).

89. *See* SOLOMON, *supra* note 63, at 14 (discussing susceptibility to pesticides and individuals' ability to detoxify organophosphates); *see also* Fawn Pattison & Katherine M. Shea, *A Collaborative Model for Children's Environmental Health Policy: The North Carolina School Children's Health Act of 2006*, 17 DUKE ENVTL. L. & POL'Y F. 233, 235 (2007).

90. SOLOMON, *supra* note 63, at 12 (considering children's unique risk from pesticides).

91. *Id.*

92. Pattison & Shea, *supra* note 89, at 235.

While children are the most susceptible to harmful organophosphate exposure, children who live on or work near a farm are at the greatest risk of all. These farm children come into contact with pesticides through residues on parents' clothing, dirt and dust entering the home, contaminated soil in outdoor play areas, food products brought directly from the fields to the table, and contaminated well water, "making these children likely to be the most pesticide-exposed subgroup in the United States."[93] These children often work with their parents in the field, elevating their exposure even more.[94] While allowing minors to accompany their parents into the field to work may be questionable practice, the Fair Labor Standards Act allows most children to work in agriculture and hazardous conditions.[95] So long as the work can be classified as "hazardous" but not "particularly hazardous,"[96] the exemptions under the Act allow most children to work in harsh farming activities.[97] Children can work in hazardous conditions on a farm owned or operated by their parents, regardless of their age, so long as the parent also works on that farm.[98] Where the child is under the age of fourteen, she only needs her parent's consent; a child over fourteen does not need parental consent.[99] The impact of these underage exposures is extremely troubling.

Today, over 400,000 children under the age of six live on farms in the United States and hundreds of thousands more live near fields and have family members who work on farms.[100] These children have been likened to canaries used by miners to test for poisonous gas[101] as they face considerably more peril from expo-

93. SOLOMON, *supra* note 63, at vii.

94. *Id.* at 18.

95. 29 U.S.C.S. § 213(c); Celeste Corlett, *Impact of the 2000 Child Labor Treaty on United States Child Laborers*, 19 ARIZ. J. INT'L & COMP. LAW 713, 720 (2002).

96. *See* 29 U.S.C.S. § 213(c)(1)(A); 29 C.F.R. § 570.70(b); Corlett, *supra* note 95, at 720; *see also Breitwieser v KMS Indus.*, 467 F.2d 1391 (5th Cir. 1972), *cert. denied* 410 U.S. 969 (1973) (explaining that the Department of Labor declared the operation of a high lift forklift truck to be a "particularly hazardous" occupation for employees under 18).

97. Corlett, *supra* note 95, at 720.

98. *Id.*; 29 U.S.C.S. § 213(c)(1)(A); 29 C.F.R. § 570.70(b).

99. 29 U.S.C.S. § 213(c)(1)(C); Corlett, *supra* note 95, at 720.

100. SOLOMON, *supra* note 63, at 1.

101. *Id.*; Canaries, due to their small size and rapid respiratory rate, are more sensitive than humans to these gases. As a result, the birds would die before the miners suffered any adverse effects, providing notice to the miners of dangerous conditions.

sure due to their heightened susceptibility to chemical exposure.[102]

IV.
THE WASHINGTON STATE MEDICAL MONITORING CASE

In 1986, farm laborers in the State of Washington requested a medical monitoring rule, following the lead of California, which had adopted a mandatory rule in 1974. The farmers argued that they and their children were in grave danger from pesticide exposure. The Washington State Department of Labor and Industries refused to implement the requested rule.[103] Three years later, the farm workers renewed their request in light of new studies from California, but the Department refused again.[104] In 1993, the Department of Labor and Industries adopted a discretionary monitoring rule in response to farm workers' threats of litigation and formed a technical advisory committee to work on proposals.[105] In 1995, the technical advisory committee recommended mandatory medical monitoring, which the Department of Labor and Industries again disregarded.[106] Subsequently, the program died because of a lack in local grower interest.[107]

A. *Medical Monitoring Rule*

In 1997, in Yakima County, Washington, a farm worker named Juan Rios complained to his physician about pain, dizzy spells, and nose bleeds when working with pesticides in vineyards.[108] After examining Rios, his doctor suggested that if he valued his health, Rios should leave his job.[109] But Rios had a family to support, so quitting was not an option. Instead, in an effort to protect himself and other field workers, he sued the State of

102. *Id.* at 2.

103. *See* Washington State Labor Council, *Farm Workers & Pesticides*, *available at* http://www.wslc.org/legis/fw-pesticide.htm (last visited Feb. 7, 2008).

104. *Id.*

105. *Id.*; *see* SCIENTIFIC ADVISORY COMMITTEE FOR CHOLINESTERASE MONITORING, FINAL REPORT: CHOLINESTERASE MONITORING OF PESTICIDE HANDLERS IN AGRICULTURE, 2004 1 (Mar. 30, 2005), *available at* http://www.lni.wa.gov/Safety/Topics/AtoZ/Cholinesterase/files/final.pdf.

106. *Id.*

107. *Id.*

108. Garber, *supra* note 70.

109. *Id.*

Washington to force growers to test workers for pesticide exposure.[110]

In the 2002 case of *Rios v. Washington Dep't of Labor & Industries*, the Washington Supreme Court found that the Washington Department of Labor and Industries violated the Washington Industrial Safety and Health Act by declining to begin mandatory medical monitoring rulemaking for farm workers who handle pesticides.[111] The Court cited a 1995 Department of Labor and Industries technical report that showed the National Institute of Occupational Safety and Health and the World Health Organization recognize habitual blood cholinesterase monitoring as an imperative resource in preventing occupational overexposure to pesticides.[112] As a result, the Court directed the Department to commence rulemaking immediately.[113] Washington's Cholinesterase Monitoring Rule (the Rule) was adopted in December 2003 and amended in 2005.[114]

The primary purpose of the Rule is to protect workers from exposure to certain organophosphates and carbamates by monitoring cholinesterase levels to prevent elevated exposure, illness, and unsafe working conditions.[115] The Rule allows farm workers to provide blood samples at the start of the spray season to establish a baseline.[116] After working continuously with organophosphates or carbamates for thirty hours in any consecutive thirty-day period, workers are required to submit a follow-up sample for comparative purposes.[117] If a worker's cholinesterase level drops more than 20 percent below the baseline, a workplace investigation is required.[118] Where levels of exposure are determined to exceed safe levels and a worker's cholinesterase level

110. Washington State Labor Council, *supra* note 103.

111. *Rios v. Washington Dep't of Labor & Indus.*, 145 Wash. 2d 483, 508 (2002).

112. *Id.* at 505-06.

113. *Id.* at 508.

114. *See* JOHN FURMAN, WASHINGTON STATE DEPARTMENT OF LABOR & INDUSTRIES, CHOLINESTERASE MONITORING OF PESTICIDE HANDLERS IN AGRICULTURE: 2007 FINAL REPORT 3 (Dec. 24, 2007), *available at* http://www.lni.wa.gov/Safety/Topics/AtoZ/Cholinesterase/files/DOSH_ChE_Report07_Final_010407.pdf.

115. *See generally* WASHINGTON STATE DEPARTMENT OF LABOR & INDUSTRIES, SAFETY STANDARDS FOR AGRICULTURE: CHOLINESTERASE MONITORING CH. 296-307 WAC, *available at* http://www.lni.wa.gov/WISHA/Rules/agriculture/HTML/part-j-1.htm#WAC296-307-148 (last visited Feb. 19, 2009).

116. *Id.* at 296-307-14820.

117. *Id.*

118. *Id.* at 296-307-14825.

drops by 30 percent or more, that worker must be removed, at least temporarily, from handling pesticides.[119]

B. *Opponents of the Rule*

The Rule faced opposition from various groups based on concerns about cost, necessity and the reliability of testing procedures. Washington growers' leading concern was the cost of testing farm workers. According to a 2003 estimate, the total annual cost to industry under the Rule would be about $1.27 million.[120] Growers asserted that they had no way to pass on the cost to consumers because of national and global competition.[121] Growers feared that complying with the Rule would push many out of business.[122] The medical and farming communities also argued that the rule was an unnecessary overreaction that would misappropriate limited resources away from more pressing issues.[123] Growers pointed to the fact that Washington State already required protective equipment for handlers of pesticides and asserted that the chemicals were safe when used properly.[124] Furthermore, growers urged that any safety or medical issues that arose from field work were not from a lack of blood testing, but rather a lack of proper protective equipment or use.[125]

Opponents of the Rule also believed that cholinesterase testing, in itself, was unreliable. Among other arguments, they challenged the competence and testing methods of laboratories in Washington State and contended that flaws in testing procedures invalidated the test results.[126] Moreover, they pointed to other factors, such as medication taken by a worker, as alternative reasons for reduced enzyme levels.[127]

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119. *Id.*

120. WASHINGTON STATE DEPARTMENT OF LABOR AND INDUSTRIES, BENEFIT-COST DETERMINATION: CHOLINESTERASE MONITORING IN AGRICULTURE 23 (Dec. 2, 2003), *available at* http://www.lni.wa.gov/wisha/p-ts/Cholinesterase/ChE-BCD-Final.pdf.

121. Garber, *supra* note 70.

122. *Id.*

123. *Id.*

124. *Id.*

125. *Id.*

126. *Id.* (discussing the testimony of Dr. Steven Smith, medical director at the U.S. Army's Umatilla Chemical Agent Disposal Facility in Oregon, to the Washington Legislature in 2003).

127. Hal Bernton, *Chemical Exposure of Farmworkers Studied*, SEATTLE TIMES, May 13, 2004, *available at* http://community.seattletimes.nwsource.com/archive/?date=20040513&slug=pesticides13m.

C. *Initial Results*

In its first year, cholinesterase testing of farm workers by the Washington State Department of Health (WSDH) revealed that of the 580 workers who were tracked[128] during the 2004 spraying season, twenty-two workers (3.8 percent) showed significant overexposure resulting in the depression of cholinesterase levels of more than 30 percent below baseline. In accordance with the Rule, these workers all required immediate removal from pesticide handling.[129] An additional ninety-seven workers (16.1 percent) revealed cholinesterase decreases exceeding 20 percent, thereby requiring a workplace investigation.[130]

As noted in Table 1, results from 2005–2007 indicate an overall drop in the number and percentage of farm workers with significant overexposure. It is noteworthy that over the four-year period, the number of workers tracked under the Rule declined. While the reason for the decline has not been investigated, Washington State Department of Labor & Industries presumes that it is due to employers reducing exposure time by improving their ability to estimate how long workers have been exposed in the fields.[131]

TABLE 1
Comparison of Cholinesterase Testing and Depression in 2004–2007[132]

	2004	2005	2006	2007
Number of workers tracked	580	611	471	386
Workers with cholinesterase depression exceeding 20% requiring workplace investigation	97 (16.7%)	49 (8%)	50 (10.6%)	49 (12.6%)
Workers with cholinesterase depression exceeding 30% requiring removal of worker	22 (3.8%)	10 (1.6%)	7 (1.5%)	18 (4.6%)

According to the nonprofit Farm Worker Pesticide Project (FWPP), though, the number of documented workers with significant cholinesterase depressions may be inaccurately low because many workers with such depressions may have been excluded by

128. The number of workers tracked means those who submitted a baseline test and at least one periodic test. *See generally* FURMAN, *supra* note 114, at 1, 9.
129. *Id.* at 9.
130. *Id.*
131. *Id.* at 7.
132. *Id.*

these tests.[133] FWPP suggests that Pesticide Incident Reporting and Tracking reports for 2004 show that three groups of workers with significant cholinesterase depressions were not included in the program's totals: 1) pesticide handlers who were not covered by the program because they did not handle pesticides for more than thirty hours in a thirty-day period; 2) handlers who experienced acute exposures after receiving baseline testing but who did not receive a follow-up test; and 3) workers who were not covered by the program because they did not "handle" pesticides directly, as defined by the Rule, but who were nonetheless exposed to significant levels of organophosphates and other pesticides through the thinning and harvesting of crops and while engaged in other farm work.[134]

In addition, the Rule does not require farm workers to comply with the blood testing procedures. Therefore, the same accuracy limitations noted earlier may be applicable, namely that exposure incidents were underreported because some workers may have been reluctant to submit to blood testing for fear of losing their jobs, or because of immigration status, language barriers, or lack of understanding of their symptoms or of the risks.[135]

V.
IMPROVING FARM WORKER PROTECTIONS

Americans are the world's top consumers. As members of such a privileged group, Americans expect a wealth of food products at minimum cost.[136] Although they are concerned about the risks pesticides pose to their health, American consumers have yet to demonstrate equal concern for the pesticide-related hazards faced by farm workers on a daily basis.[137] While the $230 billion agriculture industry is practically completely dependent on millions of farm workers nationwide, "the vast surplus of field laborers in the United States reinforces farm workers' fungible status within the agriculture industry."[138] Because the struggling Mexican economy pays an average wage of eight dollars per day, a steady stream of immigrants travels to the U.S. in search of

133. FARM WORKER PESTICIDE PROJECT ET AL., MORE MESSAGES FROM MONITORING: YEAR 2 OF WASHINGTON STATE'S FARM WORKER MEDICAL TRACKING PROGRAM 3-4 (2006), *available at* http://www.fwpp.org/media/?id=30.

134. *Id.*

135. *See supra* notes 73-75 and accompanying text.

136. Cunningham-Parmeter, *supra* note 1, at 432.

137. *Id.* at 435.

138. *Id.*

a more tolerable income.[139] Additionally, lenient enforcement of federal immigration laws contributes to the problem by allowing growers to hire undocumented workers.[140] These factors guarantee a constant supply of cheap labor, limiting farm workers' ability to voice concerns among themselves and act collectively as a group. Society's willingness to neglect the plight of these workers perpetuates their predicament by guaranteeing this issue remains out-of-sight and out-of-mind.[141] Moreover, growers and the pesticide industry have successfully drawn the public's attention away from the risks these chemicals pose to workers and focused on the "rich agricultural bounties" that the pesticides provide.[142] Like all things that seem too good to be true, enjoying such bounties comes at a price. Unfortunately, it is one the poorest and most underprotected groups in the country who must bear the burden. Although many commentators agree that this situation is unacceptable, changes do not appear imminent.[143]

A. *Determining Risks*

The conflict over regulating toxic substances primarily revolves around how to protect public health in light of the uncertainties regarding the identification and assessment of the risks these toxicants pose to human and environmental health. Hazardous substance regulation historically has been reactive rather than preventative.[144] This is due largely to the complexity of predicting harm before it becomes apparent.[145] Organophosphates and other pesticides are among the toxic chemicals that currently are at the center of the regulatory debate. While the short-term effects that these toxicants pose to farm workers are relatively clear, less evident is the amount of exposure necessary to result in long-term effects like cancer, reproductive problems, and death. Because scientific uncertainty presents huge obstacles in the environmental regulatory field, decisionmakers have increas-

139. *Id.*

140. *Id.*

141. *Id.* at 435-36.

142. *Id.* at 434.

143. *Id.*

144. ROBERT V. PERCIVAL ET AL., ENVIRONMENTAL REGULATION: LAW, SCIENCE, AND POLICY 334 (4th ed. 2003).

145. *Id.*

ingly relied on "risk assessment" and "risk management" when making policy determinations.[146]

The degree of certainty necessary before preventative regulation is appropriate was considered in *Ethyl Corp. v. EPA*.[147] In upholding the EPA Administrator's determination,[148] the court noted that defining "danger" does not require a rigid probability of harm, but is comprised of a combination of risk and harm.[149] The court went on to elucidate that regulatory steps may be taken in anticipation of the threatened harm: "The very existence of such a precautionary legislation would seem to demand that regulatory action precede, and, optimally, prevent the perceived threat."[150] Moreover, it stated that,

> "[w]here a statute is precautionary in nature, the evidence difficult to come by, uncertain, or conflicting because it is on the frontiers of scientific knowledge, the regulations designed to protect the public health, and the decision that of an expert administrator, we will not demand rigorous step-by-step proof of cause and effect."[151]

In the context of pesticide regulation, the *Ethyl Corp.* case suggests that concrete scientific evidence on the chronic effects of pesticide exposure is not absolutely necessary for regulatory action to be taken to prevent the risk of harm these toxicants present to farm workers and their families. Current evidence suggests a strong causal link between chronic exposure and serious health and reproductive problems. Acute exposure has also been linked to serious effects ranging from seizure and coma to

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146. *Id.* at 345 (explaining that "risk assessment" is the evaluation of "effects of exposure to hazardous materials or situations," while "risk management" involves evaluating alternatives and determining the "most appropriate regulatory action, if any, for responding to these risks").

147. 541 F.2d 1, 3 (D.C. Cir. 1976) (en banc).

148. The main issue in this case was whether the Agency properly required annual reductions of lead content in gasoline pursuant to its authority under the Clean Air Act to regulate gasoline additives having emissions that "endanger the public health or welfare." 42 U.S.C. § 1857f-6c(c)(1)(A). The EPA Administrator had determined that lead gasoline posed "'a significant risk of harm to the health of urban populations, particularly to the health of city children,'" *Ethyl Corp.*, 541 F.2d at 20 (citing to 38 Fed. Reg. 33734). On that basis, the Administrator ordered reductions in the lead content of gasoline. *Id.* at 15-16. Siding with the Agency, the court held that the Administrator was entitled to "apply his expertise to draw conclusions from suspected, but not completely substantiated, relationships between facts, from trends among facts, from theoretical projections, from imperfect data, from probative preliminary data not yet certifiable as 'fact,' and the like." *Ethyl Corp.*, 541 F.2d at 28.

149. *Id.* at 18.

150. *Id.* at 24.

151. *Id.* at 28.

death. Even if scientific uncertainty still exists as to the degree of risk organophosphates and other pesticides pose, there is adequate evidence indicating that preventative regulation is essential.

B. *The Pesticide Industry*

From the time of farm-worker rights leader Cesar Chavez,[152] the chemical industry, with its considerable economic and political power, has effectively opposed major changes in pesticide use and safety.[153]

The manufacturing, distribution and application of chemicals are tremendous money-making businesses. While updated figures are difficult to locate, the EPA estimates that in both 2000 and 2001, Americans spent more than $11 billion on pesticides.[154] That constituted approximately one-third of global pesticide expenditures for those years.[155] Nearly 120 American manufacturers of pesticides and around 2,200 formulators[156] market over 20,000 different pesticide products every year.[157] In spite of increasing concerns over consumption safety and an increasing demand for organically produced food, pesticide use in the U.S. continues to rise.[158] Observers of the industry suggest that the U.S. is simply not committed to reducing its widespread use of pesticides.[159] According to the United Nations Food and Agriculture Organization, pesticides are expected to increase steadily over the upcoming decades.[160] Therefore, regulation of and restrictions on pesticide use must stay apace of this growth in order to meet the challenge of an expected rise in exposure.

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152. Cesar Chavez was a well-known leader of the farm worker's rights movement during the 1950s-1970s. Among other efforts, he fought to reduce the exposure of farm workers to agricultural chemicals in an attempt to improve their working conditions. *See* Cunningham-Parmeter, *supra* note 1, at 439.

153. Cunningham-Parmeter, *supra id.*, at 439.

154. *See* KIELY ET AL., *supra* note 21, at 4.

155. *Id.*

156. *Id.* at 20.

157. ARNOLD L. ASPELIN & ARTHUR H. GRUBE, U.S. EPA, PESTICIDE INDUSTRY SALE AND USE: 1996 AND 1997 MARKET ESTIMATES 4 (Nov. 1999), *available at* http://www.epa.gov/oppbead1/pestsales/97pestsales/market_estimates1997.pdf.

158. *See* Pimentel, *supra* note 21, at 59 (summarizing data related to US pesticide use and citing statistics from the mid 1990s showing that pesticide use in the US grew thirty-three-fold between 1945 and the early 1990s to nearly 550 million tons annually); KIELY ET AL., *supra* note 21, at 8 (indicating that in 2000 and 2001, the estimated use of pesticides in the US was 1.2 billion tons).

159. Cunningham-Parmeter, *supra* note 1, at 439-440.

160. *Id.*

Without new regulatory standards for ensuring greater occupational protections, the unrelenting reliance on pesticides will continue to put farm workers' health and lives in jeopardy.

C. *History of Legislation*

The U.S. Congress adopted the country's first federal pesticide legislation with the Insecticide Act of 1910.[161] That Act focused on protecting farmers from economic exploitation by manufacturers and distributors of adulterated or ineffective pesticides.[162] Congress did not address the potential risks to human health from pesticide products until it enacted FIFRA in 1947.[163] Under FIFRA, pesticide manufacturers must register pesticides with the EPA, place warnings on the labels of particularly toxic pesticides and include other cautionary language to minimize or prevent harm to people and the environment.[164] Since the 1970s, Congress has periodically amended FIFRA in response to growing concern over the health risk of pesticides.[165] In particular, the 1996 Food Quality Protection Act[166] amended both FIFRA and the Federal Food, Drug and Cosmetic Act,[167] fundamentally altering how EPA regulates pesticides by imposing a new safety standard—"reasonable certainty of no harm"—for all pesticides used on foods.[168] The new policy was the result of a newfound understanding that pesticides can have cumulative effects on people. It also recognized that new efforts were required to protect the most vulnerable segments of the population. Despite the progress and Congress' interest in addressing the health risks re-

161. Pub. L. No. 6-152, 36 Stat. 331 (1910).

162. *See generally id.*; *see also* Smith & Rasco, *supra* note 12, at 660.

163. FIFRA *supra* note 8; *see* Smith & Rasco, *supra* note 12, at 660.

164. *See generally* FIFRA *supra* note 8; *see also* Smith & Rasco, *supra* note 12, at 660.

165. *See* Smith & Rasco, *supra* note 12, at 660. For example, the 1972 changes completely replaced the 1947 FIFRA law and is the basis of current federal policy. Pub. L. No. 92-516, 86 Stat. 973 (1972). The 1988 amendments accelerated the re-registration process. Pub. L. No. 100-532, 102 Stat. 2654 (Oct. 25, 1988), *codified at* 7 U.S.C.A. 136a-1. The 1996 amendments facilitated the registration of pesticides for special or so-called "minor" uses, reauthorized the collection of fees to support the re-registration process, and required the coordination of regulations implementing FIFRA and the Federal Food, Drug, and Cosmetic Act. Pub. L. No. 104-170, 110 Stat. 1489 (1996). *See generally* LINDA-JO SCHIEROW, PESTICIDE LAW: A SUMMARY OF THE STATUTES, CONGRESSIONAL RESEARCH SERVICE REPORT FOR CONGRESS 3 (Dec. 24, 2004), *available at* http://www.ncseonline.org/NLE/CRSreports/04dec/RL31921.pdf.

166. *See supra* note 52.

167. 21 U.S.C. § 321 (1994).

168. *Id.* at §§ 346a(b)(2)(A)(i), 346a(b)(2)(C)(ii)(I), and 346a(c)(2)(A)(ii).

lated to pesticide exposure, no federal law mandates medical monitoring for farm workers or other pesticide handlers.

D. *Recommendations for a National Medical Monitoring Rule*

Because organophosphate poisoning is not an isolated problem specific to Washington State but instead affects millions of farm workers across the country, the federal government should consider following Washington's example by making medical monitoring mandatory on a national level. At first glance, implementing such a program nationwide might seem daunting and costly. But the resulting benefits to human health and the environment—which are rarely included in cost-benefit analyses of pesticide application[169]—will likely outweigh the program costs. Economists have estimated that the total cost of health effects from pesticide use in the U.S. is $786 million annually.[170] While the objective of successful pesticide regulation is to protect the environment and human health, maintaining economic functionality of producers is also important.[171] Although policymakers might draft regulations that focus on only one of these issues, they must recognize that their regulations will have broader repercussions. The costs and benefits of pesticide regulation, both to industry as well as to people, are interwoven and cannot be addressed separately.[172]

While the industry may oppose a medical monitoring rule as it has in the past, Congress should evaluate the data available, consider the risks and recognize a need for new legislation to enforce a medical monitoring rule nationwide.

In establishing a national medical monitoring rule, Congress might look to Washington State's Rule for guidance. However, if Congress chooses to use Washington's Rule as the basis for a national monitoring rule, it will have to address some of the problems encountered by the Washington State Department of Labor and Industries during its Rule implementation process. For example, a report by the FWPP suggests that at least 7.9 percent of the farm workers who participated in blood testing had handled pesticides prior to their baseline tests, which created the possibility that these workers had artificially depressed cholines-

169. *Id.*

170. SOLOMON, *supra* note 63, at vii.

171. METCALFE ET AL., *supra* note 24, at 13.

172. *Id.*

terase baselines.[173] This flaw in the testing procedure means these workers may have been overexposed to hazardous pesticides and simply not known it. Additionally, the report contends that the Department of Labor and Industries did not effectively investigate whether eligible workers who chose not to participate in the monitoring program did so of their own accord or were influenced by their employers. According to a Labor and Industries survey, nearly 12 percent of workers who had come to a clinic to speak with health professionals declined to provide blood samples after talking with the professionals.[174]

Although there are no shortcuts to improving and maintaining the monitoring program, certain steps can be taken to ensure that the goal of ensuring human health by detecting physiological changes before illness occurs is achieved. It is critical that investigations continue to generate information on workplace conditions associated with cholinesterase depressions, especially in relation to the safety of vulnerable workers. Monitoring must continue for all workplaces where hazardous pesticides are used, including all exposed farm workers, not only handlers. To cure significant deficiencies in program implementation, the Farm Worker Pesticide Project suggests that the Washington State Department of Labor and Industries should:

> (1) Use its enforcement authority to visit the workplaces of affected workers swiftly and ensure their protection;
>
> (2) Ensure that workers get their test results promptly from both medical providers and their employers;
>
> (3) Better enforce regulations to ensure that all covered workers are offered a chance to participate, that workers are not coerced into non-participation, and that baseline tests are taken *before* exposures occur; and
>
> (4) Implement a pilot program to examine the feasibility and benefits of monitoring non-handlers who are exposed to OPs and carbamates.[175]

While the implementation of a medical monitoring rule is a significant step in achieving protection for agricultural workers, the above shortcomings must be addressed to ensure minimum safe working conditions.

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173. FARM WORKER PESTICIDE PROJECT ET AL., *supra* note 133, at 2.
174. *Id.* at 3.
175. *Id.* at Executive Summary, 4-5 (emphasis in original).

E. *Additional Protection Outside the Medical Monitoring Rule*

In addition to implementing a medical monitoring rule, Congress and the EPA should consider executing additional programs to curb exposure to pesticides. While medical monitoring traces physical changes in the body related with pesticide exposure, virtually nothing is done to track and measure the exposures themselves.[176] For example, FWPP's review of the Washington monitoring program suggests airblast sprayers cause significant cholinesterase depression.[177] Even though this suggests that drift may be involved, Washington does not require workplace or ambient air monitoring.[178]

Pesticide drift is not always detectable because some pesticides are invisible and odorless, which means exposure can occur without knowledge or awareness.[179] Moreover, pesticide drift can linger well after application, and certain pesticides take several days to several weeks to completely evaporate from the field.[180] High concentrations of these toxicants may be deposited on workers' clothes, skin or hair and then taken home and transferred to their families, unknowingly increasing exposure to the worker and family members.[181] Furthermore, pesticides can drift very long distances and have been found up to fifty miles from where they were initially applied; because of this phenomenon, people—including children—who live on or near farms[182] are exceptionally vulnerable to overexposure.[183]

If Congress and EPA are to implement an effective monitoring program, they should heed FWPP's recommendations to Washington State. Amended to apply to a national monitoring program, those recommendations include:

(1) providing inspectors at EPA and state environmental agencies with drift monitoring equipment;

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176. *Id.* at 5.

177. *Id.* at 6.

178. *Id.* at 5.

179. Pesticide Action Network North America, *Secondhand Pesticides: Airborne Pesticide Drift*, *available at* http://www.panna.org/drift.html (last visited July 18, 2008).

180. *Id.*

181. *Id.*

182. *See id.*; *see also* U.S. EPA, *Spray Drift of Pesticides, Pesticides: Topical & Chemical Fact Sheets* (Dec. 1999), *available at* http://www.epa.gov/pesticides/factsheets/spraydrift.htm (last visited July 17, 2008).

183. *See supra* notes 87-92 and accompanying text.

(2) having EPA and state environmental agencies develop programs to monitor ambient air in agricultural areas to track pesticide drift; and

(3) having EPA and state environmental agencies undertake pilot projects to explore options for monitoring exposure at specific worksites, including drift monitors, clothing patches, hand and glove swipes and other possibilities.[184]

Furthermore, state and federal officials need to create a timeline to phase out the most dangerous pesticides, like Lorsban,[185] and replace them with safer alternatives for agricultural uses. In setting this timeline, these leaders must examine possible alternatives to these dangerous chemicals, consider the challenges to transitioning to such alternatives, and decide on an appropriate course of action to defeat these challenges.[186] Such actions, though, must be carried out with full participation of all interested parties, including the pesticide industry, growers, and farm worker representatives. By incorporating these stakeholders into the process, both agricultural productivity and workers' health can be secured.

VI.
CONCLUSION

While pesticides have been used for thousands of years, it was not until recently that synthesized pesticide use became prevalent worldwide. While these chemicals provide both growers and consumers with agricultural benefits and industry with economic advantages, they pose a particular and grave threat to farm workers who mix, load and apply these toxicants. Pesticides were created and designed to kill living organisms. For humans, they can

184. FARM WORKER PESTICIDE PROJECT ET AL., *supra* note 133, at 13-14.

185. EPA banned the sale of the organophosphate Lorsban (chlorpyrifos) for most home and garden use in 2001, however, it allowed continued use of the pesticide for agricultural purposes. Farm workers and advocate groups filed suit against EPA in 2007 to stop the continued use of this organophosphate. *See* Earthjustice, *Lawsuit Challenges EPA on Deadly Pesticide* (July 31, 2007), *available at* http://www.earthjustice.org/news/press/007/lawsuit-challenges-epa-on-deadly-pesticide.html; *see also* Earthjustice et al., *Complaint for Declaratory and Injunctive Relief* (July 30, 2007), *available at* http://www.earthjustice.org/library/legal_docs/chloripyrifos-complaint.pdf. EPA held a meeting of the FIFRA Scientific Advisory Panel to consider and review the Agency's Evaluation and Toxicity profile for Lorsban on September 16-18, 2008. The Panel's meeting materials and meeting minutes can be found at http://www.epa.gov/scipoly/sap/meetings/2008/091608_mtg.htm (last visited Mar. 19, 2009).

186. FARM WORKER PESTICIDE PROJECT ET AL., *supra* note 133, at 14.

result in superficial consequences ranging from physical pain, diarrhea, and vomiting to more dramatic symptoms such as coma, cancer or death.

While most of the U.S population is not exposed to doses high enough to cause harm, handlers of pesticides, field workers and their families are often exposed to pesticides in health-threatening amounts. Insufficient illness reporting data systems, as well as inadequate information on the chronic effects of overexposure, perpetuate the already serious dangers to which these subgroups are exposed.

Opponents of a medical monitoring rule contend that such monitoring is unnecessary and that pesticides are safe when handled properly. The problem is that not all farm workers are afforded the training and protective gear necessary to ensure protection against overexposure. These workers often do not have the resources or the confidence to speak up for their own protection.

Opponents also contend that implementation of this rule will be too costly to industry and growers and will drive farmers out of business. This argument is belied to the extent that both Washington and California have implemented such rules with little negative effect on the farming industry.

The chemical industry should be allowed to participate in the development of an appropriate program that ensures the health of farm workers and their families. However, it also should be required to contribute—either directly, through taxes or via another mechanism—to the success of such a program.

In addition to a national medical monitoring rule, EPA should consider mandating national programs for monitoring ambient air and other pathways of exposure; modify registrations for highly toxic pesticides that place agricultural workers in particular danger; and continue phasing out the most dangerous of pesticides and replacing them with safer alternatives for use in agricultural production. On their own, state officials have not been able to meet the challenge of addressing the issue of pesticide use and farm-worker safety. Federal implementation of pesticide exposure monitoring rules is critical for the adequate protection of farm workers and their families.