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## Risks to Human Health Associated with Exposure to Pesticides at the Time of Application and the Role of the Courts

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## RISKS TO HUMAN HEALTH ASSOCIATED WITH EXPOSURE TO PESTICIDES AT THE TIME OF APPLICATION AND THE ROLE OF THE COURTS\*

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## I. INTRODUCTION

**T**HE Federal Insecticide, Fungicide and Rodenticide Act (FIFRA)<sup>1</sup> defines pesticide as "(1) any substance or mixture of substances intended for preventing, destroying, repelling or mitigating any pest, and (2) any substance intended for use as a plant regulator, defoliant, or desiccant."<sup>2</sup> In the United States, significant increases in the amount and frequency of pesticide application began after World War II in order to protect newly developed hybrid crops against pests and to fully realize productivity.<sup>3</sup> Moreover, pest resistance to pesticides requires in-

1. The Federal Insecticide, Fungicide, and Rodenticide Act §§ 2-31, 7 U.S.C. §§ 136-136y (1988) [hereinafter FIFRA]. FIFRA was amended in 1988 by Pub. L. No. 100-532, 102 Stat. 2654, 100th Cong. 2d Sess. (Oct. 25, 1988). The 1988 Amendments did not fundamentally change FIFRA, but do provide for accelerated reregistration of pesticides. Some provisions of the 1988 Amendments are discussed *infra* notes 34-42 and accompanying text.

2. *Id.* § 2(u), 7 U.S.C. § 136(u). See also H.R. REP. NO. 100-939, 100th Cong., 2d Sess. 26, reprinted in 1988 U.S. CODE CONG. & ADMIN. NEWS 3474. FIFRA defines pest as follows:

(1) any insect, rodent, nematode, fungus, weed, or (2) any other form of terrestrial or aquatic plant or animal life of virus, bacteria, or other micro-organism. . . which the Administrator declares to be a pest.

*Id.* § 2(t), 7 U.S.C. § 136(t).

3. See, e.g., 2 F. GRAD, TREATISE ON ENVIRONMENTAL LAW § 8.01(1) (1989); G. WARE, FUNDAMENTALS OF PESTICIDES 1 (1982); Gilbert, *America Tackles the Pesticide Crisis*, N.Y. Times, October 8, 1989 (Magazine, Part II), at 22; H.R. REP.

creasing amounts and frequency of application to achieve effective control.<sup>4</sup> Currently, approximately 2.6 billion pounds of pesticides are used in the United States each year.<sup>5</sup> Pesticides are used on food crops as well as on forests, lakes, city parks, lawns, playing fields, hospitals, schools, offices and homes.<sup>6</sup>

These increases in pesticide use are disturbing. There is a growing recognition that pesticides upset the natural ecological balance.<sup>7</sup> Moreover, the manner in which pesticides are regulated does not adequately assure that pesticides on the market are beneficial or safe to humans exposed to them. In this Article, Part I will examine the existing framework for regulating pesticides. The remainder of this Article will evaluate how courts deal with individuals, such as agricultural workers, who are exposed to pesticides at the time of application.<sup>8</sup> Part II will discuss some problems in assessing the safety of pesticides and will survey the medical literature addressing health risks associated with exposure to pesticides. Part III will survey the case law dealing with

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No. 100-939, 100th Cong., 2d Sess. 26, *reprinted in* 1988 U.S. CODE CONG. & ADMIN. NEWS 3474.

4. *See, e.g.*, R. METCALF & W. LUCKMAN, INTRODUCTION TO INSECT PEST MANAGEMENT (1982).

5. L. MOTT & K. SNYDER, PESTICIDE ALERT 5 (1987) (citing EPA, OFFICE OF PESTICIDE PROGRAMS, PESTICIDE INDUSTRY SALES AND USAGE 1985 MARKET ESTIMATES table 4 (September 1986)).

6. *Id.* (citing Shabecoff, *Pesticide Control Finally Tops the EPA's List of Most Pressing Problems*, N.Y. Times, Mar. 6, 1986, at B12, col. 3. Nonagricultural use of pesticides was the subject of recent Congressional hearings. *The Use and Regulation of Lawn Care Chemicals: Hearing before Subcomm. on Toxic Substances, Environmental Oversight, Research and Development of the Senate Comm. on Environment and Public Works*, 101st Cong., 2d Sess. (1990) [hereinafter *Hearings*]). The use of lawn care pesticides was examined in LAWN CARE PESTICIDES: RISK REMAIN UNCERTAIN WHILE PROHIBITED SAFETY CLAIMS CONTINUE: UNITED STATES GENERAL ACCOUNTING OFFICE, REPORT TO THE CHAIRMAN, SUBCOMM. ON TOXIC SUBSTANCES, ENVIRONMENTAL OVERSIGHT, RESEARCH AND DEVELOPMENT OF THE SENATE COMM. ON ENVIRONMENT AND PUBLIC WORKS (1990) [hereinafter LAWN CARE PESTICIDES].

7. *See, e.g.*, R. CARSON, SILENT SPRING (1962); 2 F. GRAD, TREATISE ON ENVIRONMENTAL LAW § 8.01 (1989); L. MOTT & K. SNYDER, PESTICIDE ALERT 58 (1987); UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, OFFICE OF POLICY, PLANNING AND EVALUATION, COMPARING RISKS AND SETTING ENVIRONMENTAL PRIORITIES: OVERVIEW OF THREE REGIONAL PROJECTS xi, 42, 58 (August 1989), three EPA regions ranked environmental problems within their regions to help set priorities for future programs. All three regions consistently ranked pesticides as a high health risk. The report suggests that inadequate government resources are devoted to controlling these risks.

8. There is growing concern about risks associated with exposure to pesticides in other settings, such as through ingestion of foods with pesticide residues or through exposure to pesticide contaminated groundwater. These problems are beyond the scope of this article. *See, e.g.*, L. MOTT & K. SNYDER, PESTICIDE ALERT (1987).

injury caused by non-target exposure to pesticides, comparing cases awarding remedies for property loss caused primarily by pesticide spray drift to cases involving human exposure. Part IV will discuss how and why courts should reconsider the manner in which they handle cases involving human exposure to pesticides.

### A. The Regulatory Framework

Federal pesticide regulation in the United States dates back to the Insecticide Act of 1910,<sup>9</sup> which was intended to protect growers and cattlemen against improper practices of chemical manufacturers, such as the manufacture, sale or transportation of adulterated or misbranded insecticides.<sup>10</sup> In 1947, Congress replaced the Insecticide Act with FIFRA.<sup>11</sup> FIFRA extended the purpose of regulation to the protection of the public against the adverse effects caused by economic poisons through a system of registration administered by the Department of Agriculture.<sup>12</sup> In 1970, pesticide registration became the responsibility of the Administrator of the Environmental Protection Agency (EPA).<sup>13</sup> FIFRA was substantially amended in 1972. These amendments established the basic framework for the regulation of chemical pesticide use in the United States today.<sup>14</sup>

FIFRA prohibits the sale or distribution of any pesticide un-

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9. Act of April 26, 1910, ch. 191, 36 Stat. 331.

10. 2 F. GRAD, TREATISE ON ENVIRONMENTAL LAW § 8.02, at 8-14 (1989).

11. Pub. L. No. 86-139, Law of June 25, 1947, Ch. 125, 61 Stat. 163 (1947) (codified as amended at 7 U.S.C. §§ 135-135k (1988)).

12. 2 F. GRAD, TREATISE ON ENVIRONMENTAL LAW § 8.02 (1989).

13. *Id.* at 8-15.

14. Federal regulation of chemical pesticides also occurs under the Food, Drug & Cosmetic Act, 21 U.S.C. §§ 301-393 (1988) [hereinafter FDCA]. Under FDCA section 346a(b), the Administrator of the EPA may set tolerances for pesticides in raw agricultural commodities to the extent necessary to protect public health; FDCA section 346a(a) prohibits the use of a pesticide on or in raw agricultural commodities which have not generally been recognized by experts as safe unless EPA has established a tolerance or an exemption from a tolerance. *See Nader v. EPA*, 859 F.2d 747, 748 (9th Cir. 1988); *National Coalition Against the Misuse of Pesticides v. Thomas*, 809 F.2d 875 (D.C. Cir. 1987). Problems associated with pesticide residues in products for consumption is beyond the scope of this article.

It should also be noted that there are nonchemical means of pest control, such as predators or devices, such as mousetraps, which are not subject to the FIFRA registration process. *See BUREAU OF NATIONAL AFFAIRS, SPECIAL REPORT, PESTICIDES: STATE AND FEDERAL REGULATION 9-10* (1987).

For a more complete discussion of federal pesticide regulation and its history, see *Ruckelshaus v. Monsanto Co.*, 467 U.S. 986, 990-97 (1984); 2 F. GRAD, TREATISE ON ENVIRONMENTAL LAW §§ 8.02-8.04 (1989); C. BOSSO, PESTICIDES AND POLITICS (1987).

less it is registered with the EPA.<sup>15</sup> Although the EPA publishes guidelines specifying the kinds of information which will be required to support the registration,<sup>16</sup> the applicant, who may be a manufacturer or user of the product, supplies the label, claims made for the pesticide, directions for use of the pesticide, and results of tests to support the claims. After the Administrator reviews the data in support of a registration,<sup>17</sup> FIFRA requires the following:

The administrator shall register a pesticide if he determines that, when considered with any restrictions imposed under subsection (d) of this section [136a] —

- (A) its composition is such as to warrant the proposed claims for it;
- (B) its labeling and other material required to be submitted comply with the requirements of this subchapter;
- (C) it will perform its intended function without unreasonable adverse effects on the environment; and
- (D) when used in accordance with widespread and commonly recognized practice *it will not generally cause unreasonable adverse effects on the environment.*<sup>18</sup>

Lack of essentiality is *not* a criterion for denying registration of any pesticide, and the Administrator may register a pesticide without determining its efficacy.<sup>19</sup> FIFRA allows EPA to conditionally register a pesticide containing an active ingredient not contained in any currently registered pesticide for a period of time sufficient to generate required data.<sup>20</sup> It should be noted, however, that a consensus regarding the amount of data necessary to support the safety of a conditionally-registered pesticide

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15. FIFRA §§ 3(a), 12(a)(1)(A), 7 U.S.C. §§ 136a(a), 136j(a)(1)(A).

16. *Id.* § 3(c)(2)(A), 7 U.S.C. § 136a(c)(2)(A); 40 C.F.R. §§ 158.20-.740 (1989).

17. The Administrator reviews the data to determine that generally accepted procedures were used, but does not attempt to replicate the studies. 40 C.F.R. § 158.80 (1989). There have been instances in which pesticides have been registered despite disturbing patterns of questionable testing procedures by registrants and testing firms hired by registrants. *See, e.g.,* Bosso, *supra* note 14, at 198-200.

18. FIFRA § 3(c)(5), 7 U.S.C. § 136a(c)(5) (emphasis added).

19. *Id.*

20. *Id.* § 3(c)(7)(C), 7 U.S.C. § 136a(c)(7)(C).

will be difficult to reach because human health effects and long-term environmental effects may not become evident for years.<sup>21</sup>

After a pesticide is registered, FIFRA provides a procedure for cancelling or reclassifying a pesticide where there is a substantial question about its safety.<sup>22</sup> Cancellation or reclassification proceedings may take one or two years,<sup>23</sup> during which the Administrator may suspend a registration pending the outcome of the proceedings if he determines that such suspension is necessary to prevent an imminent hazard.<sup>24</sup> “ ‘Imminent hazard’ is not limited to a crisis: ‘It is enough if there is a substantial likelihood that serious harm will be experienced during the year or two required in any realistic projection of the administrative process.’ ”<sup>25</sup> Absent an emergency, the Administrator may not issue a suspension order without giving registrants an opportunity to be heard.<sup>26</sup> If a registrant requests a hearing, the suspension is stayed pending an administrative hearing.<sup>27</sup> If an emergency exists, there is a procedure for suspension in advance of notification, and the Administrator may issue a suspension order pending

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21. More specifically, a chemical shown to be safe in one animal species may not be safe in other species — such as humans. For example, there is disagreement among scientists as to the applicability of animal studies to the more realistic exposure levels of humans. Most animal studies involve short-term exposure to large amounts of a chemical, whereas human exposure may be long-term and may involve routes of exposure not tested in animals. If there is chromosomal damage in the germ cells, the effects may not show up until the next generation. Also, effects on the environment, due to water and soil contamination, may not be evident for years after the application of the pesticide. Finally, limited testing of the active ingredients of a pesticide may indicate adverse effects, but cannot rule out adverse effects in animals or ecological systems not tested. For a further discussion of the considerable uncertainty about the potential for pesticides to cause chronic health effects, such as cancer and birth defects, and the amount of time necessary to ascertain these effects see *LAWN CARE PESTICIDES*, *supra* note 6.

22. FIFRA § 6(b), 7 U.S.C. § 136d(b).

23. See *Love v. Thomas*, 858 F.2d 1347 (9th Cir. 1988), *cert. denied sub nom. AFL-CIO v. Love*, 109 S. Ct. 1932 (1989).

24. FIFRA § 6d(c)(1), 7 U.S.C. § 136 d(c)(1). See *Love v. Thomas*, 858 F.2d 1347, 1350 (9th Cir. 1988), *cert. denied sub nom. AFL-CIO v. Love*, 109 S. Ct. 1932 (1989). However, a suspension pending cancellation of proceedings is by no means routine. See, e.g., *National Coalition Against the Misuse of Pesticides v. EPA*, 867 F.2d 636 (D.C. Cir. 1989) (upholds EPA's settlement with manufacturer of termiticides, chlordane and heptachlor, to cancel registration of termiticides, but to permit indefinitely sale and use of existing stocks outside manufacturer's control).

25. *Love*, 858 F.2d at 1350 n.3 (quoting *Environmental Defense Fund, Inc. v. EPA*, 465 F.2d 528, 540 (D.C. Cir. 1972), *quoted in Environmental Defense Fund, Inc. v. EPA*, 510 F.2d 1292, 1297 (D.C. Cir. 1975)).

26. *Love*, 858 F.2d at 1350 (citing FIFRA § 6(c)(1), 7 U.S.C. § 136d(c)(1)).

27. *Id.* at 1352 (citing FIFRA § 6(c)(2), 7 U.S.C. § 136d(c)(2)).

an expedited hearing.<sup>28</sup> However, in determining whether an imminent hazard justifying an emergency suspension exists, the Administrator must find that continued use would cause unreasonable adverse effects on the environment, that is, “any unreasonable risk to man or the environment, taking into account *the economic, social, and environmental costs and benefits* of the use of any pesticide.”<sup>29</sup> Thus, before issuing an emergency suspension, the EPA must balance even persuasive evidence that use of a pesticide may cause serious health risks to people exposed to it against the economic benefits of continued use of the pesticide;<sup>30</sup> lack of agency resources will not excuse the EPA from performing this risk-benefit analysis.<sup>31</sup>

FIFRA also prohibits pesticide manufacturers and distributors from making claims in the distribution and sale of a pesticide that differ substantially from claims made during the registration of that pesticide.<sup>32</sup> This prohibition does not provide the EPA with enforcement authority over pesticide applicators; furthermore, a recent General Accounting Office Report concludes that the EPA lacks the resources to bring enforcement actions against manufacturers and distributors that make false and misleading claims.<sup>33</sup>

The 1988 Amendments to FIFRA establish a scheme to reregister pesticides first registered before November 1, 1984.<sup>34</sup> Although earlier versions of FIFRA required reregistration of existing pesticides to reassess and ensure their safe use, the General Accounting Office estimated that at the current rate, EPA would not complete reregistration until the year 2024.<sup>35</sup> Concern about the inadequacy of data relating to currently registered pesticides led the states and their subdivisions to assert greater control over pesticide use. This included more stringent safeguards for workers exposed to pesticides and limitations on the use of pesti-

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28. FIFRA § 6(c)(3), 7 U.S.C. § 136d(c)(3).

29. *Love*, 858 F.2d at 1357 (quoting FIFRA § 2(bb), 7 U.S.C. § 136(bb) (emphasis added in opinion)).

30. *See Love*, 858 F.2d at 1357-63.

31. *Id.* (reversal of Agency's suspension of use of dinoseb).

32. FIFRA § 12(a)(1)(B), 7 U.S.C. § 136j(a)(1)(B).

33. *Lawn Care Pesticides*, *supra* note 6.

34. Pub.L. 100-532, 102 Stat. 2654, 100th Cong., 2d Sess. (1988) (codified as amended at 7 U.S.C. § 136a-1 (1988)).

35. H.R. REP. NO. 100-939, 100th Cong., 2d Sess. 28-29 (1988) (quoting UNITED STATES GENERAL ACCOUNTING OFFICE, PESTICIDES: EPA'S FORMIDABLE TASK TO ASSESS AND REGULATE THEIR RISKS (April 1986)).



cides.<sup>36</sup> To restore confidence in the regulatory system, the 1988 Amendments provide an accelerated registration process, which requires EPA to conduct an independent review of a registrant's data to determine its adequacy and to require additional data, provided by the registrant, when existing data is deemed inadequate.<sup>37</sup> Following completion of the review, the EPA must re-register the pesticide or take other "appropriate regulatory action," such as cancelling, suspending, or restricting the pesticide or imposing label changes.<sup>38</sup> Despite the Amendments, most older pesticides are still on the market even though they have not been completely reassessed.<sup>39</sup>

The 1988 Amendments also passed much of the costs of re-registration on to the registrant through the imposition of registration fees.<sup>40</sup> Other changes brought by the 1988 Amendments included minimizing EPA's responsibility prior to the 1988 Amendments for costs of storage and disposal of suspended or cancelled pesticides<sup>41</sup> and for indemnifying current holders of suspended or cancelled pesticides.<sup>42</sup>

However, the basic structure of FIFRA remains unchanged. The production of data to support a pesticide registration is controlled by the registrant, and this data may be withheld from public scrutiny as a trade secret.<sup>43</sup> Amendments to FIFRA in 1978 narrowed this protection by providing that "information concerning the effects of such pesticide on any organism or the behavior

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36. *Id.*

37. FIFRA § 4(a)-(g), 7 U.S.C. § 136a-1(a)-(g).

38. *Id.* § 4(g)(2)(D), 7 U.S.C. § 136a-1(g)(2)(D). This section does not further define "appropriate regulatory action," but presumably refers to the regulatory actions mentioned above which may be taken regarding any pesticide registered under FIFRA § 3, 7 U.S.C. § 136(a). See H.R. REP. NO. 100-939, 100th Cong., 2d Sess. 26 (1988).

39. For example, in *LAWN CARE PESTICIDES*, at 3, the GAO reports that of the thirty-four most widely used lawn care pesticides, thirty-two are older pesticides subject to reregistration, but not one of these has been completely reassessed.

40. FIFRA § 4(i), 7 U.S.C. § 136a-1(i). See also H.R. REP. NO. 100-939, 100th Cong., 2d Sess. 26 (1988).

41. FIFRA § 19, 7 U.S.C. § 136(q).

42. *Id.* § 15, 7 U.S.C. § 136m.

43. *Id.* § 10, 7 U.S.C. § 136h. The purpose of this provision is to prevent the use of data submitted by one manufacturer of a pesticide by another registrant to support the registration of the same or a similar product, thus, benefiting from the expenditures of the company that performed the original tests. See also FIFRA § 3(c)(1)(D), 7 U.S.C. § 136a(c)(1)(D). The history of these provisions and litigation concerning them are discussed in *Thomas v. Union Carbide Agricultural Prods. Co.*, 473 U.S. 568 (1985) and *Ruckelshaus v. Monsanto Co.*, 467 U.S. 986 (1984).

of such pesticide in the environment, including . . . data on safety to . . . humans . . . shall be available for disclosure to the public."<sup>44</sup> Despite the amendments, the public continues to experience difficulty gaining access to data regarding the health effects of pesticides, as is illustrated by the following:

In the annals of the environmental movement, 28 June [1982] may be recorded as a day of enormous importance. At about 4 o'clock that afternoon, representatives of three environmental groups were admitted to a microfilm reading room on the second floor of a federal office building on the outskirts of Washington, D.C. They were drawn there to examine hundreds of studies of the environmental effect of pesticides. It was the first time that the information had been seen by anyone outside the chemical industry and the federal government. . . . They [the environmentalists] had only four days to sift through a mountain of material; nothing except study titles could be recorded; and those present were barred from discussing what they saw with anyone else.<sup>45</sup>

FIFRA also authorizes EPA to classify pesticides where the acute dermal or inhalation toxicity is determined to present a hazard to the applicator or other persons, as restricted use pesticides that shall be applied only by or under the direct supervision of a certified applicator.<sup>46</sup> The EPA conducts certification programs in every state, except those which have their own certification programs.<sup>47</sup> However, most state legislation regulating pesticides is designed to carry out EPA-approved plans.<sup>48</sup> Many of FIFRA's standards for EPA-approved state plans are general, e.g., requiring an adequately funded state agency with legal authority and

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44. *Id.* § 10(d)(1), 7 U.S.C. § 136h(d)(1). See 2 F. GRAD, TREATISE ON ENVIRONMENTAL LAW § 8.03[6] (1986).

45. Smith, *A Battle over Pesticide Data*, 217 SCIENCE at 515 (1982). See also *Ruckelshaus v. Monsanto Co.*, 467 U.S. 986, 995-96 (health, safety and environmental data available to "qualified requesters"); Comment, *Pesticides: Problems Facing the Industry in Submitting Proprietary Scientific Data to an International Organization*, 19 GA. J. INTL. & COMP. L. 195, 196 (1989).

46. FIFRA § 3(d), 7 U.S.C. § 136a(d).

47. *Id.* § 11, 7 U.S.C. § 136i.

48. Overviews of state pesticide laws are found in 2 F. GRAD, TREATISE ON ENVIRONMENTAL LAW § 8.06 (1986); BUREAU OF NATIONAL AFFAIRS, SPECIAL REPORT, PESTICIDES: STATE AND FEDERAL REGULATION 53-74 (1987); Redfield, *Chemical Trespass? - An Overview of Statutory and Regulatory Efforts to Control Pesticide Drift*, 73 KY. L.J. 855 (1985).

qualified personnel to carry out the plan.<sup>49</sup> However, FIFRA is more specific about how information regarding integrated pest management, an approach to pest control that reduces reliance on chemical pesticides, is handled: state plans must include provisions for making instructional materials regarding integrated pest management techniques available to individuals at their request, i.e., through cooperative state extension services.<sup>50</sup> The state may not require, however, that any individual, such as a certified applicator, receive instruction concerning such techniques or demonstrate competence with respect to the use of such techniques.<sup>51</sup> Thus, those who apply the most hazardous pesticides may be unable to provide information to a customer regarding less hazardous methods of pest control.

It is also worth noting other provisions of FIFRA that govern the role of the states in pesticide regulation. States may regulate the sale or use of any federally registered pesticide, so long as such regulation does not permit any sale or use prohibited by FIFRA, but states may not impose any labeling or packaging requirements in addition to or different than those required under FIFRA.<sup>52</sup> The purpose of section 24, first added in the 1972 Amendments to FIFRA, was to permit the states to impose stricter regulations on pesticide use than that required under the Act, while at the same time provide uniform labeling and packaging nationwide.<sup>53</sup> There has been, however, considerable litigation over whether particular state and local regulations are preempted by this section of FIFRA.<sup>54</sup> The Act also permits state registration for additional uses within the state of a federally registered pesticide to meet special local needs, so long as this state registration does not cause violations of FIFRA or Food and Drug Administration (FDA) tolerances.<sup>55</sup>

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49. FIFRA § 11(a)(2), 7 U.S.C. § 136i(a)(2).

50. *Id.* § 11(c), 7 U.S.C. § 136i(c). Integrated pest management is further discussed *infra* notes 68-73 and accompanying text.

51. *Id.*

52. *Id.* § 24(a), (b), 7 U.S.C. § 136v(a), (b).

53. See Federal Insecticide, Fungicide, and Rodenticide Act 1972, Pub.L. No. 92-516, § 24, reprinted in 1972 U.S. CODE CONG. & ADMIN. NEWS (86 Stat.) 1139, 1168; S. REP. NO. 92-838, 92nd Cong., 2d Sess. (1972), reprinted in 1972 U.S. CODE CONG. & ADMIN. NEWS 3993, 4021. A technical amendment in the 1988 Amendments subtitled the preemption provision in FIFRA section 24(b), 7 U.S.C. § 136v(b), with the word "uniformity." See also FIFRA Amendments, 1988, Pub. L. No. 100-532, § 801(m)(2), reprinted in 1988 U.S. CODE CONG. & ADMIN. NEWS (102 Stat.) 2654, 2682.

54. This litigation is discussed *infra* notes 247-62 and accompanying text.

55. FIFRA § 24(c), 7 U.S.C. § 136v(c).

In summary, most information regarding pesticides is initially developed by the registrant, who is not necessarily required to demonstrate the efficacy of the pesticide, and this information may be barred from public view. Older pesticides are subject to reregistration under the same scheme, and new pesticides may be conditionally registered, but they continue to reach the market even though adequate data to support the registration has not yet been developed.<sup>56</sup> Even when concerns about the safety of a pesticide emerge, cancelling or suspending its sale and use is not a simple matter. Cancellation may take two years, and suspension of registration shifts the burden to the EPA, an agency with limited resources, to show that continued use of the pesticide poses risks to humans and the environment and that such risks outweigh the benefits of continued use. The government may pay some of the costs of recalling a pesticide where registration has been cancelled constituting another disincentive to cancellation.

FIFRA also does not discourage unnecessary pesticide use. Some pesticides are registered for restricted use, and these pesticides may be applied only by certified applicators who may have no knowledge of less hazardous pest control alternatives. State and local government efforts to restrict pesticide use to protect the public health have been successfully challenged in some instances.<sup>57</sup>

## B. Overuse of Pesticides

Given FIFRA's structure, one may legitimately question whether pesticides currently registered are needed, and whether they pose health risks that those who apply pesticides and are exposed to applied pesticides might find unacceptable if more information were known.<sup>58</sup> Indeed, information developed in the

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56. Bosso, *supra* note 14, at 200-02.

57. See *infra* notes 281-82 and accompanying text.

58. Courts have held that for purposes of assessing the environmental impact of a proposed major federal action, such as a herbicide spray program on federal lands, under the National Environmental Policy Act, 42 U.S.C. §§ 4321-4370b (1988) [hereinafter NEPA], the registration process for herbicides under FIFRA is inadequate to address NEPA environmental concerns and therefore reliance on that registration process alone is improper. *Save Our Ecosystems v. Clark*, 747 F.2d 1240, 1248 (9th Cir. 1984). See also *Citizens for Non-Toxic Pest Control v. California Dep't of Food & Agriculture*, 187 Cal. App. 3d 1575, 1587, 232 Cal. Rptr. 729, 735 (1986) (Department of Food and Agriculture required to prepare environmental impact report under state Environmental Quality Act before implementing fruit fly eradication project). Cf. *Northwest Coalition for Alternatives to Pesticides v. Lyng*, 673 F. Supp. 1019, 1025 (D. Or. 1987), *aff'd*, 844 F.2d 588 (9th Cir. 1988) (reliance on EPA data appropriate).

scientific community indicates that pesticides have adverse effects beyond those on the target organisms they are intended to control.<sup>59</sup> Pesticides applied in accordance with widespread and commonly recognized practice frequently enter non-target areas, and agricultural workers wearing so-called protective clothing may still absorb high levels of the pesticides they are applying.<sup>60</sup> Some researchers have found that of the total amount of pesticides applied in the United States, less than 0.1% of those applied to crops actually reaches the target pest.<sup>61</sup> The remainder enters non-target areas by wind drift, evaporation and movement on air currents, runoff into streams and lakes, leaching into soil and groundwater, and water erosion.<sup>62</sup> There is growing recognition that pesticides can and do enter the groundwater and contaminate the nation's drinking water supply.<sup>63</sup> Persistent pesticides intended to resist degradation and provide long-lasting protection may move through the food chain and accumulate in humans who consume treated produce and products from animals that consume treated feed.<sup>64</sup> The general public is becoming concerned with the threat of injury associated with the consumption of pesticides in food, as shown by the extensive popular press coverage of the use of Alar on apples.<sup>65</sup> However, the threat that

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59. See *infra* note 95 and accompanying text.

60. See, e.g., *Pesticides May Penetrate Protective Clothes*, 4 NEW SCIENTIST, April 19, 1984, at 4.

61. D. Pimental & L. Levitan, *Pesticides: Amounts Applied and Amounts Reaching Pests*, 36 BIOSCIENCE no. 2, Feb. 1986, at 86.

62. See, e.g., OFFICE OF PESTICIDES PROGRAMS, U.S. ENVIRONMENTAL PROTECTION AGENCY, *APPLY PESTICIDES CORRECTLY* 83-84 (1980); H.R. REP. NO. 100-939, 100th Cong., 2d Sess., pt. 1, at 26 (1988), reprinted in 1988 U.S. CODE CONG. & ADMIN. NEWS 3474.

63. See Zaki, Moran & Harris, *Pesticides in Groundwater: The Aldicarb Story in Suffolk County, NY*, 72 AMERICAN J. PUBLIC HEALTH 1391 (1982); Rajput, Uitti, Stern, Laverty, O'Donnell, O'Donnell, Yuen & Dua, *Geography, Drinking Water Chemistry, Pesticides and Herbicides and the Etiology of Parkinson's Disease*, 14 CANADA J. NEUROL. SCI. 414 (1987); Mestres, Spiliopoulos, Mestres & Cooper, *Transport of Organic Contaminants in Groundwater: Gas Chromatography Model to Forecast the Significance as Applied to Aldicarb Sulfone Residues*, 16 ARCH. ENVTL. CONTAM. TOXICOL. 649 (1987); Grumbles, *Pesticides in Groundwater and CERCLA Section 106*, 19 Env't Rep. (BNA) 281 (June 24, 1988); Cohen, *Pesticides in Groundwater*, New Hampshire Turf Talk Newsletter, Winter 1986-87, at 18; Knudson, *Experts Say Chemicals Peril Farm Belt's Water*, N.Y. Times, Sept. 6, 1986, at 8; UNITED STATES ENVTL. PROTECTION AGENCY, *PROPOSED AGRICULTURAL CHEMICALS IN GROUND WATER STRATEGIC PLAN* (1987).

64. See, e.g., 2 F. GRAD, *TREATISE ON ENVIRONMENTAL LAW* § 8.01 (1986); R. CARSON, *SILENT SPRING* (1962); B. WARD & R. DUBOS, *ONLY ONE EARTH* at 40 (1972).

65. See, e.g., Gilbert, *America Tackles the Pesticide Crisis*, N.Y. Times, Oct. 8, 1989, (Magazine, Part II), at 25.

pesticides pose to the health of people involved in the manufacture, transportation, application, and cleanup of pesticides is probably not as well recognized, nor is the exposure related to drift of pesticides sprayed over agricultural areas.

As revealed in recent Congressional hearings on risks associated with lawn care pesticides, this lack of awareness may result from the pesticide industry's promotion of their products as "safe" and "practically non-toxic," which are believed by a public that assumes that EPA-registered pesticides are safe.<sup>66</sup> However, the long-term effects of some pesticides are documented in the scientific and medical literature. The discussion in Part II will acquaint the reader with these effects.

Moreover, it is becoming questionable whether overwhelming benefits justify the risks associated with pesticide use. As pests develop resistances to synthetic pesticides, increasing amounts of those substances are used, even though most do not hit the intended target. Furthermore, it is doubtful that this increased pesticide use enhances productivity. One study notes that despite the vast growth of synthetic pesticides since the 1940's, annual crop losses to all categories of pests as a percentage of total potential crops appear not to have declined.<sup>67</sup> Where pest control is necessary to avoid crop loss, alternatives to synthetic pesticides exist.

Organic farming, which uses no nonorganic fertilizers, insecticides or herbicides to aid in farming, but rather relies on natural fertilizers and pest control agents, is growing in popularity.<sup>68</sup> Another alternative, integrated pest management (IPM), "strives for maximum use of natural controls over pest populations . . . and enhances these natural elements with techniques such as soil till-

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66. See *The Use and Regulation of Lawn Chemicals: Hearings before Subcomm. on Toxic Substances, Environmental Oversight, Research and Development of the Senate Comm. on Environment and Public Works*, 101st Cong., 2d Sess. (1990); See also *LAWN CARE PESTICIDES*, *supra* note 6.

67. 2 F. GRAD, *TREATISE ON ENVIRONMENTAL LAW* § 8.01 (1986) (citing COUNCIL OF ENVIRONMENTAL QUALITY, *ENVIRONMENTAL QUALITY, NINTH ANNUAL REPORT* at 278 (1978)). One researcher estimates that from the 1940's to the 1970's, crop losses to insects have doubled despite tenfold increases in pesticide use. L. MOTT & K. SNYDER, *PESTICIDE ALERT* 7 (1987) (citing Pimental, *Benefits and Costs of Pesticide Use in U.S. Food Production*, 28 *BIO SCIENCE*, Dec. 1978, at 772-84).

68. Gilbert, *American Tackles the Pesticide Crisis*, *N.Y. Times*, Oct. 8, 1989, (Magazine, Part II), at 25. Gilbert estimated that the number of organic farms in California doubled in 1989 and numbered 1500. It should be noted that standards for organic farming are not uniform nationwide. A summary of one group's organic farming standards is set forth in *Langan v. Valicopters, Inc.*, 88 Wash. 2d 855, 567 P.2d 218 (1977).

age, crop rotation and pest-resistant crop and livestock varieties."<sup>69</sup> IPM uses only very limited amounts of synthetic pesticides.<sup>70</sup> Through adoption of IPM techniques, insecticide use by Texas cotton farmers decreased by 88% between 1966 and 1974; sweet corn growers in Connecticut cut insecticide consumption by up to 50%.<sup>71</sup> Studies have projected that a national commitment to IPM could reduce pesticide applications by 70% to 80% with no cost in crop yields.<sup>72</sup> Other approaches, such as sustainable agriculture, that seek to promote agricultural productivity and its economic viability without compromising environmental quality and the quality of life of farmers, are also being developed.<sup>73</sup>

## II. PESTICIDE-RELATED INJURY IN HUMANS

### A. General Problems of Health Effects Studies

This discussion focuses on the health effects of direct exposure to pesticides.<sup>74</sup> It should be noted that any study of such health effects is complicated by the synergistic effects of pesticides combined with other substances, but such effects will not be addressed here.<sup>75</sup> Also, some individuals are more sensitive to pesticides and suffer problems not experienced by most people

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69. 2 F. GRAD, *TREATISE ON ENVIRONMENTAL LAW* § 8.03, at 8-13 - 8-14 (1986) (quoting COUNCIL ON ENVIRONMENTAL QUALITY, *ENVIRONMENTAL QUALITY, NINTH ANNUAL REPORT* at 278 (1978)). See also Day, *Integrated Pest Management: Towards Greening of American Pesticide Policy*, 8 *TEMP. ENVTL. L. & TECH. J.* 93 (1989).

70. *Id.*

71. L. MOTT & K. SNYDER, *PESTICIDE ALERT* 46 (1987).

72. *Id.*

73. See Hamilton, *Sustainable Agriculture: The Role of the Attorney*, 20 *Envtl. L. Rep. (Envtl. L. Inst.)* 10,021 (Jan. 1990). See also Baker, *Pest Control in the Public Interest*, 8 *UCLA J. ENVTL. L. & POLICY* 31 (1988) (use of pest control districts as means of pest control).

74. The health effects of drinking pesticide-contaminated groundwater are discussed elsewhere, see *supra* note 63 and accompanying text.

75. For example, "inert ingredients" are often mixed with the active pesticide ingredients. These inert ingredients are generally well-known and studied chemicals. However, the combination of a pesticide with an inert ingredient may affect the ability of the pesticide component to enter the body, and may also affect the way the pesticide is metabolized in the body. Although such "synergistic" effects are important to the overall understanding of pesticide health effects, very little information is available.

Other synergistic effects beyond the scope of this article involve the simultaneous use of pesticides and tobacco. It is known that tobacco use alone is associated with higher disease risk. Tobacco use, however, may cause pesticides to have a greater health risk than they would have in a person who is not a tobacco user.

under similar circumstances, however, particular susceptibility is also outside the scope of this article.<sup>76</sup>

Several observations are necessary to understand fully the studies of the health effects associated with pesticide exposure. Most of the studies linking pesticide exposure to illness in humans are based upon statistical studies of exposed and unexposed populations. However, such studies do not prove that a particular individual in the exposed population contracted a specific illness as a result of pesticide exposure. Most, if not all, of the pesticide-related diseases can also have other causes.

Cancer and other long-term diseases arise at the sub-cellular level and manifest themselves at a clinical level only when they have progressed to a point where tissue damage or tissue changes are detectable. Even with the most sophisticated knowledge and technology, a scientist cannot prove that exposure to a chemical "caused" cancer in a particular patient. When scientists refer to causation, they are speaking in terms of correlations: reproducibility and predictability of experimental results.

To illustrate, if 100 mice are exposed to a chemical and 100 other mice, the control group, are not exposed, the number of exposed mice having tumors above the number of control group tumors represents the number of tumors "caused" by the chemical. Because there is usually a background level of tumors, it cannot be determined which individual mice have the chemically induced tumors and which have the background tumors. Causation is strengthened by repetition of this type of work in other laboratories because repetition decreases the possibility that something other than the chemical caused the tumors.

Sometimes the tumor incidence over background level is so high, or the background level is so low, that scientists agree that exposure to the chemical caused the tumor.<sup>77</sup> However, in most cases, it is difficult to conclude that exposure to a suspected toxic agent was the cause of a particular disease.<sup>78</sup>

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76. In the context of pesticide poisoning, this issue is certainly not well developed because the factors that would increase sensitivity to a pesticide are only beginning to be understood. See *infra* notes 81-82 and accompanying text. [ask author]

77. A human example is the type of cancer known as angiosarcoma of the liver. The background level of this tumor is so low that if a patient with this disease is known to have been exposed to high levels of vinyl chloride, scientists agree that vinyl chloride is the cause of the tumor.

78. By analogy, if in animal experiments there were ten incidences of tumors in the control mice and twelve in the treated group (out of 100 mice in each group), the increase may be statistically insignificant. In this case it might



Some scientists believe that chemical carcinogenesis is caused by a reaction between a chemical and the DNA of a cell,<sup>79</sup> although other scientists believe that cancer may arise from chemical alteration of other cellular components. Thus, valuable information might result from studies in which chemicals are tested for their ability to cause chemical changes in DNA in test tubes in addition to studying populations. However, these *in vitro*, or test tube, studies are not directly applicable to whether these chemicals cause cancer in animals and humans.<sup>80</sup>

These *in vitro* results must be corroborated by *in vivo* — animal — tests. The scientific community is divided, however, as to the applicability of these results in regard to exposure and disease in humans.<sup>81</sup>

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be concluded that the treatment was not carcinogenic. For this reason large numbers of animals must be treated with a wide range of doses of the agent. Causation is more conclusive where the level of tumors increases with the doses of the chemical given to the treated group.

79. These scientists believe that exposure to a carcinogenic chemical alters the genetic code of the cell, contained in the DNA, and after several cell divisions the alteration is manifested by the development of cancer cells. Five basic categories of DNA damage that have consequences in humans have been described as follows: (1) gene mutations, (2) chromosomal rearrangements, (3) abnormal number of chromosomes, (4) mitotic rearrangement, and (5) stimulation of unscheduled DNA synthesis and inhibition of DNA repair. de Serres, *Evaluation of Tests for Mutagenicity as Indicators of Environmental Mutagens and Carcinogens*, 329 ANN. N.Y. ACAD. SCI. 76 (1979).

80. When a human is exposed to a carcinogen, the chemical must pass several "barriers" before it interacts with the DNA of the cell. By the time it encounters the DNA, if ever, it may have been converted to a harmless chemical. Thus, the ability of a chemical to alter DNA in a test tube could incorrectly predict carcinogenicity. The converse is also true: a "safe" chemical tested in a test tube might be converted to a carcinogen by enzymes in human cells and tissues.

81. According to one author, "there is clear historic evidence that if a chemical is carcinogenic in appropriate animal test systems, it must be treated as if it were carcinogenic in man." Rall, *Validity of Extrapolation of Results in Animal Studies to Man*, 329 ANN. N.Y. ACAD. SCI. 85 (1979). However, scientists, accustomed to testing a hypothesis before drawing a conclusion based on limited test results, are often reluctant to predict what a chemical will do in humans based upon limited animal experiments. *Id.* at 86.

Bruce Ames has argued that animal tests are of limited value in predicting absolute human risk. Ames, Magaw & Gold, *Ranking Possible Carcinogenic Hazards*, 236 SCIENCE 271 (1987). Of 226 chemicals that are carcinogenic in rodents, 96 were carcinogenic in either rats or mice. *Id.* at 275. According to Ames:

This discordance occurs despite the fact that rats and mice are very closely related and have short life spans. Qualitative extrapolation of cancer risks from rats or mice to humans, a very dissimilar, long-lived species, is unlikely to be as reliable. Conversely, important human carcinogens may not be detected in standard tests in rodents; this was true for a long time for both tobacco smoke and alcohol, the two largest identified causes of neoplastic [cancer] death in the United States.

*Id.*

There have been attempts to provide guidelines for the kind of animal tests that can be used to establish causation in humans. Some criteria that have been suggested are as follows:

1. Whether the animals were tested in accordance with correct EPA laboratory guidelines, such as housing control group animals in a different location than animals receiving toxic substances.

2. The length of the study: cancer predictions, which are related more to chronic toxicity than to acute toxicity, may not be valid if the doses given to the animals were very large and were given over a short period of time.

3. Whether the pathologist's finding of cancer was based on the view that the cellular changes were merely neoplastic, i.e. changes in cell shape, or whether malignancy or metastasis were also present.

4. Whether the sample size (number of animals) was adequate to permit valid statistical inferences.

5. Whether the type of animal used was subject to recognized or unusual tumor tendencies.<sup>82</sup>

As the foregoing discussion illustrates, science can provide a variety of methods for determining whether a chemical can cause DNA damage, or whether exposure to the chemical increases incidence of a specific disease in laboratory animals. It is more difficult to apply these data to incidents of human pesticide exposure and to determine that a particular individual's symptoms were caused by pesticide exposure.

Despite this uncertainty, a physician seeing one patient with symptoms of acute chemical exposure may have little hesitation in finding that a particular chemical caused the symptoms if (a) there is evidence of exposure to the chemical and (b) the known effects of the chemical are consistent with the symptoms. If there is little information about the particular chemical to which the patient has been exposed, a physician might look to information about other chemicals that are in the family of chemicals to which the particular chemical belongs and that are already known to cause disease. In fact, many common pesticides belong to chemical groups which have been extensively studied in terms of their effect on animal and human physiology.

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82. NOTHSTEIN, TOXIC TORTS 439-74 (1984).

## B. Pesticides Grouped According to Chemical Structure

Pesticides are used in the workplace, on farms, in greenhouses, in the home, and in the garden. Exposure can result from accidental spillage or routine long-term use. Children may be at risk of disease or birth defects as a result of chromosomal damage in parents exposed to pesticides.

The effects of pesticides on humans depends upon the chemical structure of the pesticide, the "inert" ingredients of the pesticide preparation, the route of exposure (dermal, inhalation, etc.), the duration of exposure, and the presence of "synergistic" factors such as tobacco use. In addition, pesticides as a group vary widely in their capacity to damage cells and tissues in a human. For example, dibromochloropropane is a gonadotoxin which causes decreased spermatogenesis in exposed workers. Paraquat has been linked to Parkinson's disease (although this link is disputed in the medical community). Chlordecone can cause neurological disturbances in exposed manufacturing personnel. Organophosphates such as parathion, a substitute for DDT, inhibit cholinesterase in the nervous system, leading ultimately to paralysis and death in cases of extreme exposure. Some pesticides cause chromosomal damage in humans which may potentially affect the germ cells and offspring of the exposed persons.

Pesticides can be classified into groups based upon their chemical structure.

1. **Bipyridils.** These chemical compounds are used as herbicides. Bipyridils are suspected to cause changes in cellular metabolism and to damage cell membranes. As these effects are general, damage to a variety of cells and tissues in the body can occur.

These chemicals cause a variety of symptoms, including skin irritation, dehydration, hemorrhage, and liver, kidney and lung damage. Death can result due to kidney failure or pulmonary damage. The most well-known bipyridyl is paraquat.

2. **Carbamates.** These chemicals have many uses, including use as fungicides, herbicides, and insecticides. Acute exposure can cause abdominal cramps, eye damage, respiratory damage and a variety of other symptoms. Chronic exposure can lead to anorexia, cholinesterase depression, muscle weakness and renal damage. Suspected effects of individual carbamates include mutagenic effects (Aldicarb, Carbofuran), carcinogenesis and immune suppression (Carbaryl).

Carbamates cause acetylcholine to accumulate due to an inhibition of acetylcholinesterase. This accumulation impairs central nervous system function. However, the effect disappears and the enzyme activity returns to normal after a few hours. As the enzyme is also affected in red blood cells, overexposure to carbamates can be detected using a blood test.

3. Chlorophenoxy. These chemicals are used as herbicides. Chlorophenoxy have a variety of effects both inside and outside the cell. Important biochemical reactions within the cell are affected by the chemicals and may result in demyelination of nerves and skeletal muscle damage.

These cellular effects are manifested acutely as anorexia, central nervous system damage, liver damage, respiratory difficulty, and eventually death due to peripheral vascular collapse. The chronic effects include skin disease, neuritis, and paralysis. The most well-known chemical of this group is 2,4-D which is also suspected of causing cancer and prenatal damage.

4. Organochlorines. These chemicals have several uses, including insecticidal use, and adversely affect the human nervous system. Individual chemicals in this class also have other effects.

Aldrin is a suspected carcinogen and has effects on the reproductive system. Chlordane has a variety of effects on blood cells, on the reproductive system and the developing fetus and is a carcinogen and mutagen. Endrin also causes prenatal damage and is a mutagen.

Aldrin and dieldrin are listed as cancelled pesticides in the United States as of 1974. Endrin was cancelled in 1979. In each case, oncogenesis was listed as one reason for the cancellation. Because of their chemical structure, these pesticides can be stored in human fat for extended periods of time. DDT is another member of this pesticide group.

5. Organophosphates. These chemicals are used as pesticides and herbicides. Organophosphates are also acetylcholinesterase inhibitors and can impair central nervous system function. Individual members of this large group also have other effects. For example, Parathion may be a carcinogen and may cause prenatal damage.

### C. Medical Evidence of Pesticide-Related Illness

Much of the evidence linking pesticide exposure to disease consists of isolated reports in the medical literature. Sadly, some

of these reports deal with self-induced pesticide poisoning in suicide attempts — many of which were successful.<sup>83</sup> However, there have also been several systematic studies of large groups of individuals affected through routine or accidental exposure at their place of employment or residence. Together, these kinds of reports provide very convincing evidence that pesticide exposure can and does cause both acute and chronic damage to human health.

#### D. Illness in Farm Workers

Much of the data regarding pesticide exposure of farm workers comes from countries where pesticide regulation is still at an early stage or is virtually non-existent. Often the farmers using the pesticides are, for economic reasons, more concerned about the immediate yield of crops than with the long-term effects of pesticide use. Furthermore, even if protective clothing and masks were available to applicators, in many of these countries the high heat and humidity would virtually preclude the use of adequate covering by applicators and farmers.

In rice-growing areas of the Philippines, a documented increase in male mortality has been associated with the widespread adoption of insecticides by farmers. Unfortunately, use of pesticides in this and in other comparable areas is often unregulated, and unsafe practices are common. According to one study:

[A] person applying endrin with a backpack sprayer in good repair and under typical conditions would be expected to come into direct contact with 41 mg of active ingredient per hour. At that rate, a 55 kg worker would be exposed, on the parts of the body generally left uncovered, to a third of the rodent LD<sub>50</sub> in treating an average holding of 2.5 hectare once. This estimate excludes exposure during handling of the concentrate in mixing.<sup>84</sup>

This Philippine study examined farm use of several insecticides including carbofuran, endrin, parathion and mono-

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83. Kancir, 26 *CLINICAL TOXICOL.* 257-64 (1988); Shemesh, Bourvin, Gold & Brocha, *Survival After Acute Endosulfan Intoxication*, 26 *CLINICAL TOXICOL.* 265-68 (1988).

84. Loevinsohn, *Insecticide Use and Increased Mortality in Rural Central Luzon, Philippines*, *LANCET* June 13, 1987, 1359-62. LD<sub>50</sub> refers to the amount of a substance which will kill 50% of exposed laboratory animals in a specific period of time.

crotophos. The mortality in four areas was analyzed for a period of low pesticide use (1961-1971) and high pesticide use (1972-1984).

In men, mortality attributed to non-traumatic causes was 27% higher in 1972-1984 than in 1961-1971. Mortality attributed to leukemia increased 480%. No deaths from stroke in men of 15-24 years of age were recorded before 1972. Twenty such deaths were recorded from 1972-1982.

The types of diseases indicated by the study are highly suggestive of pesticide exposure. Cyclodiene and hexachlorocyclohexane insecticides cause symptoms that are often misdiagnosed as stroke; this may account for the rise in deaths attributed to stroke among men of 15-24 years of age, an age group rarely affected by stroke.

Leukemia is a disease that has many suspected causes, one of which is exposure to pesticides. The large increase in the leukemia rate following widespread pesticide use suggests pesticide exposure as at least one factor.

Hematological disorders have also been reported among agricultural workers in Brazil. A 1984 report attributed 56% of cases of bone marrow aplasia observed in an agricultural area near Sao Paulo to pesticides and herbicides.<sup>85</sup>

Some individual case studies illustrate the severity of the problems:

A 17-year-old female employed at a tomato plantation where several organochlorides were used presented with a one month history of anaemia. Her sister had died 1 year earlier of bone marrow aplasia. . .She was treated with oxymetholone and prednisone, and her marrow function improved. 1 year later, only thrombocytopenia persists. She left the farm where she used to live and moved into town.

A 12-year-old girl was working in a cotton field when pesticide was sprayed from an aeroplane. 1 month later. . .[b]one marrow showed chiefly fat tissue and a few hemopoietic cells. She was treated with oxymetholone and prednisone. . .She died 5 months later.

A 42-two-year-old man was exposed to an organochloride when a spray pump exploded (in an accident in

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85. Lorand, Souza & Costu, *Haematological Toxicity Associated with Agricultural Chemicals in Brazil*, LANCET Feb. 18, 1984, 404.

which three colleagues died from acute intoxication). . . Pancytopenia and monocytoid cells persisted peripherally for 11 months, at which time acute myelogenous leukemia was diagnosed. He died of overwhelming infection before chemotherapy could be started.<sup>86</sup>

In 1988, Rupa *et al.* demonstrated a correlation between pesticide use and chromosomal aberrations in male garden workers. Some chromosome damage was attributable to cigarette smoking, but even accounting for this there was an increase in chromosomal damage associated with pesticide exposure. The authors concluded in pertinent part:

In the present study, people occupationally exposed to pesticides showed an increase in chromosomal aberrations . . . . The workers in the present study were pesticide sprayers and each worker handled DDT, BHC, malathion, parathion, dimethoate, fenitrothion, urea and gromor on different days and would normally spray these pesticides for eight hours per day, being directly exposed to pesticides without taking any precautionary measures and smoking while spraying.<sup>87</sup>

Chromosomal aberrations were also noted in a population of floriculturists in Argentina. These workers were involved with greenhouse production of chrysanthemums, carnations and roses, and used organophosphorus and carbamate-type pesticides simultaneously.

Some greenhouse workers exhibited symptoms of chronic pesticide intoxication: fatigue, numbness in upper and lower limbs, muscle weakness and pain in limbs, leg cramps and abdominal pain. Chromosomal damage was present in these workers and in workers who did not have symptoms of exposure.

The following summary gives an indication of the extent to which these workers and their families were routinely exposed to the pesticides:

Under the working conditions described, all the

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86. *Id.*

87. Rupa, Rita, Reddy & Reddi, *Screening of Chromosomal Aberrations and Sister Chromatid Exchanges in Peripheral Lymphocytes of Vegetable Garden Workers*, 7 HUMAN TOXICOL. 333-36 (1988).

people belonging to the community of La Capilla must be considered as exposed to pesticides due to:

- (1) the proximity of green houses to homes and the involvement of all the family members in agricultural activities;
- (2) the plastic greenhouses being without proper ventilation, where pesticides remain for a long time after spraying as aerosols, on plants or tools, contacting not only sprayers but also people working after application of the products;
- (3) the lack of protective measures: due to the high temperature in the green houses in the summer, no protective clothes are used and people can contact pesticides by skin, breathing or ingestion;
- (4) the inadequate storage of chemicals which includes storage at home;
- (5) the use of large amounts of pesticides due to the intensive production activity.<sup>88</sup>

Takahashi *et al.*<sup>89</sup> reported that agricultural workers exposed to the pesticides dibromochloropropane and ethylene dibromide exhibited depressed sperm counts as compared with a control population. This study was undertaken on the island of Molokai, Hawaii, where extensive pineapple production entails the use of these pesticides. The results were consistent with previous reports of gonadotoxic effects of dibromochloropropane in workers in chemical production plants.<sup>90</sup>

An increase in cancer incidence has been documented in pesticide applicators in Florida. There was an increase in the number of deaths from brain cancer, lung cancer and acute myeloid leukemia. Although the presence of disease could not be correlated with a particular pesticide, the risk of lung cancer increased with the number of years of exposure to pesticides, sug-

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88. Dulout, Pastori, Olivero, Cid, Loria, Matos, Sobel, Bujan & Albiuno, *Sister-Chromatid Exchanges and Chromosomal Aberrations in a Population Exposed to Pesticides*, 143 MUTATION RESEARCH 237-44 (1985).

89. Takahashi, Wong, Rogers & Hale, *Depression of Sperm Counts Among Agricultural Workers Exposed to Dibromochloropropane and Ethylene Dibromide*, 27 BULL. ENVTL. CONTAM. TOXICOL. 551-58 (1981).

90. Lipshultz, Ross, Whorton, Milby, Smith & Joyner, *Dibromochloropropane and its Effect on Testicular Function in Man*, 124 J. UROLOGY 464 (1980); Marshall, Whorton, Krauss & Palmer, *Effect of Pesticides on Testicular Function*, 11 UROLOGY 257 (1978); Whorton, Milby, Krauss & Stubbs, *Testicular Function in DBCP Exposed Pesticide Workers*, 21 J. OCCUP. MED. 161 (1979).



gesting that pesticides, not other factors, were responsible.<sup>91</sup>

California requires medical surveillance of agricultural workers, including measurements of cholinesterase activity in plasma and red blood cells. A decrease in activity over time indicates exposure to organophosphate and carbamate compounds. The effects of these pesticides on nerve cell transmission correlates well with their effects on cholinesterase activity in red blood cells; therefore, a blood test can predict neurological effects. Workers whose red blood cells show a decrease in cholinesterase activity are monitored and in some cases must avoid exposure to pesticides until the enzyme levels return to normal.<sup>92</sup> A link between pesticide exposure and Parkinsonism has been demonstrated among farmers and grain-storage workers.<sup>93</sup>

Reports such as those discussed above have not gone unnoticed by the United States medical establishment. In 1988, the Council of Scientific Affairs of the American Medical Association published a report entitled *Cancer Risk of Pesticides in Agricultural Workers*.<sup>94</sup> The report relates to a resolution passed by the American Medical Association (AMA) Board of Trustees calling for the AMA to alert physicians to the potential hazards of agricultural pesticides, to provide physicians with advice on these hazards for their patients, and to urge the appropriate labeling of these substances.

The report points out that only two pesticides — arsenic and vinyl chloride — have been definitely shown to be carcinogenic in humans. However, the report acknowledges the numerous studies that suggest correlations between elevated incidence of cancer and pesticide exposure in specific groups of people. The report concludes that much information needs to be gathered before the carcinogenic effects of other pesticides can be ruled out.

As the medical studies discussed above make clear, agricul-

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91. Blair, Granman, Lubin & Fraumeni, *Lung Cancer and Other Causes of Death Among Licensed Pesticide Applicators*, 71 J. NATL. CAN. INST. 31-37 (1983).

92. Coye, Lowe, & Maddy, *Biological Monitoring of Agricultural Workers Exposed to Pesticides: I Cholinesterase Activity Determinations*, 28 J. OCC. MED. 617-27 (1986). The effects of cholinesterase have been known for years. According to a 1953 report, adaptation to cholinesterase inhibitors can occur after long-term exposure to organic phosphorus insecticides. See Sumerford, Hayes, Johnston, Walker & Spillane, *Cholinesterase Response and Symptomatology from Exposure to Organic Phosphorus Insecticides*, 7 A.M.A. ARCH. IND. HYG. OCCUP. MED. 383-98 (1953).

93. Peters, 59 ACTA PHARM. TOXICOL. 535-46 (1986); Chapman, Peters, Matthews & Levine, *Parkinsonism and Industrial Chemicals*, LANCET Feb. 7, 1987, 333.

94. Council of Scientific Affairs, 260 J. AMER. MED. ASSOC. 959-66 (1988).

tural workers and others are often exposed to a variety of pesticides, simultaneously or sequentially, over a period of time. It will take many years of study before specific diseases and symptoms in one individual can be attributed to exposure to an identifiable pesticide or one of its components.

#### E. Other Agriculture-Related Illnesses Related to Pesticide Exposure

As was mentioned in Part I, a large proportion of applied pesticides do not reach or stay on the target for which they are intended. In view of this, studies have been conducted to determine if people living or working near sites of pesticide use are affected by exposure to the chemicals. In addition, information is available through reports from hospitals which have treated victims of exposure.

In 1987, Goldman *et al.*<sup>95</sup> reported that four episodes of illness in a farming community were associated with treatment of strawberry fields with the fumigants methyl bromide and chloropicrin. These chemicals are routinely added to soil before planting to control nematodes, insects, weeds and fungi. The treated ground is covered temporarily with a tarp, but some of the fumigants can escape into the air.

On separate occasions, low wind velocity coupled with high temperatures led to an increase in the air concentration of the fumigants. Residents living up to one-half mile from the site had to be treated for eye irritations, sore throats, headache, and in one child, hallucination. The location of the affected residents was consistent with the direction of the wind relative to the treated fields.

Apart from the irritating acute effects, methyl bromide is suspected of neurotoxic, carcinogenic, and teratogenic effects. The chronic effects of the other fumigant, chloropicrin, are unknown. Although the number of people exposed in the incidents discussed above is not large, a follow-up study of their medical conditions might yield additional information about subsequent effects of exposure to these fumigants.

The foregoing discussion only touches upon the effects of pesticides on individuals who handle and work with the chemicals and who are exposed to pesticides during and after application.

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95. Goldman, Mengle, Epstein, Fredson, Kelly & Jackson, *Acute Symptom in Persons Residing Near a Field Treated with the Soil Fumigants Methyl Bromide and Chloropicrin*, 147 WESTERN J. MED. 95-98 (1987).

The medical community is faced with the challenge of identifying, treating, and helping to prevent pesticide-associated illness and death. Also, as will be discussed below, the legal community has both the challenge and the opportunity to fashion effective ways of compensating victims of pesticide exposure and to help prevent future episodes of exposure.

### III. LEGAL PROTECTION FOR PROPERTY RIGHTS VERSUS PROTECTION ACCORDED INDIVIDUALS EXPOSED TO PESTICIDES AT TIME OF APPLICATION

Recovery for exposure to pesticides is not unknown in the common law. Indeed, courts have been quite generous in awarding recovery to individuals who have suffered property damage caused by pesticide exposure and who have suffered acute personal injury shortly after an excessive dose of pesticides or drenching. Courts have had considerable difficulty, however, in providing remedies to individuals who have long-term, low-level exposures.

#### A. Recovery for Property Damage

##### 1. Rights Against Neighboring Landowners and Applicators

For over fifty years, courts have recognized a landowner's right to apply pesticides to protect interests in land. This right, however, is qualified by the rights of neighboring landowners to be safe from unreasonable harm. In *Bennett v. Larsen Co.*,<sup>96</sup> the court described these competing rights as follows:

At common law, the landowner has the right to make use of the land as he or she sees fit. This privilege, however, is qualified by due regard for the interest of others who may be affected by the landowner's activities on the property. Thus, the landowner or possessor is under an obligation to make reasonable use of the property so that no unreasonable harm is caused to others in the vicinity. . . . Thus, the landowner or possessor could take reasonable steps to protect growing crops by spraying insecticides but had to exercise reasonable care to ensure that the pesticides were not sprayed on or did not

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96. 118 Wis. 2d 681, 348 N.W.2d 540 (1984).

drift onto others' property. If pesticides were oversprayed or drifted onto adjacent properties, the pesticide user could be held liable for any resulting damages.<sup>97</sup>

Thus, courts have recognized an individual's right to recover for property damage caused by overspraying or spray drift from the application of pesticides on adjacent property. The usual theory of recovery is negligence, although some courts have recognized some variant of strict liability in cases of pesticide-caused property damage.

#### a. *Negligence Standard*

The most common standard of liability is negligence. From the cases allowing recovery on a negligence theory, three related aspects to a successful claim can be gleaned: the plaintiff must prove that (1) the negligent application of pesticides on neighboring land (2) was the cause of (3) crop or animal loss suffered by the plaintiff.<sup>98</sup> Both the applicator and the landowner may be liable.

##### (1) Standard of Care

A typical case discussing the type of act resulting in negligence liability is *Wieting v. Ball Air Spray, Inc.*<sup>99</sup> In *Wieting*, the plaintiffs claimed that their trees and gardens were damaged when defendant negligently sprayed 2,4-D, a herbicide that kills not only undesirable plants but also broad-leafed crops, by airplane on an adjoining cornfield belonging to a neighbor.<sup>100</sup> In upholding a verdict for the plaintiffs, the court first described the standard of care:

Courts generally have held that farmers have the right to

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97. *Id.* at 690-91, 348 N.W.2d at 547 (citing *Lundberg v. Bolon*, 67 Ariz. 259, 267, 194 P.2d 454, 459 (1948); *S. A. Gerrard Co. v. Fricker*, 42 Ariz. 503, 507, 27 P.2d 678, 680 (1933); *Miles v. A. Arena & Co.*, 23 Cal. App. 2d 680, 685, 73 P.2d 1260, 1262 (1973); *Lenk v. Spezia*, 95 Cal. App. 2d 296, 300, 213 P.2d 47, 50 (1949).

98. A more traditional analysis of a negligence action requires that the component parts of negligence are duty, violation thereof, and resulting injury. *See, e.g.*, *Crouse v. Wilbur-Ellis Co.*, 77 Ariz. 359, 272 P.2d 352 (1954). However, the vast majority of cases involving pesticide exposure break the issues down as described in the text and often do not delineate whether evidence is used to support a finding of a duty, violation of a duty or causation.

99. 84 S.D. 493, 173 N.W.2d 272 (1969).

100. *Id.* Other cases concerning crop loss caused by 2,4-D are discussed *infra* notes 107-09, 131-33, 143, 174 & 180 and accompanying text.

use beneficial dusts and sprays to eliminate weeds which choke out or stunt growth. However, such use cannot be made with absolute impunity and due care must be exercised in seeing that weather conditions are right and that the poisonous spray or dust is not negligently spread.<sup>101</sup>

The plaintiff testified that he observed the defendant's plane flying over his farmstead and directly above him in his farmyard.<sup>102</sup> He also described a "good stiff breeze" that increased in velocity during the spraying and that blew from the direction of the neighboring farm. Furthermore, he testified that he smelled a very strong spraying odor and felt the liquid spray against his skin and face.<sup>103</sup> The court concluded that the evidence was sufficient for the jury to find that the defendant's pilot did not exercise due care under existing weather conditions, and further discharged the spray too close to plaintiffs' property so that the spray drifted upon their property or fell upon it as the pilot passed overhead.<sup>104</sup> Typically, if the plaintiff presents evidence that an applicator of pesticides sprayed on a windy day and caused spray drift or that the applicator failed to take precautions to prevent overspraying on plaintiff's property, courts will hold the applicator liable in negligence for damages caused by the spray.<sup>105</sup>

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101. *Id.* at 495, 173 N.W.2d at 273. See also *Faire v. Burke*, 363 Mo. 562, 252 S.W.2d 289 (1952). A similar standard is articulated in *Miles v. A. Arena & Co.*, 23 Cal. App. 2d 680, 73 P.2d 1260 (1937):

It must be conceded that, in itself, dusting vegetables to kill pests that prey upon them is a necessary and lawful operation which the owner of the vegetables may perform, either himself or through his servants, or may have performed by an independent contractor. However, he should not do the dusting, or have it done, under conditions which would indicate to a reasonably prudent person that damage to his neighbor would result.

*Id.* at 683, 73 P.2d at 1262. Later in the discussion, the court seems to term the invasion of plaintiff's property by a poisonous dust applied by defendants as a nuisance. *Id.* Although nuisance actions originally required a showing of intentional interference with a plaintiff's use and enjoyment of land, over time, negligent interferences also became actionable, resulting in much confusion in the case law. See, e.g., *W. KEETON, D. DOBBS, R. KEETON & D. OWEN, PROSSER & KEETON ON TORTS* § 91 (5th ed. 1984).

102. *Wieting*, 84 S.D. at 496, 173 N.W.2d at 273.

103. *Id.* at 496, 173 N.W.2d at 273-74.

104. *Id.* at 497-98, 173 N.W.2d at 274. Specifically the jury could find that the wind velocity was in excess of what was reasonably safe for aerial spraying.

105. See, e.g., *McLouth v. General Tel. Co. of the Southwest*, 164 F. Supp. 496 (W.D. Ark. 1958) (spray drift and overspraying); *Binder v. Perkins*, 213 Kan. 365, 516 P.2d 1012 (1973) (overspraying); *Sullivan v. Voyles*, 249 Ark. 948, 462 S.W.2d 454 (Ark. 1971) (overspraying); *Bivins v. Southern Ry. Co.*, 247 N.C. 711, 102 S.E.2d 128 (1958) (spray drift); *Moore v. St. Louis Southwestern Ry. Co.*, 301 S.W.2d 395 (Mo. 1957) (spray drift); *Kentucky Aerospray v. Mays*, 251

Even when there is considerable evidence that the defendant took precautions to avoid spray drift or overspraying, courts have held applicators liable in negligence by application of *res ipsa loquitur*.<sup>106</sup> In *Bloxsom v. San Luis Valley Crop Care, Inc.*,<sup>107</sup> the plaintiff sued an aerial applicator who sprayed 2,4-D on a nearby barley field for damage to plaintiff's alfalfa crop — a broad-leafed crop. Despite the defendant's use of a number of procedures to protect adjoining properties,<sup>108</sup> the trial court was convinced by testimony that suggested herbicides were present in plaintiff's fields on the day of the spraying. The absence of any other explanation for the damage to plaintiff's crop led the court to conclude that the damage would not have occurred in the absence of negligence and therefore upheld the trial court's application of *res ipsa loquitur*.<sup>109</sup>

Another basis for finding a negligent act involving pesticide application is a defendant's deviation from the standard of care set by a state statute regulating pesticide application. In *Bennett v. Larsen Co.*,<sup>110</sup> the plaintiff alleged that defendants had violated a

S.W.2d 460 (Ky. 1952) (overspraying); *Faire v. Burkes*, 363 Mo. 562, 252 S.W.2d 289 (1952) (spray drift); *Miles v. A. Arena & Co.*, 23 Cal. App. 2d 680, 73 P.2d 1260 (1937) (spray drift).

106. In *Bloxsom v. San Luis Valley Crop Care, Inc.*, 198 Colo. 113, 566 P.2d 1189 (1979), the court listed the essential elements of *res ipsa loquitur*:

1. The event is the kind which ordinarily does not occur in the absence of negligence[;]
2. Other responsible causes, including the conduct of the plaintiff and third persons, are sufficiently eliminated by the evidence[;]
3. The indicated negligence is within the scope of the defendant's duty to the plaintiff[;] and
4. The plaintiffs are free from any contributory negligence or other responsibilities.

*Id.* at 116, 596 P.2d at 1191 (footnote and citations omitted).

107. *Id.*

108. *Id.* These procedures included building fires around the barley field to create smoke from which the direction and velocity of the wind could be determined and stationing flagmen on the ground to inform the pilot of the airplane whether conditions were propitious for spraying. *Id.* at 115, 596 P.2d at 1190.

109. *Id.* at 117, 596 P.2d at 1191. The plaintiff testified that he smelled a chemical odor which he believed was that of an herbicide in his field and later in the day of the spraying he noticed the tips of his alfalfa plants drooping. Moreover, he presented expert testimony that after the spraying his alfalfa crop showed damage that probably resulted from the application of some type of herbicide and testimony that other area alfalfa crops grew normally during the season. *Id.* at 115-16, 596 P.2d at 1190-91. The trial court also noted that neither the late frost, subsequent grazing nor plaintiff's own application of herbicides caused the damage. *Id.* at 116, 596 P.2d at 1191.

110. 118 Wis. 2d 681, 348 N.W.2d 540 (1984), *reversing in part and affirming in part and remanding*, 114 Wis. 2d 265, 338 N.W.2d 510 (Wis. Ct. App. 1983).

provision of the Economic Poisons Act that prohibited the “[u]se [of] any pesticide in a manner inconsistent with its labeling.”<sup>111</sup> After articulating the circumstances under which a negligence *per se* rule could be applied,<sup>112</sup> the court recognized that the Economic Poisons Act was intended to extend protection from economic poisons which were highly toxic to people, plants and animals and which were a danger to public health and safety beyond that provided by the common law.<sup>113</sup> Quoting the legislative history of the statute, which noted the inadequate regulation of many economic poisons and lack of proper protection of consumers against improperly used pesticides, the court concluded that the legislature intended to prevent the improper use of pesticides dangerous to people, animals and plant life by requiring users to apply pesticides in accordance with label directions.<sup>114</sup> The court assumed that the label directions “inform the user of what life may be affected by the pesticide and of the optimal way to use and apply the pesticide in a manner which will minimize the risk of harm to affected life.”<sup>115</sup> Thus, the court held that the statute established a duty of care for pesticide users to follow label directions in the use of pesticides and that the failure to fulfill

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111. 118 Wis. 2d at 692, 348 N.W.2d at 548 (quoting WIS. STAT. § 94.71 (1975)).

112. The Wisconsin court provided the following standards for applying a negligence *per se* rule:

“When a statute provides that under certain circumstances particular acts shall or shall not be done, it may be interpreted as fixing a standard . . . from which it is negligence to deviate.” *Prosser on Torts* sec. 36 at 190. See also Restatement (Second) of Torts sec. 285 (1965). We have recognized as safety statutes those legislative enactments which are designed to protect a class of persons from a particular type of harm. *Walker v. Bignell*, 100 Wis.2d 256, 268, 301 N.W.2d 447 (1981). “[W]here a statute is designed to protect a class of persons from a particular type of harm, a violation of the statute which results in that type of harm to someone in the protected class constitutes negligence *per se*. *Meihost v. Meihost*, 29 Wis.2d 537, 540, 139 N.W.2d 116 (1966) (footnote omitted); see also Restatement (Second) of Torts secs. 286, 288 (1965). However, we have limited the application of this rule, stating, “. . . statutes are not to be extended so as to impose any duty beyond that imposed by the common law unless such statute clearly and beyond any reasonable doubt expresses such purpose by language that is clear, unambiguous, and peremptory.” *Delaney v. Supreme Investment Co.*, 251 Wis. 374, 380, 29 N.W.2d 754 (1947) (citations omitted). Whether we apply a negligence *per se* rule is also dependent upon the legislative purpose in enacting the statute. See *Burke v. Milwaukee & Suburban Transport Corp.*, 39 Wis.2d 682, 689-90, 159 N.W.2d 700 (1968).

*Bennett*, 118 Wis. 2d at 693-94, 348 N.W.2d at 548-49.

113. *Id.* at 694, 348 N.W.2d at 549.

114. *Id.* at 695, 348 N.W.2d at 549.

115. *Id.*

that duty constitutes negligence *per se*.<sup>116</sup>

*Bennett* is also noteworthy because of the facts of the case. In *Bennett*, the plaintiff sought to hold the defendants liable for the death of honeybees. The death of the bees was not caused by pesticide spray drift or overspraying, the usual bases for liability, but was caused by the bees' foraging practices which allowed for the transfer of contaminated pollen from sprayed neighboring fields back to the hive. Most courts regard bees and other animals foraging in sprayed neighboring fields as trespassers and refuse to impose on landowners a duty to protect these "trespassers" from the danger of pesticides.<sup>117</sup> However, the Wisconsin court in *Bennett* interpreted the label directions on the pesticide sprayed by defendants as imposing on the user an affirmative duty to warn beekeepers owning hives within bee flight range of an affected field that spraying will take place.<sup>118</sup> To fulfill this duty, the court required the user to take reasonable steps to ascertain and warn those who might be affected by the spraying and to give the warning far enough in advance of the spraying so as to give the beekeepers sufficient time to take precautionary steps. Once appropriate warnings are given, the pesticide user is not liable for the death of bees on the field at the time of spraying or for loss caused by bees bringing contaminated pollen back to the hive.<sup>119</sup> In Iowa, a similar duty has been imposed on pesticide users to

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116. *Bennett*, 118 Wis. 2d at 695-96, 348 N.W.2d at 549. See also *Perzinski v. Chevron Chem. Co.*, 503 F.2d 654 (7th Cir. 1974) (applying Wisconsin law, court held that seller's making of representations different from pesticide's label violated state statute and constituted negligence *per se*); *J.L. Wilson Farms, Inc. v. Wallace*, 267 Ark. 643, 590 S.W.2d 42 (Ark. Ct. App. 1979) (although court did not discuss negligence *per se*, court did uphold admission of evidence that defendants failed to comply with regulation requiring state authorization of commercial aerial application, state approval of the aircraft used for the spraying and notice of the spraying).

117. *Bennett*, 118 Wis. 2d at 691, 348 N.W.2d at 547 (quoting *Lenk v. Spezia*, 95 Cal. App. 2d 296, 302-03, 213 P.2d 47, 51 (1949)). See also *Aycock v. Norfolk-Southern Ry. Co.*, 256 N.C. 604, 124 S.E.2d 566 (1962); *McKennon v. Jones*, 219 Ark. 671, 244 S.W.2d 138 (1950); *Jeanes v. Holtz*, 94 Cal. App. 2d 826, 211 P.2d 925 (1949).

118. *Bennett*, 118 Wis. 2d at 698, 348 N.W.2d at 550. Defendants had sprayed Lannate on corn fields. The Lannate label included the following language: "This product is toxic to bees and should not be applied when bees are actively visiting the area. Apply late in evening or early morning where honey bees visit fields." *Id.* at 687, 348 N.W.2d at 546. Another case imposing a duty to warn is *Crouse v. Wilbur-Ellis Co.*, 77 Ariz. 359, 367-68, 272 P.2d 352, 357-58 (1954).

119. *Bennett*, 118 Wis. 2d at 699, 348 N.W.2d at 550-51. It is unclear how this rule operates in the real world, inasmuch as it is unclear how a beekeeper warned of spraying on neighboring land is to prevent the harm and keep the bees confined to his property.



their lessees who raise animals on the leased premises.<sup>120</sup>

In summary, courts have recognized that despite a landowner's right to use pesticides, harm to a neighbor's property resulting from such use is unreasonable and entitles the neighbor to compensation. By recognizing property loss from pesticides as unreasonable harm, courts are making the judgment that freedom from such harm is an interest worthy of protection and abrogation of that right is compensable, even without a showing that the defendant engaged in a specific negligent act, so long as the court is satisfied that the defendant caused the harm.

## (2) Causation

Courts which allow plaintiffs to recover for property damage caused by negligent spraying of neighboring property do not, of course, allow unlimited recovery; the plaintiff also must present evidence that plaintiff's damage was caused by exposure to defendant's pesticides.<sup>121</sup> This requirement is consistent with the general belief, evident throughout tort cases, that it is unfair to require an individual to pay for another's tragedy unless it is shown that it is more likely than not that he caused it.<sup>122</sup>

Evidence establishing negligent application of pesticides is also useful in establishing causation, and generally, when the plaintiff presents testimony that pesticides applied by the defendant reached the property that was damaged, that the pesticide applied generally causes the type of damage which occurred, and that the property suffered the type of damage typically caused by the pesticide applied, proof of causation is established. For ex-

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120. See, e.g., *Knapp v. Simmons*, 345 N.W.2d 118 (Iowa 1984) (landlord may be liable to tenant for loss of cattle which were poisoned by eating poison left by landlord on leased premises); *Brown v. Sioux City*, 242 Iowa 1196, 49 N.W.2d 853 (Iowa 1951) (city liable to plaintiff beekeeper for loss of bees caused when it sprayed land adjoining plot leased to plaintiff).

121. One court attempted to articulate precisely the legal standard that must be met to prove "proximate causation." See *Crouse v. Wilbur-Ellis Co.*, 77 Ariz. 359, 368-69, 272 P.2d 352, 357-58 (1954). However, even *Crouse* indicates the difficulty of defining proximate cause with any precision, and like the cases discussed *infra* notes 123-28 and accompanying text, simply talks about the type of evidence that establishes causation.

122. See, e.g., *In re Agent Orange Prod. Liab. Litigation*, 597 F. Supp. 740 (E.D.N.Y. 1984). This statement refers to the plaintiff's burden of proving cause-in-fact which is essentially a question of fact. Some courts also must be satisfied that the defendant is the proximate or legal cause of plaintiff's injury before imposing liability. In pesticide cases, however, if a plaintiff satisfies the burden of proving cause-in-fact, courts seem to assume that proximate cause is satisfied as well.

ample, in *Miles v. A. Arena & Co.*,<sup>123</sup> plaintiff sought to hold the defendants liable for destruction of their bees allegedly caused by defendants' spraying of their honeydew fields with calcium arsenate. The appellate court upheld defendants' liability, citing evidence that the defendants sprayed their honeydew fields with calcium arsenate, a poisonous dust, that a light wind was blowing on the day of the dusting, and that the dust floated from the defendants' fields to plaintiff's apiary on neighboring land.<sup>124</sup> The trial court's finding that the dust killed plaintiff's bees was supported further by evidence that calcium arsenate contains sufficient arsenic to kill bees and that dead bees were found about two weeks after the dusting.<sup>125</sup>

Some courts seem willing to infer causation simply from the fact that the substance sprayed is poisonous.<sup>126</sup> Others seem to look to expert testimony establishing that the pesticide is dangerous to the type of property raised by the plaintiff or establishing the link between the substance sprayed and the damage to the plaintiff.<sup>127</sup> Some courts also require that the plaintiff show that the damage did not result from other causes, such as poor cultivation.<sup>128</sup> In every case, however, it is essential that plaintiff suffer some property loss before a court will allow recovery.

### (3) Damages

With respect to proof of damages, a number of jurisdictions have recognized a plaintiff's right to recover when negligent ap-

123. 23 Cal. App. 2d 680, 73 P.2d 1260 (1937).

124. *Id.* at 682, 73 P.2d at 1261.

125. *Id.* at 682, 73 P.2d at 1261-62. *See also* Kentucky Aerospray v. Mays, 251 S.W.2d 460 (Ky. 1952) (judgment for plaintiff supported by evidence that mist from aircraft spraying chemical compound containing toxaphene flew from defendant's aircraft as it circled plaintiff's pond, that toxaphene will kill fish, that sampling in pond showed toxaphene concentrations three times amount needed to be deadly to all fish life in pond, and that all of plaintiff's minnows in pond died within seven or eight days after spraying). *Cf.* Swickard v. Crecelius Ranches, Inc., 211 Cal. Rptr. 187 (Cal. Ct. App. 1985) (no recovery because plaintiff failed to prove that defendant's spraying of orchard caused loss of plaintiff's bees).

126. *See, e.g.*, Alexander v. Seaboard Air Line R.R. Co., 221 S.C. 477, 71 S.E.2d 299 (1952); McKennon v. Jones, 219 Ark. 671, 244 S.W.2d 138 (1951); S. A. Gerrard Co. v. Fricker, 42 Ariz. 503, 27 P.2d 678 (1933).

127. Southwestern Bell Tel. Co. v. Smith, 220 Ark. 223, 247 S.W.2d 16 (1952); Lundberg v. Bolon, 67 Ariz. 259, 194 P.2d 454 (1948).

128. *See, e.g.*, Faire v. Burke, 363 Mo. 562, 252 S.W.2d 289 (1952). *See also* Bloxson v. San Luis Valley Crop Care, Inc., 198 Colo. 113, 596 P.2d 1189 (1979) (upheld trial court's finding that other causes, such as late frost, subsequent grazing or plaintiff's own spraying, caused plaintiffs' crop damage).

plication of pesticides on a neighboring property results in the destruction of animals on plaintiff's property.<sup>129</sup> Similarly, courts have upheld a plaintiff's right to recover where such negligent application of herbicides has resulted in the destruction of crops or other vegetation on plaintiff's property.<sup>130</sup> A recurring fact pattern involves spray drift from or overspraying of defendant's fields with 2,4-D resulting in the destruction of broad-leaf crops on plaintiff's lands.<sup>131</sup> In evaluating the measure of damages, at

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129. *See, e.g.*, *Southwestern Bell Tel. Co. v. Smith*, 220 Ark. 223, 247 S.W.2d 16 (1952) (affirmed judgment for plaintiff for loss of plaintiff's cows from defendant's spraying vegetation under its lines on plaintiff's land); *McKennon v. Jones*, 219 Ark. 671, 244 S.W.2d 138 (1951) (affirmed judgment for plaintiff for damages to plaintiff's honey bees caused by negligent spraying of cotton on defendant's land); *Lundberg v. Bolon*, 67 Ariz. 259, 194 P.2d 454 (1948) (upheld jury's verdict that defendant's negligent spraying of cotton crop caused destruction of plaintiff's bees); *Miles v. A. Arena & Co.*, 23 Cal. App. 2d 680, 73 P.2d 1260 (1937) (upheld award of damages for destruction of bees as a result of spraying of melons one half mile away); *S. A. Gerrard v. Fricker*, 42 Ariz. 503, 27 P.2d 678 (1933) (upheld judgment for plaintiff for damages to plaintiff's apiary caused by negligent spraying of defendant's lettuce fields); *Kentucky Aerospray, Inc. v. Mays*, 251 S.W.2d 460 (Ky. Ct. App. 1952) (upheld plaintiff's verdict for destruction of minnows in pond on plaintiff's land from toxaphene compound sprayed on defendant's tobacco fields).

130. *See, e.g.*, *Bivins v. Southern Ry Co.*, 247 N.C. 711, 102 S.E.2d 128 (1958) (upheld judgment for plaintiffs for damage to garden, fruit, trees, and pasture resulting from chemicals that drifted when defendant sprayed right of way); *Crouse v. Wilbur-Ellis Co.*, 77 Ariz. 359, 272 P.2d 352 (1954) (court reversed judgment n.o.v. for defendant and held that evidence that insecticide sprayed on cotton crop drifted onto and severely damaged plaintiff's cantaloupe crop was sufficient to support verdict for plaintiffs on theory of negligence). *Cf.* *Sun Pipe Line Co. v. Kirkpatrick*, 514 S.W.2d 789 (Tex. Civ. App. 1974) (no liability where jury did not find that defendant was negligent in spraying its easement across plaintiff's land, despite finding that chemical spray drifted onto plaintiff's land).

131. *See, e.g.*, *Bloxsom v. San Luis Valley Crop Care, Inc.*, 198 Colo. 113, 596 P.2d 1189 (1979) (affirmed trial court judgment against defendant for damage to plaintiff's alfalfa crop resulting from negligent spraying of 2,4-D on defendant's barley fields); *Binder v. Perkins*, 213 Kan. 365, 516 P.2d 1012 (1973) (upheld judgment for plaintiff for damages to plaintiff's alfalfa crop caused by defendant's negligent spraying of 2,4-D on neighboring wheat field); *Wieting v. Ball Air Spray, Inc.*, 84 S.E. 493, 173 N.W.2d 272 (1969) (upheld jury's verdict for plaintiffs where evidence showed that 2,4-D sprayed on defendant's corn field blew onto and damaged plaintiffs' trees and gardens); *Pendergrass v. Lovelace*, 57 N.M. 661, 262 P.2d 231 (1953) (upheld trial court judgment for plaintiff for damage to plaintiff's cotton crop resulting from negligent spraying of 2,4-D on defendant's adjacent field); *Heeb v. Prysock*, 219 Ark. 899, 245 S.W.2d 577 (1952) (upheld plaintiffs' verdict allowing recovery for damage to cotton crops caused by negligent spraying of defendant's rice crop with 2,4-D); *Alexander v. Seaboard Air Line R.R. Co.*, 221 S.C. 477, 71 S.E.2d 299 (1952) (affirmed judgment against defendants for damage to plaintiff's cotton crop caused by drift of 2,4-D sprayed on defendant's right of way); *Gragg v. Allen*, 481 S.W.2d 452 (Tex. Civ. App. 1972) (upheld implied finding that defendant's negligent spraying of 2,4-D damaged plaintiffs' cotton crops).

least one jurisdiction requires that the plaintiff must minimize damages after the spraying.<sup>132</sup>

The foregoing survey of appellate cases suggests that when plaintiffs present evidence that defendants applied pesticides on a windy day or oversprayed pesticides, and that damage of the type associated with the pesticide occurs to plaintiff's crops or animals, defendants are found to be negligent and liable for the ensuing damage. Indeed, a number of special legal rules, such as the use of *res ipsa loquitur* and negligence *per se* have been applied in the area of negligent application of pesticides to ease plaintiffs' recovery. Courts seem concerned that given the dangerous nature of pesticides, landowners who use them must exercise the utmost caution and even then, liability for ensuing harm may attach.

Moreover, some courts, recognizing the hazardous nature of pesticide application, have applied the nondelegation rule and strict liability in pesticide damage cases to hold a landowner liable for the negligence of an applicator and to ease plaintiff's burden of proving negligence in these cases.

#### b. *Nondelegation Rule*

In most pesticide damage cases, plaintiffs sue and recover against the negligent applicator.<sup>133</sup> In addition, many jurisdictions allow recovery against the landowner even when the pesticides were negligently applied by an independent contractor. In general, of course, a party is not liable for the negligent act of an independent contractor.<sup>134</sup> However, an important exception to this rule has evolved and is also generally recognized: when a party employs a contractor to carry on an inherently or intrinsically dangerous activity, that party cannot thereby insulate him-

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132. See *Faire v. Burke*, 363 Mo. 562, 252 S.W.2d 289 (1952). In a subsequent case, a Missouri court discussed the valuation of crop damage. See *Moore v. St. Louis Southwestern Ry. Co.*, 301 S.W.2d 395 (Mo. Ct. App. 1957). See also *Binder v. Perkins*, 213 Kan. 365, 516 P.2d 1012 (1973); *J.L. Wilson Farms, Inc. v. Wallace*, 267 Ark. 643, 590 S.W.2d 42 (Ark. Ct. App. 1979).

133. See, e.g., *Bloxsom v. San Luis Valley Crop Care, Inc.*, 198 Colo. 113, 596 P.2d 1189 (1979); *Binder v. Perkins*, 213 Kan. 365, 516 P.2d 1012 (1973); *Kentucky Aerospray v. Mays*, 251 S.W.2d 460 (Ky. Ct. App. 1952); *Wieting v. Ball Air Spray, Inc.*, 84 S.D. 493, 173 N.W.2d 272 (1969); *Miles v. A. Arena & Co.*, 23 Cal. App. 2d 680, 73 P.2d 1260 (1937).

134. See RESTATEMENT (SECOND) OF TORTS § 409 (1966). See also *Boroughs v. Joiner*, 337 So. 2d 340, 342 (Ala. 1976); *Pendergrass v. Lovelace*, 57 N.M. 661, —, 262 P.2d 231, 232 (1953); *McKennon v. Jones*, 219 Ark. 671, 673, 244 S.W.2d 138, 140 (1951); *S. A. Gerrard Co. v. Fricker*, 42 Ariz. 503, 506, 27 P.2d 678, 680 (1933).

self from liability.<sup>135</sup>

In *Emelwon, Inc. v. United States*,<sup>136</sup> the court explained the purpose of imposing a nondelegable duty in the context of a dangerous activity:

[L]iability is imposed on the employer for his own failure to exercise reasonable care in a situation in which the work is sufficiently dangerous that the employer himself has a duty to third persons who may sustain injuries from the work unless proper precautions are taken in the performance thereof. The taking of such precautions is a duty which the employer may not delegate to his independent contractor so as to evade liability. Should injury occur under such circumstances of sufficiently great danger the employer is liable for the breach of his own "nondelegable duty" to take precautions against harm to third parties.<sup>137</sup>

A number of jurisdictions have categorized cropdusting and spraying as an inherently or intrinsically dangerous activity making inapplicable the rule that a principal is not liable for the torts of his independent contractor.<sup>138</sup> As one court summarized the status of crop dusting in the law: "[T]he authorities are practically uniform in holding that crop dusting is an activity sufficiently freighted with danger to impose liability upon the landowner having the work done if negligence is proven, even though the fault, if any, is that of an independent contractor."<sup>139</sup>

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135. See, e.g., *Emelwon v. United States*, 391 F.2d 9 (5th Cir. 1968) cert. denied *Florida v. Emelwon, Inc.*, 393 U.S. 841 (1968) (Florida law); *Boroughs*, 337 So. 2d at 342; *S. A. Gerrard*, 27 P.2d at 680; *McKennon*, 244 S.W.2d at 140; *Pendergrass*, 262 P.2d at 232; RESTATEMENT (SECOND) OF TORTS § 427A (1966).

136. *Emelwon*, 391 F.2d at 9.

137. *Id.* at 11.

138. *Alabama*—*Boroughs*, 337 So.2d. 340. *Arkansas*—*Copeland v. Hollingsworth*, 259 Ark. 603, 535 S.W.2d 815 340 (1976); *Southwestern Bell Tele. Co. v. Smith*, 220 Ark. 233, 247 S.W.2d 16 (Ark. 1952); *McKennon*, 219 Ark. 671, 244 S.W.2d 138. *Arizona*—*Crouse v. Wilbur-Ellis Co.*, 77 Ariz. 359, 272 P.2d 352, (1954); *S. A. Gerrard*, 42 Ariz. 503, 27 P.2d 678. *New Mexico*—*Pendergrass*, 57 N.M. 661, 262 P.2d 231. *South Carolina*—*Alexander v. Seaboard Air Line R. Co.*, 221 S.C. 477, 71 S.E.2d 299 (S.C. 1952). *Texas*—*Gragg v. Allen*, 481 S.W.2d 452 (Tex. Civ. App. 1972). This case ignores *Pitchfork Land and Cattle Co. v. King*, 162 Tex. 331, 346 S.W.2d 598 (1961), which holds an applicator, who acted as an independent contractor, negligent for spray drift, but did not consider whether the landowner could be held responsible under the nondelegation doctrine. See *Sun Pipe Line Co. v. Kirkpatrick*, 514 S.W.2d 789, 793 (Tex. Civ. App. 1979).

139. *Loe v. Lenhardt*, 277 Or. 242, 247, 362 P.2d 312, 315 (1961).

Courts have brought pesticide spraying into the nondelegation rule because of the great likelihood of the drifting of a poisonous substance onto neighboring property,<sup>140</sup> because of the recognition of the dangers of spray drift in statutes regulating pesticide use,<sup>141</sup> or simply because of the potentially dangerous characteristics of pesticides.<sup>142</sup>

*c. Strict Liability*

A number of jurisdictions have taken the consequences of applying inherently dangerous pesticides one step further and have imposed strict liability on a landowner for property damage to neighboring property caused by pesticide spray drift. In these jurisdictions, negligence or fault is not a requisite to liability.

Probably the first jurisdiction to impose strict liability was Louisiana. In *Gotreaux v. Gary*,<sup>143</sup> the court found from the evidence that an applicator sprayed 2,4-D on defendant's rice crop and that the wind carried the herbicide to plaintiff's cotton and pea crop thereby causing destruction of plaintiff's crop. In deciding the appropriate legal standards to apply, the court balanced two considerations:

First, to give the owner of property the largest liberty possible in the use, occupation and improvement of his own property, consistent with the right to employ modern methods and machinery in accomplishing the improvements desired; and second, that one may not use his own property to the injury of any legal right of another.<sup>144</sup>

The court recognized both the importance of the rice crop in Louisiana and that herbicides are necessary to its cultivation. However, the plaintiff could not be deprived of his privilege of raising his cotton and pea crops because of defendant's use of spraying operations. Hence, because the plaintiff was deprived of the liberty of enjoying his farm, the court imposed strict liability on the defendant.<sup>145</sup>

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140. See, e.g., *S. A. Gerrard*, 42 Ariz. at 507, 27 P.2d at 680; *Copeland*, 259 Ark. at 603, 535 S.W.2d at 816; *Gragg*, 481 S.W.2d at 454.

141. See, e.g., *Boroughs v. Joiner*, 337 So. 2d 340, 343 (Ala. 1976).

142. See, e.g., *Pendergrass*, 57 N.M. 661, 262 P.2d 231.

143. 232 La. 373, 94 So. 2d 293 (1957) (quoting *Fotenot v. Magnolia Petroleum Co.*, 227 La. 866, 80 So. 2d 845 (1955)).

144. *Gotreaux*, 232 La. at 378, 94 So. 2d at 294.

145. *Id.* at 378-79, 94 So. 2d at 294-95. See also *Russel v. Windsor Proper-*

In jurisdictions imposing strict liability for property damage from the drifting of pesticides, "[t]he question in general is not whether defendant acted with due care and caution, but whether his acts occasioned the damage."<sup>146</sup> Thus, while the plaintiff need not prove fault, causation must still be shown. Proof of causation, however, seems to justify the imposition of liability, a judgment that implies that the defendant has invaded an interest of the plaintiff's worthy of protection.

It is interesting to examine how courts determine whether pesticide spraying activity is sufficiently hazardous to subject the actor to strict liability for any harm caused. It must be first noted that "it is the duty of the court [and not the jury] to decide as a matter of law whether a given activity, in a given factual setting, is or is not extra hazardous."<sup>147</sup> In deciding whether an activity should be characterized as extra hazardous, an Oregon appellate court balanced the utility of the defendant's conduct against the risk of harm if it is miscarried. That court concluded that despite common usage of aerial spraying, its dangerous character, as evidenced by the substantial regulation of that activity in many jurisdictions, including Oregon, poses a risk that justifies application of strict liability when actual damage results.<sup>148</sup> It is the voluntary

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ties, Inc. 366 So. 2d 219 (La. Ct. App. 1978) (court imposed strict liability on defendant for damage to plaintiff's cotton crop caused by defendant's spraying of 2,4-D on his property); Himel v. American Employers Ins. Co., 354 So. 2d 606 (La. Ct. App. 1977) (strict liability imposed for damage caused by spray drift, despite testimony that latest methods were used and no drift occurred); Winston v. State Dept. of Hwys., 352 So. 2d 752 (La. Ct. App. 1977) (state held strictly liable for damage to plaintiff's livestock resulting from spraying of underpass with arsenic); Romero v. Chris Crusta Flying Serv., Inc., 140 So. 2d 734 (La. Ct. App. 1962) (defendants held "solidarily liable" for damages to plaintiff's crops caused by drift from defendant's spraying 2,4-D on rice field); Trahan v. Bearb, 138 So. 2d 420 (La. Ct. App. 1962); Jones v. Morgan, 96 So. 2d 109 (La. Ct. App. 1957). *But cf.* Watson v. Mid-Continent Aerial Sprays, Inc., 170 So.2d 149 (La. Ct. App. 1965) (court affirmed judgment for defendants because there was insufficient evidence to establish that death and depreciation in value of plaintiff's cattle caused by aerial spraying of heptachlor for fire ants).

146. Young v. Darter, 363 P.2d 829, 833 (Okla. 1961) (citing Rylands v. Fletcher (1868) L.R., 3 H.L. 330). The court seems to also term the invasion of plaintiff's land by defendant's pesticides a trespass and indicates that the only defenses available might be where the escape of the poison is owing to plaintiff's default, or that the escape was the consequence of vis major or the Act of God. *Id.*

147. Loe v. Lenhardt, 227 Or. 242, 249, 362 P.2d 312, 316 (1961). *See also* Langan v. Valicopters, Inc., 88 Wash. 2d 855, 861, 567 P.2d 218, 221 (1977).

148. Loe v. Lenhardt, 227 Or. 242, 253, 362 P.2d 312, 318 (1961). The court actually terms the invasion of plaintiff's land by spray drift a trespass under Martin v. Reynolds Metal Co., 221 Or. 86, 342 P.2d 790 (1959), *cert. denied*, 362 U.S. 918 (1960) and the Restatement of Torts section 165. Inasmuch as the Oregon court is imposing liability without fault for harm caused by the

taking of that risk by the defendant that justifies imposition of liability.<sup>149</sup>

A later Oregon case indicates that liability without fault may be imposed either when the harm threatened is very serious or when the risk only moderately threatens economic activities, rather than harm to life, health or property or environment, but the activity can be carried on only with a substantial uncontrollable likelihood that the damage will sometimes occur.<sup>150</sup> Thus the type of harm likely to occur, as well as the probability that it will occur, is important to a court's decision to impose liability without fault.<sup>151</sup>

This statement of the law of strict liability is interesting because in general, courts only impose strict liability when the risk of harm is to a plaintiff's property and therefore are reluctant to apply strict liability principles where the harm is economic or more generally environmental.<sup>152</sup> However, the Oregon court

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defendant's conduct, it is appropriate to categorize Oregon with the strict liability jurisdictions.

149. *Loe*, 277 Or. at 254, 362 P.2d at 318 (citing RESTATEMENT TORTS § 165 (1934)).

150. *Bella v. Aurora Air, Inc.*, 279 Or. 13, 23, 566 P.2d 489, 494 (1977). See also *Langan*, 88 Wash. 2d at 862, 567 P.2d at 222 (discussing uncontrollability of drift and impossibility of eliminating risk of drift).

151. *Bella v. Aurora Air, Inc.*, 279 Or. 13, 566 P.2d 489 (1977). A landowner who applies a pesticide heavily regulated by statute is almost certainly subject to strict liability under Oregon law. *Id.*

152. See, e.g., *In re TMI Litigation Governmental Entities Claims*, 544 F. Supp. 853, 858 (M.D. Pa. 1982), *vacated and remanded sub nom Commonwealth of Pennsylvania v. General Pub. Utils. Corp.*, 710 F.2d 117 (3d Cir. 1983) (governmental entities cannot recover in strict liability for costs incurred in responding to nuclear incident in absence of allegations that government's property was actually injured); *City of Bridgeton v. B.P. Oil, Inc.*, 146 N.J. Super. 169, 177, 369 A.2d 49, 54 (Law Div. 1976) (city, which had expended money and used its employees to prevent spread of oil spill caused by leaks in defendant's gasoline or fuel oil tanks, was not "proper plaintiff" at common law to seek recovery in strict liability). One explanation for this rule is that strict liability is closely related to trespass. See, e.g., *Loe v. Lenhardt*, 227 Or. 242, 362 P.2d 312 (1961) (discussed *supra* notes 139, 147-49; *Rylands v. Fletcher*, L.R. 3 H.L. 330 (1868) (leading case from which cause of action for strict liability was developed appears to have been brought as trespass or nuisance action). A cause of action in trespass traditionally protects interests in real property, rather than general economic interests or the public's interest in the environment. See W. KEETON, D. DOBBS, R. KEETON, D. OWEN, PROSSER AND KEETON ON TORTS § 13, at 67, 70-71 (5th ed. 1984). Also, most jurisdictions limit application of strict products liability to cases involving personal injury or property damage, but not economic harm. See, e.g., *East River S.S. Corp. v. Transamerica DeLaval, Inc.*, 476 U.S. 858, 874-76 (1986). As explained in *East River*, imposing strict liability, rather than requiring the plaintiff to prove negligence, satisfies "public policy demands that responsibility be fixed wherever it will most effectively reduce the hazards to life and health inherent in defective products that reach the market." *Id.* at 866



has expressed a willingness to apply strict liability when economic harm results, and in one case seems to have done so. In *Langan v. Valicopters, Inc.*,<sup>153</sup> the Washington court held a spray applicator of Thiodan and Guthion for a landowner's Colorado beetle infestation strictly liable to neighboring organic farmers who were forced to pull their crops when the spray settled on their crops. The loss to the organic farmers was not that the crops died as a result of the spraying, as in most cases where strict liability is imposed. Rather, the crops exceeded the pesticide residue tolerances allowed for the crops to be certified as organically grown and the plaintiffs' land was decertified. The plaintiffs pulled the contaminated crops to prevent further contamination.

In applying the factors used to determine whether an activity is abnormally dangerous thereby subjecting the actor to strict liability,<sup>154</sup> the Washington court not only considers the characteristics of pesticide spraying, i.e., that drift is impossible to eliminate,<sup>155</sup> but also seems to advance a number of policy preferences. For example, in determining whether an activity is inappropriate for the place where it is carried on, the court concludes that "[g]iven the nature of organic farming, the use of pesticides adjacent to such an area must be considered an activity conducted in an inappropriate place."<sup>156</sup> Since courts applying strict liability principles generally balance the rights of plaintiffs and defendants

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(quoting *Escola v. Coca Cola Bottling Co.*, 24 Cal. 2d 453, 462, 150 P.2d 436, 441 (1944)). For similar reasons of safety, this duty includes protection against property damage, but not against economic interests; when the risk of harm is to persons or property, responsibility is imposed not on the person who suffers the injury and is unable to protect himself from that injury, but rather on the manufacturer, who is better able to reduce the risk or, when loss occurs, to absorb that loss. *Id.* at 866-67; *Pennsylvania Glass Sand Corp. v. Caterpillar Tractor Co.*, 652 F.2d 1165, 1172 (3d Cir. 1981).

153. 88 Wash. 2d 855, 567 P.2d 218 (1977).

154. These factors are as follows:

- (a) Whether the activity involves a high degree of risk of some harm to the person, land or chattels of others;
- (b) Whether the gravity of the harm which may result from it is likely to be great;
- (c) Whether the risk cannot be eliminated by the exercise of reasonable care;
- (d) Whether the activity is not a matter of common usage;
- (e) Whether the activity is inappropriate to the place where it is carried on; and
- (f) The value of the activity to the community.

*Id.* at 861, 567 P.2d at 222 (quoting RESTATEMENT (SECOND) OF TORTS § 520 (1981)).

155. *Id.* at 862, 567 P.2d at 222.

156. *Id.* at 864, 567 P.2d at 223.

to use their land as they see fit,<sup>157</sup> the court could just as easily have concluded that organic farming is inappropriate to an area where pesticides are used.<sup>158</sup> By not doing so, the court elevates the value of plaintiff's choice to engage in organic farming above that of the defendant's choice to use pesticides. This value preference is more apparent in the court's application of the sixth factor — the value of the activity to the community. The court acknowledges the value of pesticide use to control pests and increase production but concludes that, despite farmers' statutory duty to prevent the spread of pests,<sup>159</sup> it is the user of the pesticide, and not the adjacent landowner, who should bear the loss caused by pesticides because the user benefits from their continued application while the neighbors have been eliminated from the organic food market through no fault of their own.<sup>160</sup>

Thus, cases holding users of pesticides strictly liable for damage caused to neighboring property owners by the pesticides are the culmination of a trend that can be seen in negligence cases.<sup>161</sup> Courts rely on statutes regulating pesticides, as well as evidence

157. See *supra* notes 143-45 and accompanying text.

158. The court could have applied a sort of "coming to the nuisance" analysis, see W. KEETON, D. DOBBS, R. KEETON & D. OWEN, PROSSER & KEETON ON TORTS, § 88b, at 634-36 (5th ed. 1984), and determined that the organic farmers came to an area where chemical pesticides were used and voluntarily subjected themselves to the risk that pesticides applied on a neighboring property would drift onto their property. Alternatively, if the court had decided that the plaintiffs must prove negligence to recover against the defendant, their recovery might have been barred by an argument that they assumed the risk of the type of injury they suffered. Obviously, the court chose not to view the situation in these ways.

159. Indeed, the court reads the statute as creating almost a legislative mandate to use pesticides. 88 Wash. 2d at 865, 567 P.2d at 223 (citing WASH. REV. CODE §§ 15.08.030, 17.10.140, .150 (1971)).

160. *Id.*

161. The rationales behind many negligence cases are indistinguishable from those employing strict liability. For example, although *Miles v. Arena*, discussed *supra* notes 123-25 and accompanying text, imposes liability on the basis of negligence, a later California appellate decision, without acknowledging that it may be breaking new ground, remanded a case dismissed on the pleadings by the trial court for a determination by the trial court of whether the jury should be instructed on a theory of strict liability. See *SKF Farms v. Super. Court*, 153 Cal. App. 3d 902, 200 Cal. Rptr. 497 (1984).

It is unclear, however, why jurisdictions employing far reaching negligence theories have refused to adopt strict liability to pesticide property damage cases, particularly since the rationales behind both types of rules are so similar. For example, in *Bennett*, discussed *supra* notes 110-19 and accompanying text, Wisconsin rejected strict liability, but allowed the case to proceed on a negligence *per se* theory for reasons similar to those employed by the Oregon court in *Bella and Loe*. Similarly, although New Mexico recognizes the nondelegation rule in crop dusting cases, see *supra* note 142, a recent case suggests that strict liability may not be imposed. *Ligocky v. Wilcox*, 95 N.M. 275, 620 P.2d 1300 (1980).

of their dangerous characteristics, to conclude that pesticide use is a hazardous activity and that the user is liable for property loss linked to that activity, even where caution is used. In short, courts apply legal rules to compensate for any unconsented exposure to pesticide that interferes with the manner in which the plaintiff chooses to use his or her property, whether it be to grow crops incompatible with the defendant's pesticide use, to engage in organic farming, or to raise animals that may be harmed by defendant's pesticide use.

## 2. Rights Against Manufacturers and Sellers

### a. Negligence

Those who suffer property damage caused by pesticide use may also have rights of recovery against the manufacturer or seller of the pesticide. The most prevalent theory of recovery is negligence. As in cases against neighboring landowners and applicators, in a negligence action against a manufacturer or seller, the plaintiff must prove some negligent act that caused plaintiff's property loss. When there is evidence that a pesticide caused plaintiff's loss, proof of the manufacturer or seller's negligence is easily accomplished.

For example, in *LaPlant v. E.I. DuPont de Nemours & Co.*,<sup>162</sup> the court found sufficient evidence for a jury to find that a weed killer manufactured by the defendant and sprayed along a drainage ditch caused nitrates to accumulate in the sprayed foliage.<sup>163</sup> When this foliage was consumed by plaintiff's cows, nitrate poisoning and death resulted.<sup>164</sup>

Although the pesticide, as sacked and sold, was not poisonous, the court upheld the lower court's conclusion that the defendant was negligent for failure to warn of the risk of harm suffered by the plaintiff.<sup>165</sup> The jury found that the application of defendant's product to the willows left a salty residue on the foliage which made it particularly attractive to cattle and resulted in a lethal accumulation of nitrates.<sup>166</sup> In addition, the jury found that in the exercise of ordinary care this should have been known to

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162. 346 S.W.2d 231 (Mo. Ct. App. 1961) (plaintiff sought recovery for loss of cattle that ate willows along drainage ditches that third party had sprayed with weed killer manufactured by defendant).

163. *Id.* at 234.

164. *Id.*

165. *Id.*

166. *LaPlant*, 346 S.W.2d 231.

the manufacturer.<sup>167</sup> Since there was evidence from which the jury could find that the danger of nitrate poisoning was foreseeable by the manufacturer, the manufacturer was negligent in failing to exercise ordinary care to avoid the danger.<sup>168</sup> However, the court suggested that a higher standard of care might be applicable; in manufacturing and distributing chemical weed killers, the manufacturer "in that field is held to the skill of an expert, is charged with superior knowledge of the nature and qualities of its products and is obligated reasonably to keep abreast of scientific information, discoveries and advances."<sup>169</sup> A finding of negligence was appropriate where the evidence showed that the manufacturer's labeling of the pesticide as "not hazardous to livestock" was misleading.<sup>170</sup> Moreover, this assurance of safety may be negligent toward people to whom the assurance was not made and who did not in fact rely on it, such as the plaintiff in the case before the court.<sup>171</sup>

Most cases involving the liability of the manufacturer or seller of a pesticide are, as in *LaPlant*, predicated on the defendant's failure to warn of the danger of harm suffered by the plaintiff. In a number of cases, courts have found that federal and state statutes forbidding the sale of economic poisons, such as pesticides which are misbranded, which have a label bearing false and misleading representations, which lack directions necessary for the protection of the public, and which lack warnings necessary to prevent injury to person, vegetation and animals, create a standard of care. When a label fails to warn of the danger resulting in harm to a plaintiff, these courts have concluded that the manufacturer violated the statutory prohibition against misbranding and that "violation of the statute constitutes negligence [negligence *per se*, that is] as a matter of law precluding the need for establishing the common-law elements of negligence. The statute itself creates the standard of conduct required."<sup>172</sup> In adopting negligence *per se* in actions against manufacturers, these courts, like those adopting the principle against neighboring landowners,

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167. *Id.* at 241-42.

168. *Id.* at 240-41.

169. *Id.* at 240.

170. *LaPlant*, 346 S.W.2d at 241.

171. *Id.* at 241-42.

172. *McClanahan v. California Spray Chem. Corp.*, 194 Va. 842, 852, 75 S.E.2d 712, 718 (1953). *See also* *Perzinski v. Chevron Chem. Co.*, 503 F.2d 654, 658-59 (7th Cir. 1974); *Perry Creek Cranberry Corp. v. Hopkins Agr. Chem. Co.*, 29 Wis. 2d 429, 438, 139 N.W.2d 96, 101 (1966).

seek to implement the intent of the statutes to afford protection from the dangers of economic poisons.<sup>173</sup>

*b. Strict Liability*

A few jurisdictions have focused on the inherently dangerous character of pesticide spraying and have expanded the liability rules in actions against sellers and manufacturers of pesticides. In *Chapman Chemical Co. v. Taylor*,<sup>174</sup> the Arkansas court considered the liability of a manufacturer and seller of 2,4-D to the owner of a cotton crop on land three-fourths of a mile from the land on which the manufacturer/seller's product was used. The court held that the pesticide was an inherently dangerous product and that strict liability should be applied.<sup>175</sup> In view of the dangerous nature of the product that it was selling (capability of damaging broad-leaved plants with which it has contact), the court charged the manufacturer/seller with knowledge of tests which would have revealed the peculiar carrying quality of the dust it was selling and imposed liability on the defendant despite an absence of evidence that the defendant actually knew of that quality.<sup>176</sup> Thus, in deciding to apply a rule of strict liability for property damage, the court is impressed not simply with the inherently dangerous characteristic of the pesticide, but rather with the manufacturer's failure to warn of its propensity to drift and cause damage.<sup>177</sup>

Case law finding sellers and manufacturers liable for property damage caused by use of a pesticide is less extensive than

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173. *McClanahan*, 194 Va. at 851, 75 S.E.2d at 717-18. See also *Perry Creek*, 29 Wis. 2d at 435, 139 N.W.2d at 100.

174. 215 Ark. 630, 222 S.W.2d 820 (1949).

175. *Id.* at 632, 222 S.W.2d at 821.

176. *Id.* See also *Reasor-Hill Corp. v. Kennedy*, 272 S.W.2d 685 (Ark. 1954).

177. *Cf. Walton v. Sherwin-Williams Co.*, 191 F.2d 277 (8th Cir. 1951). In *Walton*, a federal case in which the court applied Arkansas law, the court refused to find error in the trial court's imposition of strict liability against the manufacturer of 2,4-D, marked to be mixed in an oil solution. *Id.* at 282. The court distinguished *Chapman*, and refused to reverse the trial court's ruling that 2,4-D in an oil solution is not an inherently dangerous product. *Id.* at 281-82. Unlike the dust considered in *Chapman*, which was shown to drift great distances and cause damage regardless of the degree of care employed in its use, in *Walton* it was shown that the pesticide could be safely used in an area of mixed crops. *Id.* at 282. See also *Ligocky v. Wilcox*, 95 N.M. 275, 276, 620 P.2d 1300, 1301 (N.M. Ct. App. 1980) ("[a] conclusion of strict [products] liability does not follow from the finding that [a pesticide] was intrinsically and inherently dangerous"); *Boyd v. Thompson-Hayward Chem. Co.*, 450 S.W.2d 937 (Tex. Civ. App. 1970) (in indemnity action by applicator against manufacturer, court upheld verdict of no negligence by manufacturer that did warn of damage that could result when 2,4-D drifts).

that against landowners and applicators<sup>178</sup> but expresses similar themes. Courts have recognized that manufacturers of pesticides have a heightened responsibility to inform users and others exposed to their products about the dangers associated with use of the product and have imposed liability where this responsibility has not been met. Courts regard statutes regulating labeling an expression of intent to afford protection from the dangers of pesticides and have recognized that pesticides are dangerous because of both their inherent characteristics and propensity to drift off target. In addition, these cases are significant in that they allow the user of the pesticide to bring an action against a remote seller regardless of privity of contract.<sup>179</sup>

### 3. Equitable Relief

There is another theory that one court has used to grant relief to plaintiffs for property damage caused by pesticide application. In *Kell v. Appalachian Power Co.*,<sup>180</sup> a power company owned a right-of-way easement over the plaintiffs' property. On at least two occasions, the power company had applied 2,4,5-T and 2,4-D (which when applied in equal portions comprise what is popularly known as Agent Orange) to clear vegetation away from a power transmission line constructed by the company across the property.<sup>181</sup> When the company planned to again spray toxic herbicides, the plaintiffs brought an action to enjoin permanently the

178. One reason the case law in this area may be less extensive is that when a pesticide causes damage contrary to its label, the user has a fairly straightforward breach of warranty claim. See, e.g., *Corprew v. Geigy Chem. Corp.*, 271 N.C. 485, 157 S.E.2d 98 (1967); *Venie v. South Cent. Enters., Inc.*, 401 S.W.2d 495 (Mo. App. 1966) (plaintiff recovered for damages to strawberry plant caused by herbicide sold by defendant and expressly warranted by seller to be "perfectly safe for strawberries"); and cases cited *supra* notes 162-73 and accompanying text. Cf. *Wilson v. E-Z Flo Chem. Co.*, 281 N.C. 506, 189 S.E.2d 221 (1972) (manufacturer not liable where warning on use of pesticide communicated to retailer, who failed to communicate warning to user of specific requirements for use of product). These cases require no showing of negligence or the inherently dangerous nature of the product and may not result in appellate review.

179. See, e.g., *McClanahan*, 194 Va. at 859, 75 S.E.2d at 722 (duty to warn required to prevent injury to objects being treated as well as to people applying it); *Corprew*, 271 N.C. at 499, 157 S.E.2d at 108 (court found error in lower court's dismissal of complaint by user of herbicide, purchased for use on plaintiff's corn crop, that allegedly damaged peanut and soybean crops planted on same land in succeeding years despite warning by manufacturer that herbicide could have ill effects on succeeding crops of corn and other small grain. Court allowed case to proceed on theories of negligence and breach of warranty for failure to warn of potential effects on other crops, such as those planted by plaintiff).

180. 289 S.E.2d 450 (W. Va. 1982).

181. *Id.* at 452.

power company from using any form of toxic herbicide to clear trees, branches, and other obstructions from the right of way. The case presented a novel issue inasmuch as the plaintiffs sought to *enjoin* the spraying, rather than to recover damages after the spraying had occurred.

The court, in granting an injunction, first considered the rights conferred on a power company under a general right of way. A power company has the right to enter upon the land to maintain and repair equipment.<sup>182</sup> In exercising this right, however, the company may not inflict unnecessary damage upon the land or unreasonably increase the burden placed upon the servient tenement.<sup>183</sup> Thus, although the court recognized the company's right to enter onto plaintiffs' land to cut and remove trees and other obstructions which might interfere with the operation of its equipment, it recognized a myriad of problems, including pesticide spray drift, lingering fumes after spraying, the potential to kill broad-leaved plants and to contaminate water sources that arise from the aerial application of toxic herbicides due to the nature of the chemicals used and the manner of application.<sup>184</sup>

Interestingly, the sources of the court's information about these problems were a law review article,<sup>185</sup> cases,<sup>186</sup> and statutes regulating the use of pesticides.<sup>187</sup> Given these problems, the court construed the right-of-way agreement allowing the company to cut and remove trees as *not* including the right to destroy all living vegetation within the area sprayed or in adjoining areas where deadly herbicides could drift.<sup>188</sup> In ordering that an injunction be granted, the court balanced the relative rights of a grantor-owner of the land and the grantee of the easement:

The power company's right to use technological innovations must be weighed against the right of the grantor-owner to possess and use the adjacent land and the land underlying the power lines. The use of aerial broadcast

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182. *Id.* at 454.

183. *Id.*

184. *Kell*, 289 S.E.2d 450.

185. *Id.* at 454-55 (quoting Kennedy, *Liability in the Aerial Application of Pesticides*, 22 S.D.L. Rev. 75, 76 (1977)).

186. *Id.* (citing *Emelwon v. United States*, 391 F.2d 9 (5th Cir. 1968)); *Binder v. Perkins*, 213 Kan. 365, 516 P.2d 1012 (1973); *Loe v. Lenhardt*, 227 Or. 242, 362 P.2d 312 (1961).

187. *Id.* at 455 (citing Federal Environmental Pesticide Control Act of 1972, 7 U.S.C. § 136-136y (1982), and the West Virginia Pesticide Use and Application Act, W. VA. CODE § 19-16B-1 to 19-16B-26 (1975)).

188. *Kell*, 289 S.E.2d at 456.

spraying of herbicides impermissibly interferes with the grantor-owner's rights and interests. For example, the grantor-owner's right to cultivate the land could be nullified by the use of the herbicides. The power company cannot indiscriminately wreak havoc upon the owner's land and its appurtenances in order to exercise its limited right to protect its lines from danger and hindrance from overhanging branches and trees. The use of aerial broadcast spraying of toxic herbicides inflicts unnecessary damage on the land. It is not necessary to the maintenance or protection of the power company's equipment to wantonly destroy everything growing in the proximity of its lines regardless of whether the matter destroyed poses a danger to the power company's equipment.

. . . .

The power company does not have the right . . . to destroy vegetation that does not endanger or hinder its equipment. We, therefore, hold that language in an indenture which gives a power company the right to cut and remove trees, overhanging branches or other obstructions that endanger the safety, or interfere with the use, of the power company's lines on the right-of-way . . . does not authorize the power company to apply toxic herbicides to that right-of-way by aerial broadcast spraying.<sup>189</sup>

*Kell* is interesting because the court ordered the *prevention* of damage caused by pesticide application as a matter of law — the court relied on legal sources in concluding that the spraying could potentially result in an impermissible harm on the plaintiffs.<sup>190</sup> Also, in balancing the relative rights of grantor and grantee, the court found the grantor's right to be free of pesticides superior to the power company's right to make use of them.<sup>191</sup> While arguably this balance must be restricted to the facts of *Kell*, that is, spraying on an easement, the type of balancing done in *Kell* also occurs in the strict liability cases as a matter of law.<sup>192</sup> Thus, the holding of *Kell* is, at most, a small step from more traditional case

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189. *Id.* at 456-57.

190. *Id.* at 454-57.

191. *Id.* at 457.

192. *See supra* notes 143-46 and accompanying text.



law governing the respective rights and duties of adjacent landowners spraying pesticides.

#### 4. Conclusion

A number of interrelated themes pervade the cases in which plaintiffs are able to recover for pesticide-related property damage. First, many of the cases balance a property owner's right to use pesticides against another's right to be free from pesticide exposure. Although powerful arguments weigh in favor of the user of pesticides, such as the statutory obligation to keep land free of pests, the right to make whatever use of land as one sees fit, protection of growing crops, and the perceived economic advantages of such protection, most courts have struck the balance in the neighbor's favor. In so doing, courts have recognized the dangerous nature of pesticides and the interest of others to be free from pesticides and injuries to crops and animals caused by pesticides, including injury to organic farmers whose products are decertified as organic.

Second, although some courts define three or four distinct elements that plaintiff must prove before imposition of liability is justified, proof of any one element also seems to satisfy the requirements of the other elements. Thus, proof of negligent application or demonstration that pesticide application is an ultrahazardous activity readily leads to the conclusion that pesticides caused plaintiff's loss. Also, sufficient evidence linking plaintiff's loss to defendant's pesticide allows courts to determine that the defendant was negligent or that liability may be imposed without proof of a specific negligent act.

Third, courts often rely on legal sources to conclude that pesticide use is a dangerous activity and that plaintiff's burden of recovery for loss caused by that activity should be eased. For example, courts view statutes regulating pesticide labeling and use as expressing a need to protect people, animals, and plant life from the risk of harm associated with pesticide use. Hence, they rely on such statutes to ease plaintiff's burden of proving recovery and, in one case, to enjoin spraying altogether.

Finally, courts are concerned that manufacturers and applicators of pesticides must communicate to those who may be exposed to pesticides information about pesticide-related risks so that they may take appropriate precautions. Thus, whatever the benefit of pesticides, they must not be used to deprive others of their legitimate right to raise animals and crops that may be in-

compatible with pesticide use. Also, courts have recognized the responsibilities of manufacturers and sellers as well as applicators and landowners to ensure that the legitimate interest of others to be free from pesticide exposure is not infringed.

It is puzzling, however, that the themes pervading property damage cases have not been applied to many cases involving personal injury. These cases will now be explored.

## B. Recovery for Personal Injury

In general, cases seeking recovery for personal injury resulting from pesticide application may be subdivided into two broad categories. First are "drenching" cases, that is, cases in which an individual suffers serious injury after exposure to a large amount of pesticides in a very short period of time and in a manner not intended by the manufacturer. The second category of cases are those involving exposure to low levels of pesticides. Drenching cases have proven easier for courts to resolve than low level exposure cases.

### 1. Drenching Cases

Drenching cases have been brought against applicators as well as manufacturers and sellers. The earlier cases seek recovery in negligence. One example of a drenching case allowing recovery in negligence against an applicator is *Lawler v. Skelton*.<sup>193</sup> In *Lawler*, the plaintiff presented substantial evidence that defendant's contractor, who was spraying a cotton crop with a mixture of malathion and endrin, oversprayed and released the pesticides over the cotton gin where plaintiff was working.<sup>194</sup> It was undisputed that if a person receives an excessive amount of those chemicals, they can be highly toxic and dangerous to human life; the container labels, as well as a government aeronautics safety manual, reflected that endrin and malathion are dangerous to

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193. 130 So. 2d 565 (Miss. 1961) (court held that jury verdict was against overwhelming weight of evidence and remanded case for new trial). The court in *Lawler* did not explicitly identify the theory of liability it applied. It does, however, apply the nondelegation rule, see *infra* notes 133-42 and accompanying text, which is applicable only to negligence cases. *Id.* at 569. Thus, the court believed the plaintiff presented sufficient evidence to establish defendants' liability on a negligence theory. See also *Council v. Duprel*, 250 Miss. 269, 165 So. 2d 134 (1964) (plaintiff alleged loss in cotton production caused by application of herbicides used by defendants, and court, affirming judgment for defendants, considered only liability premised on theory of negligence).

194. *Lawler*, 130 So. 2d at 568.

humans exposed by skin contact, inhalation or swallowing.<sup>195</sup> Immediately after the spraying, the plaintiff became dizzy and nauseated, the next day his temperature rose and he went into a coma. In subsequent months he suffered various illnesses.<sup>196</sup>

The court determined that the great weight of the evidence supported the conclusion that the contractor sprayed the plaintiff with a chemical mixture and that the spraying was the proximate cause of the plaintiff's immediate acute illness.<sup>197</sup> Similarly, in other cases where a victim has suffered acute symptoms shortly after a heavy exposure to a pesticide, the toxicity of which is established by container labels, government reports or expert testimony, courts have had little difficulty in finding that the exposure caused the injury and that all the elements of liability have been established.<sup>198</sup>

Drenching cases involving recovery in negligence against applicators are also noteworthy in extending liability to any party who might have prevented the heavy exposure. For example, in *Lawler*, the court relied on a number of property damage cases to hold that the defendant could not delegate the work of dusting or spraying a crop with poisonous insecticides to an independent contractor.<sup>199</sup> Similarly, when an employee is exposed to pesticides sprayed by an applicator hired by the plaintiff's employer, courts have held that the employer is liable for breach of a non-delegable duty to furnish its employees a safe place to work.<sup>200</sup> More specifically, these courts have determined that the employers knew or should have known of the harm from the warning labels used on the herbicides sprayed and the other evidence establishing their toxicity. Therefore, these courts have concluded that the employer was negligent in failing to warn plaintiff of the presence of a toxic substance in the area and of the dangers and

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195. *Id.* at 567.

196. *Id.* at 567-68.

197. *Id.* at 568.

198. *See, e.g.,* *Holladay v. Chicago, Burlington & Quincy R. Co.*, 255 F. Supp. 879, 885-86 (S.D. Iowa 1966) (court looked to testimony of several physicians to uphold its conclusion that plaintiff's disease was caused by herbicide exposure); *Tripp v. Choate*, 415 S.W.2d 808, 811-12 (Mo. 1967) (court relied on testimony of physician who treated victim to find that victim was exposed to DDT and that exposure caused his death).

199. *Lawler*, 103 So. 2d at 569 (discussing the nondelegation rule established in such cases as *Heeb v. Prysock*, *McKennon v. Jones* and *Crouse v. Wilbure-Ellis*). For discussion of the nondelegation rule, see *supra* notes 133-42 and accompanying text.

200. *See, e.g.,* *Holladay*, 255 F. Supp. at 883.

hazards of coming into contact with this substance.<sup>201</sup>

Thus, when a victim suffers acute symptoms shortly after a heavy exposure to a pesticide and the toxicity of the pesticide is known, courts have little hesitation in finding liability on the part of the applicator or other responsible party who could have prevented the heavy exposure.<sup>202</sup> These cases, like the property damage cases,<sup>203</sup> seem to infer causation from the facts of misapplication and damage similar to that usually associated with exposure to the product and assume wrongdoing when exposure, causation, and injury are well established.

Drenching cases are more commonly brought against the manufacturer of the pesticide. As in property damage cases and drenching cases against applicators, the courts have found compelling the plaintiff's evidence that exposure to pesticides had caused injury. Most cases concentrate their discussion on the standard of care owed by the manufacturer to the plaintiff and whether that standard was breached.<sup>204</sup> In one case, the breach of the standard of care was established by failure to eliminate the dangerous character of goods to the extent that the exercise of reasonable care enables the manufacturer to do so.<sup>205</sup> In that case, the packaging of a dangerous toxic substance in a container that allowed the victim to mistake it for a jug of water was a breach of the standard of care.<sup>206</sup>

Most cases, however, base negligence on the theory that "a manufacturer and seller of a product which, to his actual or constructive knowledge, involves danger to users, has a duty to give a warning of such danger."<sup>207</sup> Even when a pesticide has some type

201. *Id.* at 884-85. See also *Tripp v. Choate*, 415 S.W.2d 808, 811 (Mo. 1967).

202. See, e.g., *Farm Servs. Inc. v. Gonzales*, 756 S.W.2d 747, 753 (Tex. Ct. App. 1988).

203. See *supra* notes 96-132 and accompanying text.

204. See, e.g., *Ziglar v. E.I. DuPont de Nemours & Co.*, 53 N.C. App. 147, 154, 280 S.E.2d 510, 513 (1981). A few cases have rejected liability on a breach of warranty theory because, even when the pesticide causes serious bodily injury after dermal exposure or ingestion, there is no evidence that the product was not fit for the purposes for which it was sold. See, e.g., *Muncy v. Magnolia Chem. Co.*, 437 S.W.2d 15, 20 (Tex. Civ. App. 1968); *Rumsey v. Freeway Manor Minimax*, 423 S.W.2d 387, 394 (Tex. Civ. App. 1968).

205. *Ziglar*, 53 N.C. App. at 155, 280 S.E.2d at 516.

206. *Id.*

207. *Muncy v. Magnolia Chem. Co.*, 437 S.W.2d 15, 17 (Tex. Civ. App. 1968). Interestingly, the court then quotes section 402A, RESTATEMENT (SECOND) OF TORTS, comment j, which involves strict products liability, rather than negligence.

The general duty to warn discussed in *Muncy* requires a manufacturer to

of warning label, courts examine whether the label was adequate to satisfy the duty to warn.<sup>208</sup> In undertaking this examination, many courts deciding drenching cases, like those deciding property damage cases, regard federal and state statutes and regulations governing pesticide labeling as setting minimum standards; the failure to comply with these standards is regarded as negligence *per se*. “[H]owever mere compliance does not mean the manufacturer or seller is free from negligence as a matter of law. . . . [T]he sufficiency of the warning [is] a question of fact.”<sup>209</sup>

Thus in discussing the contents of the warning required to avoid negligence liability, some courts have held that the duty to warn includes a requirement not only to disclose fully the extent of the danger of a pesticide use, but also to disclose the measures that may be taken to avoid fatal consequences of its use; if there is no known antidote, the manufacturer must fully inform the public of that fact.<sup>210</sup> In another case, a court further found that the label must satisfy the manufacturer’s duty to provide directions for safe use for the purpose intended, for incidental and attendant uses, and for safe disposal.<sup>211</sup>

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perform tests to learn about the dangers of a product such as a pesticide; if the manufacturer does not know of the great danger, it is negligent in marketing a product which had unknown toxic capabilities. *Griffin v. Planters Chem. Corp.*, 302 F. Supp. 937, 944 (D.S.C. 1969). It is difficult to distinguish this duty to warn discussed in negligence law from the duty in strict liability. *See, e.g., Flamino v. Honda Motor Co.*, 733 F.2d 463, 467 (7th Cir. 1984); *Feldman v. Lederle Laboratories*, 97 N.J. 429, 452, 479 A.2d 374, 387 (1984).

208. *See, e.g., Muncy*, 437 S.W.2d at 17.

209. *Id.* at 19. *See also* *Hubbard-Hall Chem. Co. v. Silverman*, 340 F.2d 402 (1st Cir. 1965) (affirming judgment for plaintiffs in case where adequacy of warnings was submitted to jury); *Griffin*, 302 F. Supp. at 943-44. *But see* *Fitzgerald v. Mallinckrodt, Inc.*, 681 F. Supp. 404 (E.D. Mich. 1987) (held that FIFRA’s comprehensive system for registration and labeling of pesticides preempted any state law tort recovery based on failure to warn theory). The preemptive effect of FIFRA will be addressed more fully at *infra* notes 247-62 and accompanying text.

210. *Rumsey*, 423 S.W.2d at 393. *See also* *Ziglar*, 53 N.C. App. at 159-60, 280 S.E.2d at 518. Similarly, in *Griffin*, a case in which the plaintiff’s death was caused by the absorption into the body of one percent parathion dust occurring when a bag of the substance that plaintiff was handling burst, the court held inadequate a label that had no skull and crossbones, that listed no antidote, and that did not advise one exposed to call a doctor immediately. *Griffin*, 302 F. Supp. at 944.

211. *Boyl v. California Chem. Co.*, 221 F. Supp. 669, 674 (D. Or. 1963). In *Boyl*, the manufacturer of a liquid vegetation growth preventative was held liable in negligence to the plaintiff who suffered acute physical symptoms after she unwittingly lay stomach down in an area where, five days earlier, she had poured the rinse water from a container used to apply the herbicide. *Id.* at 676. The court described the duty to warn of the manufacturer of a weed killer as follows:

More recent drenching cases have also awarded recovery to plaintiffs; however, the theory of recovery usually has been strict products liability rather than negligence. For example, in *Villari v. Terminix International, Inc.*,<sup>212</sup> plaintiffs contracted with the defendant to treat their home for termite control. In performing the treatment using a termiticide known as Aldrin, a chlorinated hydrocarbon that has been banned for residential use in some states, the defendant spilled a quantity of Aldrin in the plaintiffs' basement and made efforts to remove the spill using the plaintiffs' household mops and rags. All members of plaintiffs' family suffered headaches, nausea, dizziness, and general malaise. Air sampling tests performed later revealed airborne levels of Aldrin in excess of safety levels set by the National Academy of Sciences.<sup>213</sup> The court held that plaintiffs' allegations, that defendant sold or distributed unreasonably dangerous insecticides and failed to warn of the danger, stated a claim for strict liability under section 402A of the Restatement (Second) of Torts:

Under section 402A, a product may be defective because it fails to carry warnings concerning the risks of foreseeable improper uses. The Villaris have, in our view, presented sufficient evidence to permit a reasonable jury to infer that Aldrin is hazardous if inhaled, that Aldrin was introduced into their home without proper warnings as to that danger, and that Aldrin is defective as a product in the absence of proper warnings.<sup>214</sup>

The warnings required under strict liability are practically indistinguishable from those required in negligence as discussed

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So, today a manufacturer who undertakes to produce and sell to the general public a product with high risk of human harm must provide specification, instruction, and warning, so that it is reasonably safe for ordinary persons to use it, *not only* for the purposes for which it is produced and intended to be used *but also* all other necessarily incidental and attendant uses (such as storage or disposal) and to give reasonable notice and warning of after or delayed effect or latent or lingering dangers not known or reasonably to be expected by the ordinary user, but which are "foreseeably probable" to the manufacturer with his expertise.

*Id.* at 674 (footnote omitted). The manufacturer's liability was premised on its failure to provide advice on the disposal of the rinse which could mislead a user to conclude that there was no lingering risk. *Id.* at 676.

212. 663 F. Supp. 727 (E.D. Pa. 1987) (opinion is also published at 677 F. Supp. 330).

213. *Id.* at 728-29.

214. *Id.* at 729.

above,<sup>215</sup> except that the court does not engage in the fiction that the manufacturer must have knowledge or constructive knowledge of the dangers of which it must warn; the court assumes that the existence of the danger triggers a duty, the breach of which triggers liability.<sup>216</sup>

Thus, drenching cases resulting in personal injury are similar to property damage cases in that proof of causation seems almost automatic when plaintiff proves that the pesticide was misapplied and that he or she suffered symptoms usually associated with excessive exposure. Also, when the plaintiff presents compelling evidence that plaintiff's exposure to defendant's pesticide caused the plaintiff's injury, courts have readily concluded that the exposure was caused by defendant's negligence or ease plaintiff's burden of proving negligence by applying strict liability. Because of the inherently dangerous nature of pesticides, courts have imposed on manufacturers and sellers liability, not only for failure to eliminate the dangerous nature of the product, but also for failure to adequately warn the user of dangers of and proper instruction for use of the product and for failure to inform of antidotes,

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215. See *supra* notes 165-78 and accompanying text.

216. Indeed, in *Muncy*, discussed *supra* note 187[old numbering] and accompanying text, the court cites section 402A in support of its negligence analysis. This type of strict liability should not be confused with the theory of strict liability for an ultrahazardous activity adopted in such cases as *Loe v. Lenhardt*, see *supra* notes 139, 147-49 and accompanying text. As explained by the court in *Villari*, that type of strict liability does not accurately reflect the relationship between the parties:

One of the central purposes of . . . strict liability [for an ultrahazardous activity] is to assure that those receiving the benefits of dangerous but essential activities insure against the costs those activities impose on others. . . .

The Villaris have attempted to bring their claim under this theory by asserting that application of Aldrin was an activity engaged in by Terminix for its *own* economic benefit, and that the costs of the activity should be borne by Terminix rather than by the Villaris. But this characterization of the transaction is, in our view, unrealistic. Homeowners contract for termite protection in order to reduce damage to, and safeguard the economic value of, their homes. We see no rationale under this theory of liability for requiring a contractor to insure against costs to a homeowner which are caused by an activity requested by that homeowner for the protection of that homeowner's own property. Legal theories that more accurately reflect the relationship between the parties—including strict products liability under section 402A—are, in our view, better suited to the claim at hand.

663 F. Supp. at 732 (citations omitted). See also *First Nat'l Bank v. Nor-Am Agricultural Prods., Inc.*, 88 N.M. 74, 537 P.2d 682 (1975) (in action seeking recovery from manufacturer of liquid seed disinfectant used by defendant grain processor to treat seed, ingested by hog and causing injury to children who later ate hog, court rejected theory of strict liability for ultrahazardous activity in favor of strict products liability).

so that users have an opportunity to avoid the risks associated with use of the product.

## 2. Low Level Exposure Cases

As documented in the medical literature surveyed in Part II, lower levels of exposure to pesticides may also result in a myriad of symptoms or physiological changes, some of which may not be noticed by the exposed person at the time of exposure. Documented effects include cancer, chromosomal damage, birth defects, neurological defects, and blood disorders. These changes may occur over a long period of time and when they are finally manifested clinically, it may not be possible to trace them back to pesticide exposure.

Cases brought by individuals subjected to lower levels of exposure reflect this difficulty in detecting injury at the time of exposure and in linking clinical symptoms to the exposure. Courts address cases involving exposure to lower levels of pesticides in the same way as drenching cases. Hence, in order to recover, a plaintiff must show that the defendant's conduct was negligent and that the negligence caused plaintiff's injury. However, in low level exposure cases, unlike drenching and property damage cases, plaintiffs have considerable difficulty in establishing proof of an actual injury and, when the injury is evident, proof that injury was caused by exposure to the pesticide. Moreover, plaintiffs may experience difficulty in satisfying a court that some standard of care has been breached. Even when strict products liability is applied in lieu of negligence, courts may be precluded from holding that a pesticide has inadequate warnings and is defective as a product because a number of jurisdictions have held that FIFRA preempts such claims.

With respect to proof of injury, some effects of low level exposure may only be detected by laboratory tests. For example, chromosomal damage has been found in agricultural workers who were symptomless. The effects of such chromosomal damage may not be manifested for years and in some cases not until the birth of offspring with birth defects. Even when exposure to a particular pesticide is known to result in birth defects among a certain percentage of the offspring of the exposed population, it is unknown which members of the exposed population will give birth to children with pesticide-related defects until that event materializes; at most it can be said that the members of the exposed group are "at risk" of giving birth to children with defects.



However, a plaintiff who has not suffered an acute physical injury but whose injuries consist of subclinical changes or increased risk of developing carcinogenesis, teratogenesis or mutagenesis is unlikely to recover in a legal action.

A typical case involving such low level exposure is *Rabb v. Orkin Exterminating Co.*,<sup>217</sup> a case involving plaintiffs' exposure to termiticides present in their home. The termiticides contained chlordane and heptachlor which were subsequently withdrawn from the market.<sup>218</sup> The evidence in *Rabb*, however, supported a finding that at the time of application in plaintiffs' home, the defendant had adhered to specifications on the EPA-approved termiticide label in applying the termiticides at plaintiffs' residence.<sup>219</sup> Evidently, plaintiffs had failed to satisfy the jury that they suffered from a present physical injury and therefore the court held that the plaintiffs offered insufficient evidence that they suffered an increased risk of future disease:

[I]n a personal injury action, the verdict may include only such future damages as "reasonably certain will of necessity" result in the future from the injury. The "reasonably certain" rule has been described as one "which manifestly and logically will reasonably come to pass, and not a mere possibility or probability." It is a consequence "which follows the original act complained of in the usual, ordinary, and experienced course of events." . . . [P]laintiffs' failure to establish that they "most probably" would suffer from any of the unspecified diseases which they claimed might be suffered in the future was fatal to their increased risk claim which was properly excluded.<sup>220</sup>

Consistent with other cases involving exposure to toxicants, the court upheld the rejection of plaintiffs' increased risk claim in the absence of evidence favoring a greater than 50% chance that a future consequence will occur.<sup>221</sup> The following expresses the at-

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217. 677 F. Supp. 424 (1977). This opinion denied plaintiffs' motions for a directed verdict and a new trial after a jury returned a verdict in favor of the defendant. *Id.* at 430.

218. *Id.* at 426.

219. *Id.*

220. *Id.* (citations omitted).

221. *Rabb*, 667 F. Supp. at 427 (citing *Lohrmann v. Pittsburgh Corning Corp.*, 782 F.2d 1156, 1160 (4th Cir. 1986)). See also *Jackson v. Johns-Manville Sales Corp.*, 781 F.2d 394 (5th Cir. 1986); *Gideon v. Johns-Manville Sales Corp.*, 761 F.2d 1129, 1136-37 (5th Cir. 1985).

titude of most courts to evidence of increased risk of developing disease:

The developments at the very frontier of science do not provide reasonably probable predictions. There is no definitive epidemiological evidence to verify the mathematical calculation of quantitative risk assessment. While the animal test results and in vitro studies present the possibility that DBCP [Dibromochloropropane] *may* be a human carcinogen, such an extrapolation does not reach the requisite level of acceptance within the scientific community to justify legal reliance. To award damages based on a mere mathematical probability would significantly undercompensate those who actually do develop cancer and would be a windfall to those who do not.

There has always existed a considerable lag between advances and discoveries in scientific fields and their acceptance as evidence in a court proceeding. . . .

[T]he jury in this case could not have sufficient reliable data regarding risk assessment of these various plaintiffs to make an intelligent award. They would be required to speculate on future developments without the reliable prediction or degree of certainty required by our system of tort law.<sup>222</sup>

Thus, according to this court, a jury cannot be permitted to assess cancer risk where the scientific community cannot yet do so; therefore, the court ruled that as a matter of law the risk of cancer is not a proper element of damages for the jury to assess.<sup>223</sup>

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Some earlier cases showed more flexibility in allowing recovery for the risk of future disease. For example, in 1930 a California court upheld a jury award of \$10,000 to a plaintiff who had an increased risk of cancer as a result of overexposure to X-rays. *Coover v. Painless Parker, Dentist*, 105 Cal. App. 110, 111, 286 P. 1048, 1050 (1930). In this case, a doctor testified that it was common for cancer to develop after exposure of this type. The court stated the following:

The record contains positive evidence that a condition actually exists which makes this dread disease much more likely. We think this predisposition in itself is some damage. . . . The necessity of constantly watching and guarding against cancer, as testified to by the physician, is an obligation and a burden that the defendant had no right to inflict upon the plaintiff.

*Id.* at 115, 286 P. at 1054. This need to watch and guard against cancer is the kind of burden forced upon individuals exposed to some forms of pesticide. Most courts today, however, apply the "50%" rule discussed in *Rabb*.

222. *Arnett v. Dow Chem. Co.*, No. 82-9015, slip op. (Cal. Mar. 21, 1983).

223. *Id.* at \_\_\_.

Some plaintiffs, recognizing the difficulty of recovering for increased risk, have tried to recover for their fear of future disease. This claim has met with some success by plaintiffs who have been exposed to substances whose long term health effects have been generally recognized in the medical and scientific community.<sup>224</sup> However, plaintiffs exposed to low levels of pesticides have not been successful. For example, in *Rabb*, the court held that in the absence of evidence of present injury or evidence that there was a greater than 50% chance that plaintiffs will develop a disease resulting from their termiticide exposure, exclusion of evidence of plaintiffs' fear of future disease was proper.<sup>225</sup>

Courts allow recovery for mental anguish or emotional distress in three situations: (1) for severe and extreme distress caused by "outrageous conduct;" (2) for a bystander who is a witness to a traumatic event; and (3) for pain and suffering attendant to some physical injury when the fear and condition are reasonably certain to occur. The purpose of these requirements is to provide sufficient guaranties of genuineness before cases proceed to the jury.<sup>226</sup> The court in *Rabb* concluded that the plaintiffs failed to present evidence of any of the three situations.<sup>227</sup> In most low level pesticide exposure cases, it will be difficult to satisfy a court that one of these situations is present.<sup>228</sup> Although some may view the registration process under FIFRA as flawed, a court is unlikely to find outrageous conduct by a manufacturer who followed that process and by an applicator who followed the label directions. Moreover, low level pesticide exposure is not the type of sudden occurrence that courts consider a traumatic event;<sup>229</sup> further, physical injury remains difficult to establish.

In cases where an applicator misapplies a pesticide, a few

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224. See, e.g., *Jackson*, 781 F.2d at 415 (asbestos); *Gideon*, 761 F.2d at 1138 (asbestos); *Dartez v. Fibreboard Corp.*, 765 F.2d 456, 468 (5th Cir. 1985) (asbestos); *Hagerty v. L & L Marine Servs., Inc.*, 788 F.2d 315 (5th Cir. 1986) (dri-polene, a chemical containing benzene, toluene, and xylene); *McAdams v. Eli Lilly & Co.*, 638 F. Supp. 1173 (N.D. Ill. 1986) (DES); *In re Moorenovich*, 634 F. Supp. 634 (D. Me. 1986) (asbestos).

225. *Rabb*, 677 F. Supp. at 427.

226. See *Ackerson v. Dow Chem. Co.*, No. 808161, slip. op. (Cal. Super. Ct., S.F. County, Apr. 4, 1989).

227. *Id.* at —. See also *Gergel v. Chemlawn Servs. Corp.*, No. 87-1138, slip op. at 4-6 (E.D. Pa. July 5, 1988).

228. See *Ackerson* (despite evidence that DBCP is carcinogenic in animals, that DBCP has been banned and causes male sterility, claims of workers exposed to DBCP for fear of cancer was dismissed). Cf. *Arnett v. Dow Chem. Co.*, S.F. Master File No. 729586 (plaintiffs with verifiable claims of sterility able to proceed with fear of cancer claims).

229. See, e.g., *Wisniewski v. Johns-Manville Corp.*, 812 F.2d 81 (3d Cir.

courts have shown a willingness to bend the rules. For example, *Laxton v. Orkin Exterminating Co.*,<sup>230</sup> involved negligent application of chlordane which resulted in contamination of plaintiffs' water supply. The court wrote in pertinent part:

Here it is undisputed that the plaintiffs ingested polluted water when the defendants negligently permitted dangerous chemicals to infiltrate plaintiffs' household water supply. The plaintiffs needed and obtained medical services after using the spring. There is no question as to the reasonableness of the medical expenses. Nor is there any claim that the expenses were not necessary under the circumstances. The chemical which polluted their spring was a possible carcinogen. Even though the tests proved negative, in our opinion a jury could find sufficient "injury" to these plaintiffs to justify a recovery for their natural concern and anxiety for the welfare of themselves and of their infant children.<sup>231</sup>

Hence, recovery for negligent infliction of mental anguish was upheld when a plaintiff has ingested an indefinite amount of a harmful substance; the finder of fact may conclude that the plaintiff has sustained sufficient physical injury to support an award for mental anguish even if subsequent medical diagnosis fails to reveal any other physical injury.<sup>232</sup> Similarly, in *Villari v. Terminix*,<sup>233</sup> testimony regarding the plaintiff's headaches, nausea, dizziness, and general malaise in the month following misapplication of a termiticide was sufficient to support a products liability claim against the applicator.<sup>234</sup> This testimony also satisfied the requirement of physical symptoms to support a claim for negligent infliction of emotional distress due to fear of the consequences of exposure to hazardous termiticides and a claim for the costs of future medical surveillance.<sup>235</sup>

Courts have also experienced difficulty deciding what plaintiffs must show in order to prove that their exposure to pesticides was the cause of injury. This difficulty reflects the scientific un-

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1987) (court affirmed dismissal of mental distress claims of widow and children of asbestos worker whose slow and painful death they observed).

230. 639 S.W.2d 431 (Tenn. 1982).

231. *Id.* at 434.

232. *Id.*

233. 663 F. Supp. 727, 729 (E.D. Pa. 1987).

234. *Id.* at 729.

235. *Id.* at 734-35.

certainty in this area, the disagreement over the relevance of *in vitro* and animal studies to human exposures, and the problem that symptoms such as muscle aches, nausea, and headaches have a myriad of causes other than pesticide exposure. In addition, many studies linking pesticide exposure to particular diseases show an increased incidence of disease over background levels in the exposed population, but do not establish that a particular individual's disease was caused by the pesticide exposure.

Perhaps the leading pesticide exposure case where evidence of causation was sufficient is *Ferebee v. Chevron Chemical Co.*<sup>236</sup> *Ferebee* involved an action brought by the estate of an agricultural worker, who allegedly developed pulmonary fibrosis and died as a result of long-term skin exposure to diluted solutions of paraquat, a herbicide distributed by the defendant. Despite an apparent absence of animal or epidemiological studies clearly establishing a cause-effect relationship, plaintiffs presented two expert witnesses who testified that paraquat poisoning was the cause of Ferebee's illness and death. The court held that this testimony was based on well-founded methodologies and was sufficient to support plaintiffs' verdict.<sup>237</sup> However, many courts are less willing to admit as evidence controversial diagnoses of the cause-effect relationship between pesticide exposure and plaintiff's injuries.<sup>238</sup>

As with regard to proof of present injury, courts seem willing to deem the evidence of causation sufficient where it can pinpoint some wrongful conduct on the part of the manufacturer or applicator. For example, in *Bandura v. Orkin Exterminating Co.*,<sup>239</sup> plaintiffs presented evidence that defendant falsely led plaintiffs to believe that their home was termite infested to induce their purchase of exterminator's services. The court easily upheld the jury's decision that exposure to chlordane and heptachlor caused plaintiffs' symptoms.<sup>240</sup> Also, in *Gonzalez v. Virginia Carolina Chemi-*

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236. 736 F.2d 1529 (D.C. Cir. 1984).

237. *Id.* at 1535-36. See also *Peteet v. Dow Chem. Co.*, 868 F.2d 1428 (5th Cir. 1989); *Bandura v. Orkin Exterminating Co.*, 664 F. Supp. 1218, 1219 (N.D. Ill. 1987).

238. See, e.g., *Skogen v. Dow Chem. Co.*, 375 F.2d 692, 706 (8th Cir. 1967) (court upheld finding that brain damage was caused by viral encephalitis rather than organo-phosphate poisoning from insecticide was supported by the evidence); *Gergel*, slip op. at 6; *Diaz v. Eli Lilly & Co.*, 14 Mass. App. Ct. 448, 440 N.E.2d 518 (1982) (unusual or controversial diagnoses of cause-effect relationship between exposure to pesticide and plaintiff's blindness inadmissible).

239. 664 F. Supp. 1218 (N.D. Ill. 1987).

240. *Id.* at 1219.

*cal Co.*,<sup>241</sup> the court had little difficulty concluding that plaintiff's exposure to defendant's defoliant caused his acute symptoms where the defendant-manufacturer distributed a dangerous poison without adequate tests and warning of its toxicity in violation of federal and state statutes regulating pesticide labeling and without communicating a protective antidote for the toxic substance.<sup>242</sup>

Thus, given that scientists disagree about the health effects of low level pesticide exposure, the difficulties of demonstrating these effects and the court's requirement that a high level of certainty be shown before the elements of injury and causation will be satisfied, plaintiffs subjected to low level pesticide exposure have experienced difficulty in obtaining compensation. Courts have shown some willingness to lower this level of certainty in cases against manufacturers who have distributed pesticides with labels that fail to conform to statutory requirements and against applicators who fail to follow label directions or accepted practices. However, for a number of reasons, these failures are likely to be rare, even though individuals may be exposed to unnecessarily high and potentially unsafe levels of pesticides. With respect to a manufacturer's failure to warn, many cases against pesticide manufacturers premise liability on the manufacturer's failure to warn of the product's danger, to adequately inform or instruct about its use and disposal or to provide adequate information in the event of excessive exposure. Additionally, some courts have found that failure to comply with statutory or regulatory requirements is negligence *per se*.<sup>243</sup> Presumably, manufacturers will comply with the FIFRA registration process before placing pesticides on the market and, thus, will be in compliance with statutory requirements.

Registration does not, however, mean that a particular pesticide is safe or useful. Some courts have recognized that compliance with FIFRA does not preclude an examination of the adequacy of a label. The leading case is *Ferebee v. Chevron Chemical Co.*,<sup>244</sup> discussed above. Despite EPA approval of paraquat and its label, the court examined the adequacy of the warning and observed that the label indicated only that dermal contact could cause severe skin irritation and therefore failed to warn of possi-

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241. 239 F. Supp. 567 (E.D.S.C. 1965).

242. *Id.* at 573.

243. See *supra* notes 110-16, 172-73 and accompanying text.

244. 736 F.2d 1529 (D.C. Cir. 1984).

ble long term lung disease resulting in death. Moreover, the court expressed no doubt that during the time Ferebee applied paraquat, 1977 to 1979, it was known that paraquat exposure could lead to fibrotic disease and that the pesticide could lead to fibrotic lung disease upon entry into the body.

Indeed, the manufacturer had knowledge of incidents in 1976 of paraquat exposure causing serious injury including lung disease and death.<sup>245</sup> The manufacturer of paraquat had a duty to warn of dangers which it knew or should have known during Ferebee's exposure. Based on the evidence presented, the court upheld the jury's finding that as of the last date of Ferebee's exposure, Chevron's knowledge of the link between dermal paraquat exposure and lung disease was sufficient to require a more detailed label and that the inadequate labeling caused Ferebee's disease.<sup>246</sup>

Despite the evidence, Chevron argued that the jury verdict should be overturned because EPA approval of paraquat and its label under FIFRA required the jury to find the label adequate and that federal law preempts state common law actions based on inadequate labeling. The court noted that FIFRA's provisions precluded EPA authorization of a pesticide unless the product, as labeled, would not cause "unreasonable adverse effects on the environment."<sup>247</sup> The court concluded, however, that while FIFRA aims at ensuring that, from a cost-benefit point of view, paraquat as labeled does not produce "unreasonable adverse effects on the environment," state tort law, having in contrast, broader compensatory goals, may deem a label inadequate despite its sufficiency under a cost-benefit standard if it nonetheless fails to warn against any significant risk. Absent Congressional intent to the contrary, states are free to perform their own cost-benefit balancing and may tip the scales more heavily in favor of the health of its citizens than EPA is permitted to by FIFRA.<sup>248</sup>

The court did not find the necessary Congressional intent to preempt state tort failure to warn cases. Although, a provision of

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245. *Id.* at 1537.

246. *Id.* at 1536, 1538-39. *See also supra* notes 162-73 and accompanying text.

247. *Id.* at 1539 (quoting FIFRA § 3(c)(5)(C), 7 U.S.C. § 136a(c)(5)(C)). FIFRA defines these effects as follows: "[A]ny unreasonable risk to man or environment, taking into account the economic, social, and environmental costs and benefits of the use of [the] pesticide." FIFRA § 2(bb), 7 U.S.C. § 136(bb).

248. *Ferebee*, 736 F.2d at 1540. *See also* Hubbard-Hall Chem. Co. v. Silverman, 340 F.2d 402, 405 (1st Cir. 1965).

FIFRA prohibits a state from imposing or continuing "in effect any requirements for labeling . . . in addition to or different from those required under this subchapter,"<sup>249</sup> the regulatory aim of FIFRA, to assure that adequate labels are used, does not displace the compensatory aims of tort law. Moreover, FIFRA's aims do not displace a judgment of a jury that as between a manufacturer and an injured party the manufacturer ought to bear the cost of compensating for those injuries that could have been prevented with a label more detailed than that approved by the EPA.

Moreover, the court observed that section 136v(b) not only limits state action with regard to labeling, but allows more stringent constraints on the use of EPA-approved pesticides<sup>250</sup> and therefore a state's power to regulate use can include the requirement of compensating for injuries resulting from use of a pesticide. Finally, the court noted that if an EPA-approved label does not adequately convey information about risks associated with use of a pesticide, which may result in a manufacturer's liability to injured users, manufacturers may petition EPA to allow more detailed labeling of their products.<sup>251</sup>

This last point was elaborated in *Cox v. Velsicol Chemical Corp.*,<sup>252</sup> an action by the estate of a pest control operator alleging that the decedent developed lung cancer as a result of exposure to defendant's chlordane products and that the manufacturer of chlordane failed to give adequate warnings about the risks associated with use of its products.<sup>253</sup> In rejecting the manufacturer's argument that FIFRA preempted the plaintiffs' action, the court noted the significant role the manufacturer plays in the regulatory scheme of FIFRA. Each manufacturer drafts for each product a warning label for EPA approval, thus creating the possibility that two manufacturers of the same product will choose different labels. The fact that manufacturers submit their own labels implies a duty to provide a label that gives adequate warnings about the

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249. *Ferebee*, 736 F.2d at 1540 (quoting FIFRA § 24(b), 7 U.S.C. § 136v(b)).

250. *Id.* at 1541 (citing FIFRA § 24(a), 7 U.S.C. § 136v(a) and *National Agricultural Chems. Ass'n v. Rominger*, 500 F. Supp. 465 (E.D. Cal. 1978)). Similar conclusions were reached in *Chemical Specialties Mfrs. Ass'n, Inc. v. Lowery*, 452 F.2d 431 (2d Cir. 1971) (earlier version of FIFRA did not preempt local regulations governing classification and labeling of pressurized products); *Whitener v. Reilly Indus. Inc.*, No. 87-5225 slip op. (S.D. Ill. Oct. 25, 1989); *Roberts v. Dow Chem. Co.*, 702 F. Supp. 195 (N.D. Ill. 1988); *Wilson v. Chevron Chem. Co.*, No. 83 Civ. 762 (S.D.N.Y. Dec. 17, 1986) (1986 WL 14925).

251. *Ferebee*, 736 F.2d at 1541.

252. 704 F. Supp. 85 (E.D. Pa. 1989).

253. *Id.* at 86.



risks associated with the product's use, notwithstanding the approval of the EPA. Hence, the court concluded that Congress intended FIFRA to set minimum standards.<sup>254</sup>

*Roberts v. Chemlawn Corp.*<sup>255</sup> expressed another reason why EPA labeling requirements should merely be viewed as setting minimum standards. In *Roberts*, the manufacturer of lawn care pesticides that allegedly caused a variety of ill-health effects to the pesticide-sensitive plaintiff, urged that the court should defer to the EPA's primary jurisdiction and require the plaintiff to utilize EPA's special review procedure in lieu of a judicial remedy.<sup>256</sup> The court rejected this argument:

As far as this court can tell, the EPA will not complete its assessment of non-agricultural pesticides until the beginning of the next century. The EPA's expedited review program (special review) appears backlogged as well. According to GAO estimates, "[s]pecial reviews completed through October 1986 have generally taken two to six years *or longer* to complete." And while the special review process has allegedly been expedited, we question whether that action will significantly reduce the duration of the proceedings given the increased workload of the special review branch. Our fears appear confirmed by those in a position to know: "The Chief of EPA's Special Review branch told us [the GAO] that, while special reviews have taken too long, it is difficult to speed up the special review process when EPA is dealing with so much uncertainty with respect to quality of risks and benefits data, and with competing resource demands from other pesticide program activities."<sup>257</sup>

Despite the sound reasons why it is appropriate for state tort law to be more protective of human health than FIFRA, a recent case has reconsidered the precedent set by *Ferebee*. In *Fitzgerald v. Mallinckrodt, Inc.*,<sup>258</sup> a case involving a greenskeeper who spilled

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254. *Id.* at 86-87.

255. 716 F. Supp. 364 (N.D. Ill. 1989).

256. *Id.* at 365-66.

257. *Id.* at 365-66 (citation omitted) (footnote omitted). Using similar reasoning the court refused to require plaintiff to exhaust administrative remedies. *Id.* at 368-69. *But see* *Ryan v. Chemlawn Corp.*, 29 Env't Rep. Cas. (BNA) 1415 (N.D. Ill. 1989) (court dismissed complaint in deference to EPA's primary jurisdiction; resolution of issues involve command of arcane technical data, uniquely within EPA's competence).

258. 681 F. Supp. 404 (E.D. Mich. 1987).

an inorganic mercury based fungicide on himself, the court reviewed the provisions of FIFRA considered in *Ferebee*.<sup>259</sup> The court concluded that FIFRA's comprehensive system for the registration and labeling of pesticides preempted state tort law recovery.<sup>260</sup> The court reasoned that the express prohibition of state imposition of additional or different labeling or packaging requirements imposed by section 136v(b) preempted state regulation; therefore, allowing tort recovery would be "back door" regulation. Specifically, the court stated that "any state law tort recovery based on a failure to warn theory would abrogate Congress' intent to provide uniform regulations governing the labeling of pesticides."<sup>261</sup>

Other courts have placed additional limitations on recovery against a manufacturer by one exposed to a hazardous pesticide. For example, in *Stiltjes v. Ridco Exterminating Co.*,<sup>262</sup> not only did the court hold that a pesticide manufacturer satisfied its tort duty to warn by meeting the FIFRA labeling requirement, the court also held that by restricting sales only to licensed commercial applicators, a manufacturer has no duty to provide instructions or warnings to individuals. The court reasoned that the applicators are, as a matter of law, charged with knowledge of the dangers associated with and safe use of pesticides; therefore, the manufacturer has no further duty to warn the applicator's customers.<sup>263</sup>

This reasoning is troublesome because it ignores the control manufacturers have over the contents of the label.<sup>264</sup> Also, a pesticide applicator gains a substantial part of his expertise in the field from his manufacturer or supplier rather than from independent sources.<sup>265</sup> An applicator may know no more than what the manufacturer chooses to communicate to him directly and through the regulatory process, and may not have additional

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259. See *supra* notes 247-51 and accompanying text.

260. *Fitzgerald*, 681 F. Supp. at 408.

261. *Id.* at 407. The court's opinion follows *Palmer v. Liggett Group, Inc.*, 825 F.2d 620 (1st Cir. 1987), which held that the federal Cigarette Labeling Act preempted state tort actions against cigarette manufacturers premised on the manufacturers failure to warn of the risks associated with cigarette smoking.

262. 178 Ga. App. 438, 343 S.E.2d 715 (1986), *aff'd*. 256 Ga. 255, 347 S.E.2d 568 (1986) (Supreme Court opinion substituted for Opinion of Court of Appeals, 180 Ga. App. 700, 350 S.E.2d 856 (1986)).

263. *Stiltjes*, 343 S.E.2d at 719. See also *Dine v. Western Exterminating Co.*, Civ. No. 86-1857-OG (D.D.C. March 9, 1988) (1988 WL 25511).

264. See *supra* notes 17-18 and accompanying text.

265. For example, a certified applicator may not be required to demonstrate knowledge of integrated pest management. See *supra* notes 51-52 and accompanying text.

information to communicate to customers. Moreover, one cannot assume that simply because a commercial applicator has "knowledge" of the risks associated with use of a pesticide, that knowledge is possessed by its employees.<sup>266</sup> Thus, one court has concluded that at the very least a pesticide manufacturer must label containers that reach the hands of an applicator's employees to inform of hazards and safe use.<sup>267</sup>

Thus, plaintiffs seeking recovery against manufacturers on a failure to warn theory may have difficulty when the manufacturer uses an EPA-approved label that fails to communicate all risks associated with use of the pesticide and that may never reach the person likely to be exposed, such as an applicator's employee or customer. For similar reasons, it may be difficult to show that an applicator following accepted practices misapplied a pesticide even when people are exposed to unnecessarily high levels of pesticides. As discussed earlier, pesticides are being used in ever increasing amounts, and surprisingly high levels are being measured off-target. The medical literature is filled with examples of high incidence of disease associated with pesticide exposure. It is questionable whether generally accepted practices adequately protect the environment and public health, and indeed there are instances, as illustrated in *Rabb*, where individuals are exposed to a pesticide that is subsequently withdrawn from the market because of safety concerns. Nonetheless, a court in such a situation is reluctant to find that a pesticide was misapplied when the label specifications have been followed.

The cases involving low level pesticide exposure are troublesome in several respects. First, unlike many property damage cases which regard statutes regulating pesticide labeling as support for the dangerousness of pesticides and, at best, as providing minimum standards for labeling and use, there is a growing body of case law holding that FIFRA preempts more protective case law.

Second, unlike property damage cases that impose a broad duty on manufacturers, sellers, and applicators to inform, cases involving personal injury have restricted the scope of the manu-

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266. *Khan v. Velsicol Chem. Corp.*, 711 S.W.2d 310, 313, 315-16 (Tex. Ct. App. 1986).

267. *Id.* at 316. See also *Whitener v. Reilly Indus. Inc.*, No. 87-5224, slip op. (S.D. Ill. Oct. 25, 1989) (court refused to extend learned intermediary doctrine, which exonerates from liability drug manufacturers who give warnings, to prescribing physicians to situation when pesticide manufacturer communicates warning to employer).

facturers' duty to warn and refused to safeguard an individual's interest in remaining free from the health risks associated with pesticide exposure. Unlike cases that recognize an individual's interest to be free from the risk to property associated with pesticide exposure, courts addressing personal injury cases seem more concerned that manufacturers and applicators are not overregulated. This trend is particularly disturbing, because manufacturers of pesticides control the process of testing for safety and the contents of the labeling with minimal oversight from the EPA, despite the protective language of FIFRA.

Third, unlike the body of case law that infers causation from some misconduct by the defendant and proof of damage of a type associated with exposure to the pesticide, courts dealing with personal injury have been reluctant to ease plaintiff's burden of proving causation. A reason for this different treatment may be that in many property damage cases, the harm was caused by an herbicide such as 2,4-D, which damaged crops. Thus, the herbicide was having its desired and *recognized* effect, albeit in the wrong place. Issues of causation were not difficult to resolve. In cases involving personal injury, the herbicides and insecticides at issue were designed and developed to have effects on specific plants and insect pests, not on humans. These desired effects being known, the pesticides were applied by the user who had no knowledge of *other* undesired effects that the pesticide might have. It is these effects of pesticides, unrelated to their designed uses, that set the issue of personal injury apart from the issue of unwanted crop damage — at least in terms of causation. However, despite the understandable difficulty courts have in linking pesticide exposure to particular personal injuries, their unwillingness to ease plaintiffs' burdens of proof is disturbing because the manufacturers control the development of information regarding health risks and its release of that information to the public. These rulings provide no incentives for manufacturers of pesticides to go beyond the necessary minimum or to develop information regarding health risks associated with pesticide exposure and to release this information to the public.

#### IV. CONCLUSION

The cases that discuss remedies for exposure to pesticides seem to make several assumptions. First, the cases appear to assume that pesticides are generally useful. For example, even the property damage cases that ease plaintiff's burden of proof to re-

cover for crop loss caused by spray drift do not question the defendant-landowner's right to use "beneficial dusts and sprays" to rid his land of pests. However, studies are increasingly demonstrating that comparable productivity can be achieved without synthetic chemical pesticides. Moreover, the regulatory process does not necessarily require an applicant for registration of a pesticide to demonstrate efficacy. Thus, the benefits of pesticides are subject to question.

Second, courts assume that when used according to label directions, pesticides can be used safely. However, the current regulatory structure basically places in the hands of the registrant responsibility for determining the safety of the pesticide and the types of warnings and directions for safe use to be placed on the label. EPA cannot replicate these studies. Even if it can be assumed that current registrants follow accepted protocol in developing data, data demonstrating ill-health effects may take many years to develop, during which time the pesticide is on the market. Older pesticides subject to re-registration may never have been subject to adequate safety tests. Indeed, the medical literature is replete with instances where long term exposure to registered pesticides has been linked to serious injury despite compliance with label directions.<sup>268</sup> Thus, the assumption that pesticides can be used safely is also questionable.

Courts should recognize that they are making these questionable assumptions and, in cases involving human exposure, should allow plaintiffs to present evidence that challenges these assumptions. The property damage cases have already evolved doctrines that compensate, in a fairly straightforward fashion, for property loss caused by neighboring pesticide use. These cases recognize that a plaintiff's interest in property includes the right to use that property free from pesticide exposure. *Langan* goes so far as to hold that an organic farmer's decision to grow organic crops cannot be interfered with, even when no traditional crop loss has occurred. *Kell* goes one step further and allows the grantor of an easement to prevent exposure of his land to pesticides. In cases of human exposure, courts should similarly recognize that one's right to use and enjoyment of property includes the right to be free from the health risks associated with exposure to pesticides used on neighboring land, particularly in light of the questionable benefits and safety of pesticides.

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268. See *supra* notes 91-95 and accompanying text.

Indeed, current nuisance law could accommodate evidence concerning the risk of developing serious bodily injury in deciding whether pesticide spraying is a nuisance given the risk of drift onto neighboring lands. An action in private nuisance arises from a defendant's interference with plaintiff's use or enjoyment of land.<sup>269</sup> There is support for the proposition that a threat of future injury may be a present menace and interference with enjoyment and is an actionable basis for a nuisance.<sup>270</sup> At least one court has recognized that, in a nuisance action, even when plaintiffs have not been diagnosed with a disease, damages for inconvenience, discomfort and annoyance resulting from exposure to a hazardous substance on defendant's property are recoverable.<sup>271</sup> Thus, where the spraying of pesticides on neighboring property creates a risk of future health consequences and thereby diminishes one's use and enjoyment of property, an action for damages should be allowed or, in appropriate cases, plaintiffs like those in *Kell*, should be allowed to enjoin pesticide application that threatens to diminish such use and enjoyment.<sup>272</sup>

In addition, most cases involving personal injury caused by exposure to chemical pesticides premise recovery on the manufacturer or applicator's failure to warn of the dangers associated with the use of the product. Although usually unstated, courts in failure to warn cases implicitly assume that the benefits of a product outweigh its risks; however, the manufacturer has a responsibility to render the product as safe as possible by issuing appropriate warnings.<sup>273</sup> However, as shown above, it is highly questionable whether in cases involving pesticide exposure this assumption is valid. Thus, in cases involving human exposure to pesticides, courts should follow *Villari* and allow plaintiffs to proceed in actions against sellers and manufacturers on the theory of strict products liability. However, rather than focusing on the warnings, courts should submit to juries the question of whether the defendant has sold a "product in a defective condition unrea-

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269. W. KEETON, D. DOBBS, R. KEETON, D. OWEN, PROSSER & KEETON ON TORTS § 13, at 67 (5th ed. 1984).

270. *Id.* at 620.

271. *Burns v. Jaquays Mining Corp.*, 156 Ariz. 375, 379, 752 P.2d 28, 32 (Ariz. Ct. App. 1988) (citing RESTATEMENT (SECOND) OF TORTS § 929 (1986)) (plaintiffs exposed to asbestos from defendant's mill and tailings pile).

272. *See* W. KEETON, D. DOBBS, R. KEETON, D. OWEN, PROSSER & KEETON ON TORTS § 89, at 640-41, 647 (injunctive relief particularly appropriate in pollution cases).

273. *See, e.g., Borel v. Fibreboard Paper Prods. Corp.*, 493 F.2d 1076 (5th Cir. 1973), *cert. denied* 419 U.S. 869 (1974).

sonably dangerous to the user or consumer.”<sup>274</sup> In many jurisdictions, such a question would compel the jury to weigh the risks against the benefits of the product by considering the following seven factors:

- (1) The usefulness and desirability of the product — its utility to the user and to the public as a whole.
- (2) The safety aspects of the product — the likelihood that it will cause injury, and the probable seriousness of the injury.
- (3) The availability of a substitute product which would meet the same need and not be as unsafe.
- (4) The manufacturer’s ability to eliminate the unsafe character of the product without impairing its usefulness or making it too expensive to maintain its utility.
- (5) The user’s ability to avoid danger by the exercise of care in the use of the product.
- (6) The user’s anticipated awareness of the dangers inherent in the product and their avoidability, because of general public knowledge of the obvious condition of the product, or of the existence of suitable warnings or instructions.
- (7) The feasibility, on the part of the manufacturer, of spreading the loss by setting the price of the product or carrying liability insurance.<sup>275</sup>

A risk-utility analysis would put before the jury not only information about the risks to human health caused by pesticide use and any information concerning its questionable utility, but also information about alternatives to chemical pesticide use that are less risky, such as integrated pest management practices, sustainable agricultural practices, and hand clearing of noxious weeds. In addition to information regarding the adequacy of warnings, other relevant evidence would include information about overuse of pesticides and the inability of individuals to protect themselves from the risks associated with pesticide exposure.

Rethinking the appropriate standard of liability does not, of

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274. A well-known formulation of this principle is found in the RESTATEMENT (SECOND) OF TORTS § 402A (1986).

275. *Cepeda v. Cumberland Eng’g Co.*, 76 N.J. 15, —, 386 A.2d 816, 826-27 (1978) (quoting Wade, *On the Nature of Strict Tort Liability for Products*, 44 Miss. L.J. 825, 837-38 (1973)). See also *Caterpillar Tractor v. Beck*, 593 P.2d 871 (Alaska 1979); *Barker v. Lull Eng’g Co., Inc.*, 20 Cal. 3d 413, 143 Cal. Rptr. 225, 573 P.2d 443 (1978).

course, eliminate the need to determine whether exposure to pesticides caused the plaintiff's injury, a barrier to recovery in toxic tort cases generally. Proof of causation invariably involves introduction of epidemiological evidence, which rarely establishes a decisive link between exposure and injury. In pesticide exposure cases, courts should allow plaintiffs to introduce health effects studies involving not only the pesticide to which the plaintiff was exposed, but also those in related groups. For example, pesticides could be classified on the basis of chemical structure. Toxicity data obtained for one pesticide could be introduced in cases involving other chemically-related pesticides. Thus, a plaintiff exposed to an inadequately studied pesticide would not be at a disadvantage due to the paucity of data to support his case.

In addition, animal studies should be introduced when conducted in accordance with accepted guidelines, such as those discussed in Part II.<sup>276</sup> Certainly, the fact that a particular plaintiff is unusually sensitive to the pesticide should not prohibit recovery. Instances of severe reactions to pesticides are coming to light.<sup>277</sup> These cases may represent unusual sensitivity to a pesticide. However, they also suggest that there are pesticide-associated risk factors yet to be discovered. It would be virtually impossible for a pesticide manufacturer to provide, and for the government to evaluate, data regarding all of the factors that would increase a person's sensitivity to a pesticide.

Nonetheless, cases of sensitive plaintiffs should be treated in the same manner as the organic farmers in *Langan*, and the manufacturer or user of a pesticide that profits from its sale and use

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276. See *supra* note 82 and accompanying text.

277. For example, in 1986, Branch & Jacqz, *Is Carbaryl as Safe as Its Reputation?*, 80 AM. J. MED. 659-64 (1986), reported the case of a seventy-five year old man who was found to have headaches, memory loss, anorexia, and weight loss; these symptoms correlated with long-term exposure to the pesticide carbaryl (a-naphthyl-N-methylcarbamate) — an acetylcholinesterase inhibitor. The wife and child of the patient were not affected.

Subsequent studies of the patient revealed that he was taking cimetidine for an ulcer condition. Cimetidine inhibits enzymes in the liver that eliminate compounds such as carbaryl from the system; the physicians postulated that the patient's sensitivity to carbaryl was due to his inability to metabolize and eliminate the pesticide.

To test this hypothesis, a human volunteer was exposed to carbaryl before and after taking cimetidine. As expected, clearance of carbaryl from the blood was significantly decreased after the volunteer was treated with cimetidine. Ward, 26 CLINICAL TOXICOL. 269-81 (1988).

Cases of sensitive individuals suffering as a result of exposure to commonly used lawn care pesticides marketed as "safe" and "practically non-toxic" are recounted in *Hearings, supra* note 6.



should compensate one who is deprived of his health because of such sale or use.<sup>278</sup> Such a result is consistent with cases involving exposure to other toxicants that hold that a product seller has a duty to foresee and warn against the remote possibility that a small number of users will experience a severe reaction.<sup>279</sup>

Furthermore, even when plaintiffs cannot demonstrate present injury caused by a pesticide known to increase their risk of developing cancer, genetic defects and developmental problems in future generations, courts should follow the lead of those courts that have awarded medical surveillance costs to such plaintiffs.<sup>280</sup> Such awards assure plaintiffs that funds will be available to pay medical costs, and perhaps lost wages, if serious disease develops.

Finally, courts should follow *Ferebee* and find that FIFRA does not preempt tort actions in accordance with state law. Not only does preemption law compel this conclusion, but in addition, the types of evidence appropriate to a tort case may never have been considered in the registration process under FIFRA. Thus, FIFRA cannot be relied on to adequately protect individual's rights to be free from exposure to dangerous substances.

The foregoing conclusion does not, of course, preclude the passage of state statutes and local ordinances to restrict pesticide use, which is, perhaps the clearest way for those concerned about the health risks associated with pesticide exposure to limit the use of chemical pesticides.

There has been sharp disagreement over the extent to which state and local legislation limiting pesticide use has been preempted by FIFRA.<sup>281</sup> However, the Second Circuit recently ex-

278. See *Gergel*, slip op. at 10 (obligation to warn product users of idiosyncratic reactions to pesticide is jury question).

279. See, e.g., *Billiar v. Minnesota Mining & Mfg. Co.*, 623 F.2d 240, 246 (2d Cir. 1980); *Tiderman v. Fleetwood Homes*, 102 Wash. 2d 334, 684 P.2d 1302 (1984).

280. See, e.g., *Merry v. Westinghouse*, 684 F. Supp. 847 (M.D. Pa. 1988); *Burns v. Jaquays Mining Co.*, 156 Ariz. 375, 752 P.2d 28 (1987); *Ayers v. Jackson Township*, 106 N.J. 557, 525 A.2d 287 (1987).

281. Compare *New York State Pesticide Coalition, Inc. v. Jorling*, 874 F.2d 115 (2d Cir. 1989) (state notification program not preempted); *Coparr, Ltd. v. City of Boulder*, 735 F. Supp. 363 (D. Colo. 1989); *D-Con Co., Inc. v. Allenby*, 728 F. Supp. 605 (N.D. Cal. 1989) (additional warnings required by Proposition 65 not preempted); *Central Maine Power Co. v. Town of Lebanon*, 571 A.2d 1189 (Me. 1990) (local ordinance prohibiting nonagricultural commercial spraying of herbicides not preempted); *Deukmejian v. County of Mendocino*, 36 Cal. 3d 476, 204 Cal. Rptr. 897, 683 P.2d 1150 (1984) (county initiative ordinance prohibiting aerial application of phenoxy herbicides for reforestation not preempted) with *Maryland Pest Control Ass'n v. Montgomery County*, 646 F. Supp.

plained why FIFRA's provision prohibiting state labeling requirements in addition to or different from those required under FIFRA should not preclude state and local governments from requiring that additional information be given to those who may be exposed to pesticide application or from otherwise restricting pesticide use:

The meaning of the word "labeling" as used in the statute is decisive. . . . "Labeling" is better understood by its relationship . . . to the product. Clearly, since the key function of the scheme is to identify and describe the poisonous chemicals, statutory labeling may include a warning. But this does not bar all similar statements. FIFRA "labeling" is designed to be read and followed by the end user. . . . By contrast, the target audience of the New York notification program is those innocent members of the general public who may unwittingly happen upon an area where strong poisons are present as well as those who contract to have pesticides applied. . . . The New York Regulations . . . ensure minimum warnings to the public at large and a greater degree of disclosure to those contracting to have pesticides applied [and do not conflict with section 24(b)].

. . . .

In enacting § 24(b) Congress clearly sought to set minimum standards for pesticide labeling,. . . not to prevent states from regulating the "sale and use" of the poisonous chemical substances . . . [that] serve to further the purpose of [FIFRA] by enlisting state aid to prevent "unreasonable adverse effects [of pesticide use] on the environment."<sup>282</sup>

Thus, not only should courts recognize the real risks of pesticide use in deciding cases seeking *post hoc* compensation, legislative bodies can and should develop measures to protect local

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109 (D. Md. 1986) *aff'd* 822 F.2d 55 (4th Cir. 1987) (posting and notice requirements in county ordinance preempted); *Mortier v. Town of Casey*, 154 Wis. 2d 18, 452 N.W.2d 555 (Wis. 1990) (ordinance limiting aerial spraying of pesticides preempted).

282. *New York State Pesticide Coalition v. Jorling*, 874 F.2d at 118-19 (citations omitted). See also *Central Me. Power v. Town of Lebanon*, slip op. at 7 (presumptions of federal supremacy does not invalidate local regulation of safety and health matters, such as pesticide regulation).

residents from the health and environmental effects of unnecessary use of synthetic chemical pesticides.

The authors recognize that the foregoing conclusions have been reached without differentiating among types of pesticides with different chemical compositions and that all pesticides are not equal in terms of the risk that they pose to human health and the environment. This failure to differentiate is due to the problem in health effects studies. When an individual or population is exposed to a variety of pesticides or pesticides with several active and so-called inert ingredients, it may be impossible to determine which pesticide or ingredient(s) caused the disease or symptoms. The ill-health could have resulted from synergistic effects of more than one chemical. This inability to draw clear conclusions about the effects of pesticide exposure is exacerbated by the problem that much information that would allow the medical and scientific community to develop more precise information regarding chemical make-up and consequent effects of pesticides is shielded from the public.

This is not to say that any plaintiff who has been exposed to any pesticide should be able to recover from anyone connected with the manufacture or use of the pesticides generally. Rather, a plaintiff should be able to proceed with a claim upon demonstration of his or her unconsented exposure to a pesticide that was used or manufactured by a defendant and that created a significant risk of harm to the plaintiff. Exposure would be demonstrated in the same way as in property damage and drenching cases. Lack of consent could be shown, as in property damage and drenching cases, by evidence that a pesticide applied on a neighboring property drifted onto the plaintiff's property, thereby disturbing the plaintiff's use and enjoyment. In cases brought by plaintiffs who are users of pesticides, failure to provide information about risks of exposure that might influence the user's decision to use the pesticide and would indicate lack of consent. Epidemiological, *in vitro*, and animal studies would be relevant to prove significant risk of harm. Significant risk of harm should not mean a greater than 50% probability of developing disease because, under such a rule, few would ever recover. Rather, risk significant enough that the plaintiff would have chosen to avoid the risk or to require medical intervention would suffice. Also, a plaintiff who is exposed to several pesticides or a pesticide with more than one ingredient that may be responsible for his or her harm or for creating a significant risk of harm,

should not be required to identify which particular ingredient caused the harm. The plaintiff's burden would be satisfied by demonstrating that each defendant, by manufacturing or applying one of the substances to which plaintiff was exposed, contributed to the creation of the significant risk of harm.<sup>283</sup> Naturally, a defendant would have an opportunity to rebut this evidence of significant risk, and any recovery would vary by the significance of the risk of harm caused.

Such a rule would advance a number of policies. As some courts have recognized in the case of other products with delayed effects, the defendant whose conduct in marketing the product played a significant role in creating unavailability of proof should bear the cost of injury rather than the innocent plaintiff.<sup>284</sup> Also, the manufacturer is in the best position to discover and guard against defects in its products and to warn of harmful effects. Thus, holding the manufacturer liable for defects and failure to warn of harmful effects will provide an incentive to product safety.<sup>285</sup> Similarly, where exposure to a particular product creates a significant risk of harm, liability rules that encourage pesticide manufacturers and applicators to communicate the risks to those likely to be exposed, consumers can make more informed choices about whether to use the pesticide in light of the risks, and bystanders will have some opportunity to protect themselves from exposure. When individuals are deprived of the choice to protect themselves from exposure causing significant risk of harm, that deprivation is an invasion of a legally protected interest and should be compensable.

The foregoing rule should not result in overcompensation. Meeting the burden of proving significant risk of harm will still require the use of experts to evaluate the available safety data to determine the nature of the risk. In the case of some substances, such as a naturally occurring substance used as a fertilizer, which are regulated as pesticides under FIFRA, but whose chemical characteristics suggest no human health effects, for which epidemiological studies show that exposed populations have no increased incidence of disease over background levels and for which animal and *in vitro* studies indicate no ill-health effects, a

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283. See *Jorling*, 874 F.2d at 118-19; *Central Me. Power*, slip op. at 7; *Martin v. Abbott Laboratories*, 102 Wash. 2d 581, 689 P.2d 368 (Wash. 1984); *Collins v. Eli Lilly Co.*, 116 Wis. 2d 166, 342 N.W.2d 37 (1984).

284. *Sindell v. Abbott Laboratories*, 26 Cal. 3d 588, 163 Cal. Rptr. 132, 607 P.2d 924, cert. denied, 449 U.S. 912 (1980).

285. *Id.*

plaintiff exposed to such a pesticide, albeit without consent, will be unable to show a significant risk of harm and will be unable to recover.