The Fruits of Ill-Health:
Pesticides and Workers' Bodies in Post–World War II California

*By Linda Nash**

ABSTRACT

In the postwar period, modernist frameworks of the human body, which described the body as both cosmopolitan and separated from its environment, competed with ecological frameworks that constructed the body as inherently porous and tightly linked to the surrounding world. The history of pesticide-related illness among farmworkers, and the gradual recognition that pesticides posed a new kind of public health problem, illustrates how these competing understandings were adopted, mobilized, and applied by different groups, as well as how politics shaped the emergence of new medical facts. New forms of illness generated new knowledge about the modern landscape and made visible material links between bodies and their environments.

INTRODUCTION

The orchard has long been associated with health in California's promotional literature. Nineteenth-century agriculturists and boosters alike extolled horticulture as a means for improving the landscape and the bodies of those who labored there. For consumers, the link between fruit and health would be sustained down to the present day through the advertising campaigns of the Sunkist cooperative and other producers. But as farming practices themselves changed, the reputed healthfulness of the farm and orchard environment no longer matched the reality if, in fact, it ever had. By the late twentieth century, dangerous machinery, harsh working and living conditions, and the introduction of greater and greater quantities of chemicals had rendered California orchards and fields among the most hazardous places to work. Certainly for those who labored in agriculture in the decades after World War II, the modern orchard became a location that constantly threatened their physical well-being. While postwar consumers were likely to associate oranges with vitamin C and a healthy diet, those who harvested the fruit had a radically different perspective. As one farmworker told an interviewer in 1969, "Whenever I pick oranges, I feel so bad; my mouth feels sour and dry from the nose all the way down to the stomach. It is so bad that I can't even eat."[1]

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[1] California Department of Public Health (CDPH), *Community Studies on Pesticides,* 15 Dec. 1970, 14.

Tracing the history of the pesticide-related illness in the postwar decades makes visible the parallel effects of modernization on the landscape and the bodies of working people. In doing so, this essay considers not only the agency of humans but also the agency of nature, not only the vulnerability of the environment but also the vulnerability of human bodies. As laboring bodies transformed the orchard through pruning, picking, planting, and spraying, the orchard transformed those same bodies, often in less visible, but no less material, ways.

The principal objective of this essay, however, is to consider the ways in which politics and cultures of knowledge make visible or invisible a link between the health of human bodies and the condition of the surrounding environment. The "fact" of pesticide toxicity to agricultural workers was one that emerged into popular and political consciousness quite slowly. Though the first fatal poisonings were reported in the late 1940s, the issue received little attention until the late 1960s and no serious regulation until the 1970s. Even then, the risks faced by farmworkers received little attention in comparison with other environmental health issues.

Why did the effects of pesticides on working people remain invisible to so many for so long? Although the invisibility of pesticide poisoning had multiple sources, in this essay I focus on the discursive strategies and conceptual models of modern medicine, particularly that of occupational health, the discipline in which the problem of pesticide poisoning was first articulated. Over the course of the 1950s and 1960s, occupational health specialists would assume primary responsibility for defining and regulating the relationship between bodies and environments on the modern farm. Paradoxically, however, the methods and assumptions of their discipline both revealed and obscured the connection between the modern agricultural environment and the illnesses of workers. Visibility and invisibility were produced together.

In speaking about the post–World War II boom in pesticide production, the historical as well as the popular emphasis has been on DDT and the organic chlorinated hydrocarbons made household words in Rachel Carson's *Silent Spring.* Popular thinking still holds that the rapid introduction of pesticides after the war hinged on the fact that little or nothing was known about their harmful effects. In this view, it is the biochemical characteristics of DDT that account for its wholesale introduction and adoption. Despite its ability to accumulate and concentrate in certain plants and animals, and even in human tissue, it has a relatively low *acute* toxicity. DDT had been used on U.S. troops during the war, after all, and was credited with saving as many as 5 million lives. Toxicological ignorance, while a questionable explanation for the government's failure to restrict the use of DDT, cannot account for the simultaneous introduction of organophosphate (OP) pesticides. German researchers discovered and produced these compounds during World War II as part of that nation's chemical weapons program; scientists immediately recognized that OP chemicals were powerful human neurotoxins.[2]

[2] Edmund Russell, *War and Nature: Fighting Humans and Insects with Chemicals from World War I to Silent Spring* (New York, 2001); Thomas R. Dunlap, *DDT: Scientists, Citizens, and Public Policy* (Princeton, N.J., 1981); Margaret Humphreys, "Kicking a Dying Dog: DDT and the Demise of Malaria in the American South, 1942–1950," *Isis* 87 (1996): 1–17; John H. Perkins, *Insects, Experts, and the Insecticide Crisis: The Quest for New Pest Management Strategies* (New York, 1982); Christopher J. Bosso, *Pesticides and Politics: The Life Cycle of a Public Issue* (Pittsburgh, Pa., 1987); and Edmund Russell, "The Strange Career of DDT: Experts, Federal Capacity, and Environmentalism After World War II," *Technology and Culture* 40 (1999): 770–96.

As with DDT, chemical manufacturers introduced organophosphate compounds to the domestic market immediately after the fighting stopped, and American farmers were eager customers. By 1949, growers in California were applying parathion and tetraethyl phosphate (TEPP) to their fields. In 1951, they added demeton (systox) and EPN; in 1953, malathion and chlorthion; and in 1956, dipterex and the extremely toxic metacide. In 1958, several serious poisonings accompanied the introduction of thimet into cotton production. That year also saw the introduction of tetram, disulfuton (di-syston), mevinphos (phosdrin), azinphosmethyl (guthion), and carbophenothion (trithion). By 1963, more than 16,000 pesticides had been registered in California, and farmers had become increasingly reliant upon multiple applications of multiple chemicals. By the late 1960s, a typical California walnut farmer was spraying her trees with multiple chemicals several times a year: once with a copper sulfate compound to control blight; once with guthion to control codling moths; and once with trithion or parathion to control mites.[3] Synthetic chemicals quickly became a critical component of the environment on a modern California farm.

The toxicity of OP compounds resides in their ability to inhibit the action of cholinesterase, an enzyme critical to the normal functioning of the nervous system. The result is hyperexcitability, which may be observed as muscle twitches, tremors, convulsions, bronchial spasms, constriction of the pupils, abdominal cramps and vomiting, irregularities in heart beat, and in extreme cases, respiratory paralysis and cardiac arrest. Little is known about the chronic effects of these compounds, though mounting evidence suggests they may produce delayed neurological problems. In addition, both farmers and farmworkers are at increased risk for several types of cancer, which some researchers suggest is linked to their high rates of pesticide exposure.[4]

What is known is that systemic poisonings and death went hand in hand with the introduction of these pesticides into peacetime agriculture. Although poisonings would quickly become, and remain, a transnational problem, most information on the health dangers of pesticides in the 1950s and 1960s would emerge from California, more particularly from the Central Valley. In 1949, in a single incident near Marysville, California, twenty-five pear pickers became seriously ill after entering an orchard that had been sprayed with parathion twelve days earlier. By September of that year, the California Department of Public Health (CDPH) was aware of 300 cases of poisoning by agricultural chemicals within the state, including two deaths.[5]

From the beginning, poisonings had been linked primarily with fruit crops, which partly accounts for their prevalence in the Central Valley. Nature and history have combined to make California one of the premier regions in the world for growing fruits and vegetables. By 1899, California was already growing more fruit than any

[3] CDPH, *Community Studies on Pesticides,* 2 Feb. 1972, table 4.

[4] Howard W. Chambers, "Organophosphorus Compounds: An Overview," *Organophosphates: Chemistry, Fate, Effects,* ed. J. E. Chambers and P. E. Levi (San Diego, Calif., 1992), 3–17. The first evidence that OP pesticides could create long-term neuropsychological problems was reported in 1961 by Australian researchers. Lakshman Karalliedde, Stanley Feldman, John Henry et al., eds., *Organophosphates and Health* (London, 2001), xxiii. See also Marion Moses, "Pesticide-Related Health Problems and Farmworkers," *AAOHN Journal* 37 (1989): 115–30; Devra Lee Davis, Aaron Blair, and David G. Hoel, "Agricultural Exposures and Cancer Trends in Developed Countries," *Environmental Health Perspectives* 100 (April 1992): 39–44; and Aaron Blair and Shelia Hoar Zahm, "Cancer among Farmers," *Occupational Medicine: State of the Art Reviews* 6 (1991): 335–54.

[5] Herbert K. Abrams, "Occupational Illness Due to Agricultural Chemicals, 1949," *California's Health,* 15 Sept. 1950, 35.

other state in the nation. By the end of World War II, the state was producing 33 percent of the nation's pears, 42 percent of the peaches, 50 percent of the oranges, 90 percent of the grapes, and 100 percent of the lemons, olives, avocados, apricots, almonds, and artichokes. The specialization of California farms in horticulture would grow only more pronounced over the following decades.[6]

As farmers introduced a multitude of new plant varieties into the state, they also introduced new insects, which they struggled to control. In California, many introduced insects were not subject to the same ecological limits that constrained their populations in their native locales. The absence of typical predators, the mild climate, and abundant food supplies allowed many insect species to proliferate. By the early twentieth century, California fruit growers were contending with scales, beetles, thrips, moths, phylloxera, aphids, spider mites, and peach-tree borers. The prevalence of insect problems prompted many to turn to chemical control as early as the 1880s. Growers' adoption of strict standards for cosmetic quality in the early twentieth century exacerbated the rapid turn toward chemical compounds. In the 1950s and 1960s, California farmers rapidly converted to the new organic chemicals that appeared on the market. Throughout this period, they applied pesticides on more acres and in larger quantities than did their counterparts elsewhere in the country. Estimates from the 1960s typically put the state's share of pesticide usage at 20 percent of the national total, but no one knew the actual amounts applied.[7]

From 1901 until the 1970s, the department solely in charge of researching and regulating the use of pesticides in California was the state Department of Agriculture. The concerns of this agency, however, lay primarily with the efficacy of pesticides rather than their effects on human health. Staffed with agronomists, entomologists, and, increasingly, chemists, the agriculture department maintained no expertise in public health or medicine. Meanwhile, twentieth-century medicine had largely rejected the environmentalist focus of earlier eras, focusing instead on the isolated human body and particular infectious agents. The only disciplinary space in which a strong link between environment and human health remained was in the relatively marginalized field of occupational health. It was within this disciplinary space that the health effects of OP pesticides were articulated with growing concern after World War II.[8] It was also within this space that the fact of pesticide poisoning would remain confined until the late 1960s.

Though not typically considered as such, occupational health (or industrial hygiene as it was referred to in the early part of the century) was one of the earliest of the "environmental sciences." Since its inception, the discipline had highlighted the link be-

[6] Steven Stoll, *The Fruits of Natural Advantage: Making the Industrial Countryside in California* (Berkeley, Calif., 1998); Miriam J. Wells, *Strawberry Fields: Politics, Class, and Work in California Agriculture* (Ithaca, N.Y., 1996), 19–37; and Paul Rhode, "Learning, Capital Accumulation, and the Transformation of California Agriculture," *Journal of Economic History* 55 (1995): 773–800.

[7] Stoll, *Fruits of Natural Advantage* (cit. n. 6), 98; Martin Brown, "An Orange Is an Orange," *Environment* 17 (1975): 6–11. California fruit growers, under the auspices of their marketing cooperative (Sunkist), first developed standards for cosmetic quality in the 1910s. See Richard C. Sawyer, *To Make a Spotless Orange: Biological Control in California* (Ames, Iowa, 1996), 34–6. For 20 percent number, see Robert Z. Rollins, "Federal and State Regulation of Pesticides," *American Journal of Public Health* 53 (1963): 1427–31.

[8] For a history of pesticide regulation in California, see http://www.calepa.ca.gov/About/History01/dpr.htm (accessed 27 May 2003); Rollins, "Federal and State Regulation of Pesticides" (cit. n. 7). Comments on occupational health are drawn in part from Thomas H. Milby, M.D., former CDPH director, telephone interview by author, 1 Oct. 2002.

tween the health of bodies and the condition of their environment. Emerging as a progressive response to nineteenth-century industrialization, industrial hygiene focused on the diseases peculiar to certain trades, concerning itself not merely with the body of the worker but also with the work environment: the modern factory. It owed much to nineteenth-century theories of environmental disease, which had assumed that environment shaped the physical and moral qualities of individuals. As the discipline evolved, practitioners and researchers followed the lead of medical bacteriologists and focused increasingly on identifying and monitoring specific contaminants in the workplace. In the 1920s and 1930s, industrial hygienists turned toward laboratory research, using animal studies to establish maximum safe-concentration levels for particular chemicals. Yet even as the scope of the discipline narrowed and it dissociated itself from its earlier relationship to environmental medicine, industrial hygienists continued to focus on how the (work) environment affected health. In this endeavor, occupational health stood apart from most other realms of medical understanding in the mid-twentieth century.[9]

In the late 1940s, the problem of pesticide poisoning gradually drew a few of California's occupational health specialists onto the unfamiliar terrain of modern agriculture. Not part of the traditional domain of industrial medicine, agriculture was perceived, however inaccurately, as work that took place in a natural, rather than a man-made, environment, that was inherently healthful, not hazardous. Yet as agriculture became industrialized, it took on many of the characteristics of the factory: mass production, standardized products, wage labor, workforce segmentation, and corporate ownership. Among these industrial characteristics was the increasing rate of work-related injuries and illnesses. The mass-poisoning incident in Marysville in 1949 prompted California's Bureau of Adult Health to begin publishing annual statistics on the incidence of occupational disease attributable to agricultural chemicals. Throughout the 1950s, reports of pesticide-induced occupational disease increased within the state. By 1963, CDPH was reporting that agriculture had the highest rate of occupational disease in the state, more than 50 percent higher than that of any other industry. These statistics did not even take into account the vast underreporting of pesticide-related illness.[10]

UNRULY ENVIRONMENTS

As occupational health experts moved onto the farm, what they found was that fields and orchards were not fully amenable to their control—far from it. The traditional methods of occupational health relied upon monitoring workers' bodies for signs of illness and limiting harmful exposures, either by modifying industrial processes and work routines or by providing protective equipment to workers. While occupational health experts acknowledged the importance of environment to health, they also assumed that the work environment was fixed, relatively predictable, and ultimately amenable to their control. A questionable assumption even for the most

[9] On these developments within the field, see Christopher Sellers, *Hazards of the Job: From Industrial Disease to Environmental Health Science* (Chapel Hill, N. C., 1997). See also Jacqueline Karnell Corn, *Response to Occupational Health Hazards: A Historical Perspective* (New York, 1992).

[10] Irma West, "Occupational Disease of Farm Workers," *Archives of Environmental Health* 9 (1964): 92–8; CDPH, *Reports of Occupational Disease Attributed to Pesticides and Agricultural Chemicals, California, 1950* (Berkeley, Calif., [1951?]).

stable of factory environments, it bore no relationship to the reality of agriculture in postwar California. For instance, toxicology assumed that the quality of toxicity was inherent to an isolated chemical substance and that data on chemical effects forged in the laboratory could be applied to any environment. In the fields of California, however, the local environment repeatedly escaped the descriptions of a delocalized laboratory science. As one investigator later lamented, in practice the amount of toxic residue on a given crop depended upon "the vicissitudes of environmental factors."[11] Place mattered in multiple ways, and the unpredictability of the natural world continually frustrated those who sought to describe and manage the agricultural environment.

From the beginning, poisonings had been clustered geographically in hot, arid regions, suggesting the importance of climatic factors. A study of parathion decay conducted in the 1970s revealed that pesticide residues in the same field could vary as much as 90-fold, depending upon the time of year the chemical was applied. The toxicity of any given residue might also be a function of weather. In 1963, more than ninety peach pickers in the northern San Joaquin Valley became severely ill, an incident that made front-page news. Yet sampling for parathion residues in the orchard suggested that levels were not high enough to produce acute effects in workers, which led investigators to suspect that a degradation product of parathion was responsible. Later work would establish the role of the "oxygen analogs" of organic phosphates. Created under conditions of intense sunlight, these compounds have a toxicity ranging from two to hundreds of times the toxicity of their predecessor chemical.[12] The California climate could produce both superior fruit and extremely toxic substances; the production of toxicity, like the yield of peaches, varied from year to year and from field to field. Once introduced into the environment, OP chemicals were subject to the uncontrolled agency of nature.

As researchers pursued the issue of worker exposure and pesticide toxicity, they found a multitude of significant environmental "variables." Important climatic factors included not only temperature, but rainfall, wind velocity, incident radiation, and humidity. Relevant as well was the type of soil: soils with high clay content were likely to bind the pesticides and slow their dissipation. Soil moisture, on the other hand, could increase the dispersion rate. Perhaps not surprisingly, then, studies of pesticide levels in different orchards located within the same area often yielded dramatically different results even when application rates had been the same. Seemingly every environmental factor researchers thought to consider had some effect on toxicity. The type of crop had a significant effect—citrus, peaches, and grapes were among the most likely to generate toxic exposures. But when researchers looked beyond the basic crop type, they found that the variety could also influence toxicity: a Minneola tangelo did not interact with a pesticide in the same way as an Orlando tangelo, nor a Temple orange in the same way as a Washington navel. As one pair of investigators

[11] William J. Popendorf and John T. Leffingwell, "Regulating OP Pesticide Residues for Farmworker Protection," *Residue Reviews* 82 (1982): 126; Jeffrey M. Paull, "The Origin and Basis of Threshold Limit Values," *American Journal of Industrial Medicine* 5 (1984): 227–38.

[12] F. A. Gunther, "Insecticide Residues in California Citrus Fruits and Products," *Residue Reviews* 28 (1968): 1–120; Thomas H. Milby, Fred Ottoboni, and Howard W. Mitchell, "Parathion Residue Poisoning among Orchard Workers," *Journal of the American Medical Association* 189 (1964): 351–6.; and Robert C. Spear, "Report of the Status of Research into the Pesticide Residue Intoxication Problem in the Central Valley of California," in *Pesticide Residue Hazards to Farm Workers: Proceedings of a Workshop Held February 9–10, 1976* (Salt Lake City, Utah, 1976), 43–62.

concluded, pesticides were so sensitive to environmental conditions that even when they had been applied in precisely the same manner, the residue levels could be highly variable. What was the weather? What types of plants were involved? Had it rained? Had it been windy or calm? Was it foggy or sunny? Was the field located in a valley? On a hill? On a north slope or a southern one? It was this environmental "sensitivity" that made mass OP poisoning events an unpredictable occurrence.[13] Toxicity was not simply a quality of a given chemical but a relationship between that chemical and the environment in which it was applied. The gridded fields, the engineered irrigation canals, the neat rows of cotton, lettuce, and orange trees lining the Central Valley all suggested a landscape highly ordered and eminently under human control. Mass outbreaks of illness among workers revealed that the modern farm was actually a chaotic, unpredictable ecology.

Like environments, bodies, too, were unruly entities that repeatedly escaped surveillance mechanisms. In contrast to the assumption of bounded and stable spaces that underlay the models of occupational health, the space that most California farmworkers occupied was, in reality, always discontinuous. Farmworkers are overwhelmingly migrants, constituted by the flows of a global labor market that recruited the most exploitable workers to pick the state's most profitable agricultural products. Unlike most modernized agriculture, which is characterized by high levels of machine mediation (think of cotton or wheat harvesting, in which a single worker steers a large machine among the rows), fruit and vegetable harvesting has never been fully amenable to mechanization. Even today it remains a labor-intensive enterprise. While the number of farmworkers declined nationally in the postwar period, it increased in California. Although some workers were permanent residents of the state, most moved in search of seasonal work at some point during the year. Others, such as the braceros—temporary workers brought into the United States from Mexico under a bilateral agreement during and after World War II—had no permanent homes in the state. Regardless of where they came from, most harvesters did not work directly for a grower; they worked for a labor boss who contracted to multiple growers. The workforce on a California farm was always changing, and workers labored in multiple environments. Migrants passed from field to field, county to county, state to state, often not knowing where they would be the following day, unable to recall all the places they had already been.[14] Occupational health professionals found they could not even begin to calculate worker exposures nor track and test worker bodies. Movement itself obscured the relationship between bodies and environments, between sick workers and modern orchards. Throughout the 1950s and 1960s, public health officials in California would complain that mobile bodies could not be adequately monitored or studied.[15]

[13] For a summary of this research, see Popendorf and Leffingwell, "Regulating OP Pesticide Residues" (cit. n. 11).

[14] According to Miriam J. Wells, in the 1990s, an estimated 78 percent of all farmwork in California was performed by hired workers. See Wells, *Strawberry Fields* (cit. n. 6), 24. For history and working conditions in California agriculture, see Stoll, *Fruits of Natural Advantage* (cit. n. 6), 124–54; Carey McWilliams, *Factories in the Field: The Story of Migratory Farm Labor in California* (Boston, 1939); Cletus Daniel, *Bitter Harvest: A History of California Farmworkers, 1870–1941* (Berkeley, Calif., 1981); Ernesto Galarza, *Farm Workers and Agri-business in California, 1947–1960* (Notre Dame, Ind., 1977); and Henry P. Anderson, *The Bracero Program in California, with Particular Reference to Health Status, Attitudes, and Practices* (Berkeley, Calif., 1961).

[15] Dr. Irma West lamented the "wasted opportunity for research." See West, "Pesticides and Other Agricultural Chemicals as a Public Health Problem with Special Reference to Occupational Disease in California," 18 July 1963, California State Library, Sacramento, Calif., 10–1.

Those bodies that could be located proved resistant to attempts to describe the effects of exposure. Though industrial toxicologists recognized in theory that the response of individual bodies to particular compounds might vary considerably, in practice they assumed the inherent similarity of all bodies, that a given exposure would generate a predictable effect.[16] In reality, workers' responses to pesticide exposure differed immensely, and attempts to quantify the effects of particular exposures seemed to yield only more variables requiring quantification. The absorption of pesticides varied in the field with work rate, work style, personal habits, and the type of clothing harvesters wore. Most disturbing was the recognition that the organophosphates had cumulative effects, which rendered exposed workers more susceptible to future exposures.[17] Moreover, researchers discovered that certain pesticide combinations had dangerous synergistic effects. Malathion, for instance, one of the OP pesticides least toxic to human beings in isolation, can become highly toxic in the presence of certain other chemicals. Yet the proliferation of new agricultural chemicals and the constant mobility of the most exposed individuals made it impossible for state professionals to record what they termed a worker's "exposure history."

An interesting phrase, "exposure history" asserts, against the normalizing tendencies of modern toxicology, the relevance of the history of an individual body. Toxicity, in other words, was not simply the result of the interaction between a given chemical and those qualities of human bodies presumed to be essential or obvious (gender or weight, for example), but of the contingent histories of the bodies in question. Had they been exposed to parathion before? How much and for how long? Where else had they worked, and under what conditions? What other chemicals had they been exposed to? Was their blood cholinesterase already depressed? By how much? The quality of "toxicity" was, in fact, a highly complex relationship among a particular chemical, the surrounding environment, and a particular body with its own history of exposures and injuries. Given the variability of toxicity among individuals, occupational health experts insisted that the preferred method for determining the existence of OP poisoning was a blood test for cholinesterase levels, a screening test suggested in 1950.[18] Yet as investigators seized upon cholinesterase as a kind of litmus test for exposure in the early 1960s, they came to realize that even "normal" cholinesterase levels varied widely among individuals. Moreover, levels of cholinesterase in the blood were only an approximation—not always a good one—for levels in the brain, which most researchers felt was the real variable of interest. While everyone agreed that OP exposure depressed cholinesterase, there was considerable disagreement over how much depression was significant. In a few cases, doctors even found that blood levels of cholinesterase could be normal, despite the presence of severe symptoms.[19]

[16] Paull, "Threshold Limit Values" (cit. n. 11); Robert Proctor, *Cancer Wars: How Politics Shapes What We Know and Don't Know about Cancer* (New York, 1995), 153–73.

[17] William J. Popendorf, "Exploring Citrus Harvesters' Exposure to Pesticide Contaminated Foliar Dust," *American Industrial Hygiene Association Journal* 41 (1980): 652–9; Robert C. Spear, David L. Jenkins, and Thomas H. Milby, "Pesticide Residues and Field Workers," *Environmental Science and Technology* 9 (1975): 308–13. For comment on cumulative effects of parathion exposure, see CDPH, *Occupational Disease in California Attributed to Pesticides and Agricultural Chemicals, 1959* (Berkeley, Calif., 1961), 7.

[18] D. Grob, W. L. Garlick, and A. M. Harvey, "The Toxic Effects in Man of the Anticholinesterase Insecticide Parathion (p-Nitrophenyl Diethyl Thionophosphate)," *Johns Hopkins Hospital Bulletin* 87 (1950): 106–29.

[19] "Discussion" in *Pesticide Residue Hazards* (cit. n. 12), 73–6.

The human body, like the natural environment, was unpredictable and resistant to quantification. It exhibited an agency of its own that escaped both conscious control and scientific description. As biomedical and environmental knowledge increased, so did uncertainty.

The ability, or perhaps inability, of occupational health to produce dependable knowledge about pesticide poisoning was conditioned by political and intellectual factors. In the 1950s, occupational health officials were unwilling to confront the power of California's agricultural interests directly, in part because they saw themselves as disinterested experts, with no particular politics. Yet despite the studied neutrality of CDPH reports, many field investigators slowly came to recognize that the hazards of pesticides could not be separated from the political economy of farm labor. In a 1963 report on the occupational hazards of agricultural chemicals, the agency asserted that farmworkers' limited legal protections and lack of unionization significantly increased the biological hazards of pesticides. In other words, officials within CDPH gradually acknowledged that, at some level, pesticides were a political, as well as a medical, issue.[20]

It was not only the hesitancy of the California health establishment to engage political questions that limited its ability to make pesticide poisoning visible, however, but also its reliance on modernist models of the body. Though the discipline of occupational health necessarily recognized a connection between bodies and environments, the two remained distinct entities. In the prototypical exposure model that gradually emerged, investigators focused on four critical variables: the amount of pesticide applied, the amount remaining in the orchard when workers began harvesting, the amount that entered the worker's body, and the response of the body to different amounts of exposure (see Figure 1). In such a model, the connection between body and environment is clearly indicated by the line that connects "environmental residue" to "worker dose." Nonetheless, bodies and environments are confined to their own distinct boxes, which are punctuated only by a slender arrow. This iconography is revealing. When investigators spoke of "exposure pathways," they implied that such pathways were narrow routes of entry that could be regulated or even blocked.[21] The occupational health emphasis on discrete boundaries marks the modernist desire to see bodies as both cosmopolitan and separate, or at least separable, from their environment. Such models suggested that the impact of chemicals upon health was ultimately controllable. The goal of occupational health, after all, was to engineer compatibility between fragile human bodies and the industrial work environment.

Critical to understanding the prevalence of pesticide poisoning in California, however, were the ways in which workers' bodies became completely intermixed with their work environment. Observations made in the field revealed the limits of the language of "environmental residue" and "exposure pathway." As one occupational health expert described it:

[20] Milby interview (cit. n. 8); CDPH, *Occupational Disease in California Attributed to Pesticides and Agricultural Chemicals, 1963* (Berkeley, Calif., [1964?]).

[21] For discussions of modern conceptions of the body, see Emily Martin, "The Body at Work: Boundaries and Collectivities in the Late Twentieth Century," in *The Social and Political Body,* ed. Theodore R. Schatzki and Wolfgang Natter (London, 1996); idem, *Flexible Bodies: The Role of Immunity in American Culture from the Days of Polio to the Age of AIDS* (Boston, 1994); and Donna Haraway, "The Politics of Postmodern Bodies: Constitutions of Self in Immune System Discourse," in *Simians, Cyborgs, and Women* (New York, 1991).

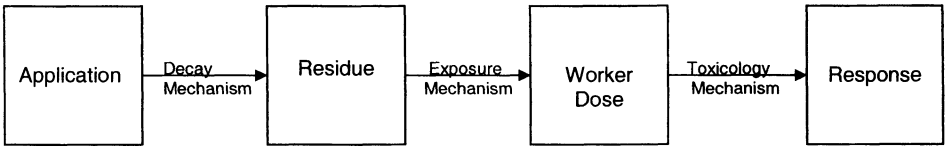

Figure 1. *Conceptual model used to understand pesticide poisioning within the discipline of occupational health. (From William J. Popendorf, "Exploring Citrus Harvesters' Exposure to Pesticide Contaminated Foliar Dust,"* American Industrial Hygiene Association Journal *41 [1980]: 652–9. Reprinted with permission of* American Industrial Hygiene Association Journal.*)*

> [Fruits] do not grow at the tips of branches. In order to cut a cluster of grapes, or pick an orange or a peach, it is . . . necessary to penetrate a leaf curtain. In the course of only an hour or two, the worker is drenched with whatever liquids may be clinging to these leaves: he has inhaled quantities of whatever dusts the picking process has rendered airborne; he has gotten these substances up his shirt sleeves, down the front of his shirt, down the back of his neck; he has gotten them in his eyes and ears; he has gotten them in his mouth and throat.[22]

This lack of mechanical mediation and the resulting bodily engagement—the mixing of bodies, leaves, sweat, and dust—has rendered fruit picking unlike the modern assembly line and particularly dangerous in the presence of organophosphates such as parathion. Absorbed rapidly through the skin, organophosphates are typically even more damaging when a person sweats or wears contaminated clothing. The hot environment of the Central Valley and the intricacy of orchard work made it impracticable for workers to wear gloves, masks, or other protective equipment. Moreover, workers might wear the same contaminated clothing for days, eat contaminated fruit, and wash with contaminated water. On several occasions, crews of workers reported being sprayed directly with chemicals as they worked. At other times, entire crews were forced to spend the night in recently sprayed orchards. Here, given the social realities of farm labor, the notion of the body as a discrete entity penetrated only by narrow "pathways" begins to break down.[23]

At a certain level, workers themselves seem to have constructed a more all-encompassing relationship between health and the environment. By the mid-1950s, some workers had connected their illnesses to the pesticide-laden landscape of rural California. When asked by a public health researcher in 1958 about their recent health problems, several braceros volunteered their concerns over pesticides: "While I was working for _____ Farms, I got sick. My mouth puffed up and swelled. I think it was because of the poison they put on the plants. It hurt a lot." Another laborer told the same interviewer: "I got sick here. My eyes hurt very much. I don't know what caused it, but it may have been something they sprayed on the trees."[24]

[22] Statement of Thomas H. Milby in U.S. House Committee on Education and Labor, *Occupational Safety and Health Act of 1969: Hearings on H. R. 843, H. R.. 3809, H. R. 4294, H. R. 13373,* 91st Cong., 1st sess., 1969, 1389–90.

[23] On the ability to manage and quantify respiratory exposures, for example, see Popendorf and Leffingwell, "Regulating OP Pesticide Residues" (cit. n. 11), 152; Keith T. Maddy, "Current Considerations on the Relative Importance of Conducting Additional Studies on Hazards of Field Worker Exposure to Pesticide Residues," in *Pesticide Residue Hazards* (cit. n. 12), 134–5. On working conditions, including direct spraying of workers, see CDPH, *Community Studies on Pesticides,* 15 Dec. 1970, especially 20–2.

[24] Anderson, *Bracero Program* (cit. n. 14), 286, 288.

What emerges from these scattered, translated, and necessarily partial statements is not only the braceros' recognition of the danger of "chemicals" and "spray" but also a more general sense that California, or at least the state's agricultural landscape, was itself disease-ridden. Farmworkers constructed a popular epistemology of environmental health in which changes to the agricultural environment, in this case the introduction of new pesticides, were registered in their own bodies. As one bracero stated, "I have talked to many braceros from my village who have worked in the Untied States. Many of them are in worse health when they return to Chorinzio than they were when they left. The reason for this, I believe, is that they have to breathe in too many chemicals that have been sprayed on the plants where they work."[25] These workers located disease not within their own bodies as germs or viruses but in a landscape they found foreign and physically threatening and one over which they had little or no control. In their epistemology, the environment, rather than the body, was the site of pathology.[26] Having little or no technical knowledge of the chemicals themselves, workers gradually came to associate particular illnesses with particular locales or particular crops, an assessment biomedicine would later confirm. As one farmworker reported, "My daughter gets swollen hands and feet, and welts, when picking tomatoes. Also peaches. . . . My husband gets very sick at the stomach when picking the lemons and valencia oranges. I get eye irritation with all the jobs around here: plums, grapes, peaches, tomatoes."[27] In these accounts, sick bodies were products of a larger environment and could not be neatly separated from it.

CREATING VISIBILITY: POLITICS AND EPISTEMOLOGY

From a political perspective, it is depressing, though perhaps not surprising, that the health problems of a severely marginalized group of workers drew so little notice in the 1950s and 1960s. Yet in the same period, the risks of pesticides to consumers received considerable political attention. In 1950, Representative James Delaney of New York initiated a series of hearings around the country that focused primarily on the risks of eating foods containing small quantities of DDT and other organochlorine chemicals. In 1954, Representative Arthur Miller of Nebraska successfully sponsored a bill that required the U.S. Food and Drug Administration to ensure that any pesticides remaining on food products posed no health risks to the consumer. In 1958, Congress passed the Delaney amendment to the Food, Drug, and Cosmetic Act, which established a "zero tolerance" for carcinogens in the food supply. Two years later, the publication of *Silent Spring* generated massive popular and political attention to the risks of pesticides, but again the public debate focused almost exclusively on the organochlorine compounds and the risks to consumers.[28] In the wake of *Silent Spring,*

[25] Ibid., 215.

[26] For a similar observation in a different context, see Michelle Murphy, "The 'Elsewhere within Here' and Environmental Illness; or, How to Build Yourself a Body in a Safe Space," *Configurations* 8 (2000): 87–120.

[27] CDPH, *Community Studies on Pesticides,* 15 Dec. 1970, 14.

[28] James Whorton, *Before Silent Spring: Pesticides and Public Health in Pre-DDT America* (Princeton, N.J., 1974); John Wargo, *Our Children's Toxic Legacy: How Science and Law Fail to Protect Us from Pesticides* (New Haven, Conn., 1998), 70–8; and Bosso, *Pesticides and Politics* (cit. n. 2), 61–78. My comments on public attention are also derived in part from reviewing entries in *The Readers Guide to Periodical Literature* for the years 1950–1968 and from the *San Francisco Chronicle Index, 1950–1980.*

environmental groups would begin lobbying for a complete ban on DDT within the United States; many of these groups tacitly accepted, and even supported, the increased use of organophosphates as a replacement for the more environmentally persistent organochlorine compounds. In contrast to the continuing attention devoted to issues of consumer health throughout the 1950s and early 1960s, federal hearings on the risks of pesticides to workers would not be held until 1969. Moreover, ongoing toxicological research was devoted almost entirely to residues on the edible portions of plants, whereas the greatest danger to workers came from the contact of their skin with contaminated leaves. No worker safety regulations would be adopted until 1971, when California established reentry intervals (mandatory waiting periods between the application of pesticides and the time at which workers would be permitted into the field to harvest), but only for the most lethal pesticide-and-crop combinations. Federal regulations, which were markedly weaker than those passed in California, would not be adopted until the mid-1970s.[29]

Yet serious poisonings among agricultural workers continued throughout the 1960s. While the most dramatic incident was that of the peach pickers in 1963, similar incidents followed, and they received little or no press. In 1966, thirty-seven workers became seriously ill in five different instances. In 1967, peach pickers in the northern San Joaquin Valley were again poisoned; this time after exposure to azinphosmethyl ethion. In 1968, nineteen orange harvesters were seriously poisoned by parathion near Lindsay. Still officials directed relatively little attention at the problem. In part this was because few workers actually died from systemic poisoning. It was also possible because pesticide illness among farmworkers was dramatically underreported. As one researcher put it, it was difficult to argue the seriousness of the problem "because you can't show bodies. . . . We just don't have the bodies, dead or otherwise."[30] Yet consumers of pesticide-treated food were not becoming obviously ill or falling dead in greater numbers. To the contrary: farmworkers suffered far greater pesticide exposures and many more illnesses than did consumers. Dr. Howard Mitchell, chief of the occupational health group at CDPH, was among those who recognized the implicit double-standard for consumer and worker health. Testifying before the state legislature in 1964, Mitchell observed that "instead of being so preoccupied with finding out whether people are being made ill from food residues from what we consider homeopathic doses, it might be interesting to note what are some measurable effects among those people who are exposed to large quantities for many years."[31] Despite Mitchell's suggestion that more money should be directed toward occupational health research, the legislative and research focus remained on consumers.

Epistemologically, concerns over consumer health always focused on ingestion. Con-

[29] On DDT and environmental groups, Dunlap, *DDT* (cit. n. 2). For a summary of the adoption of worker reentry regulations, see Victoria Elenes, "Farmworker Pesticide Exposures: Interplay of Science and Politics in the History of Regulation (1947–1988)" (master's thesis, Univ. of Wisconsin, Madison, 1991); Orville E. Paynter, "Worker Reentry Safety, III: Viewpoint and Program of the Environmental Protection Agency," *Residue Reviews* 62 (1976): 13–20.

[30] Comment of Robert C. Spear in *Pesticide Residue Hazards* (cit. n. 12), 231; Ephraim Kahn, "Pesticide Related Illness in California Farm Workers," *Journal of Occupational Medicine* 18 (1976): 693–6.

[31] Statement of Doctor Howard Mitchell in California Assembly, Interim General Research Committee, Subcommittee on Pesticides, *Hearings on Pesticides: Report of the Governor's Pesticide Review Committee,* 6 Feb. 1964, 107. Mitchell was seeking increased funding for his own division. See also Mary K. Farinholt, *The New Masked Man in Agriculture: Pesticides and the Health of Agricultural Users* (Cleveland, Ohio, [1962?]).

taminants were presumed to enter the body through a well-defined and singular pathway, the mouth. Bacteriological models and modernist constructions of the body underlay these discussions. It was easier for physicians as well as laypeople to acknowledge the orifices of the body as routes of connection to the environment—rather than the skin, for instance—for over these we have more control. Foods can be chosen. A mouth can be shut. Pesticide risks to consumers were thus rendered analogous to being infected with typhoid after drinking water from a contaminated well. Offending pollutants could be identified and cleaned up, or so legislators thought. In contrast, workers' chemical exposures were obviously not confined to a single pathway. Their illnesses pointed not to a discrete source of contamination but to an environment rendered generally toxic.

Social class and location also powerfully determined the visibility, and acceptability, of pesticide effects. The San Joaquin Valley was not suburban Los Angeles or Washington, D.C. An ethnically Mexican farmworker was not a white middle-class consumer. While many officials within CDPH increasingly acknowledged that social and political conditions were critical factors in farmworker health, they nonetheless continued to invoke racialized notions of susceptibility to explain the relatively higher incidence of poisoning among ethnically Mexican workers. CDPH officials asserted that workers' inability to understand English, "substandard" education, unfamiliarity with the danger of the substances, poor hygiene, marginal health, lack of attention to early symptoms, and reluctance to seek medical attention all put them at greater risk.[32] These discussions of bodily susceptibility to pesticide poisoning invoked and intertwined with other discourses that had raged around the body of the Mexican immigrant for decades. Nonwhite bodies have historically been seen as a source of contagion and disease in the United States, and the importation of Mexican laborers under the bracero agreement during and after World War II rekindled longstanding fears about the threats to (white) public health posed by certain racial and ethnic groups. Though public health officials rejected any form of biological racism, they portrayed Mexican cultural differences as so important and so deeply rooted as to be a kind of racial proxy. Public health officials, as well as both political supporters and opponents of farmworkers, drew on a racialized discourse of hygiene that asserted that farmworkers' lack of education made them susceptible to all kinds of disease, whether infectious diarrhea or parathion poisoning. Either way, much of the problem of pesticide poisoning seemingly lay with the workers themselves, not the work environment. As the president of the California Medical Association told the state senate, "People just must be more careful about their personal hygiene if they are going to avoid any difficulty [with pesticides]." Adopting a similar analysis, if a more sympathetic tone, a state occupational health official insisted that this group required much greater supervision in the use of pesticides.[33]

[32] West, "Occupational Disease of Farm Workers" (cit. n. 10); CDPH, *Occupational Disease in California* (cit. n. 20), 13–4.

[33] On immigrants as disease carriers, see Anderson, *Bracero Program* (cit. n. 14), 223–4; Nayan Shah, *Contagious Divides: Epidemics and Race in San Francisco's Chinatown* (Berkeley, Calif., 2001); and Alan M. Kraut, *Silent Travelers: Germs, Genes, and the "Immigrant Menace"* (New York, 1994). On racial stereotypes associated with Mexicans and Mexican Americans, including the discourse of hygiene, see David Montejano, *Anglos and Mexicans in the Making of Texas* (Austin, 1987), 220–34; Alexandra Minna Stern, "Buildings, Boundaries, and Blood: Medicalization and Nation-Building on the U.S.-Mexico Border, 1910–1930," *Hispanic American Historical Review* 79 (1999): 41–82. Quote is from statement of Ralph Teall in California Senate, Fact-Finding Committee on Agriculture, *Hearings in Regard to the Application and Use of Pesticides,* 16 June 1964, 12. Comment on need for supervision is from West, "Occupational Disease of Farm Workers" (cit. n. 10), 98.

Because many of the symptoms of organic phosphate poisoning (headaches, nausea, vomiting, cramps) could be associated with viral or bacterial infection, sickness among workers could be read as a sign of their own weak and disease-prone bodies. Growers and labor contractors frequently insisted that the sources of illness lay within the impure or substandard bodies of workers. When large groups of pickers became ill simultaneously, their symptoms were often interpreted as evidence of more typical illnesses, such as food poisoning or common diarrhea. Alternatively, when only a few pickers were affected, heat stroke was the typical explanation. A doctor from Tulare County told the U.S. Congress that "[the workers] joke about the field boss calling them all sickly, saying, 'You people are always passing the Hong Kong flu to one another on the way to work.'"[34] This construction of illness rendered the cause as a virus and also a completely foreign agent—an alien disease residing in the bodies of alien workers—with no connection to either pesticides or the local environment. For those who opposed regulation, the assumption of a body that had no relation to its environment served obvious economic interests. Modernist frameworks of disease were supported by biomedicine and effectively mobilized by growers and their supporters. This discourse of infection and diseased bodies exonerated the pesticide-ridden landscape of central California and helped render chemical exposures invisible to a broader public. Even those who advocated on behalf of farmworkers believed their poor health to be rooted in their poverty and exclusion from American society, not in the physical environment in which they worked.[35]

The problem of farmworker exposures finally emerged into public consciousness and political debates in the late 1960s, garnering public research funds and prompting limited state and federal regulation. While California occupational health specialists would be there to cite the data they had gathered over two decades, the reasons for this new visibility for the most part lay outside their own profession, in the labor and antiwar politics of the 1960s. Most critically, the United Farmworkers (UFW), which began organizing workers in the San Joaquin Valley in 1964, made visible the appalling conditions that characterized so much of California agriculture. The increased scrutiny of working conditions also brought attention to the hazards associated with agricultural pesticides, and in 1968, the union made health and safety issues a key element in its contract demands. Then in 1969, the UFW brought several farmworkers to testify before the U.S. Senate about their experiences in the field—the prevalence of spraying, the chronic headaches and nausea experienced by workers, stories of continuing seizures, nosebleeds, and persistent skin conditions. Yet recognizing that the experience of Mexican workers did not necessarily constitute "evidence" in the eyes of a white public, union leaders also mobilized the data of biomedicine, pointing out that blood tests done on children in Tulare County indicated that nearly half of those tested had abnormally low cholinesterase levels as

[34] Lee Mizrahi in House Committee, *Occupational Safety and Health Act* (cit. n. 22), 1449–50, 1453. For industry attitude, see John M. McCarthy, "Comments on Reentry Research," in *Pesticide Residue Hazards* (cit. n. 12), 223–6. On calls for research, see ibid., appendix A, 244–53. On evolution of federal policy, see Elenes, "Farmworker Pesticide Exposures" (cit. n. 29). For various diagnoses, see Griffith E. Quinby and Allen B. Lemmon, "Parathion Residues as a Cause of Poisoning in Crop Workers," *J. Amer. Med. Ass.* 166 (1958): 740–6. Statement of Milby in House Committee, *Occupational Safety and Health Act* (cit. n. 22), 1387; CDPH, *Community Studies on Pesticides,* 15 Dec. 1970, 15.

[35] See, e.g., Anderson, *Bracero Program* (cit. n. 14).

well as abnormally high levels of organochlorine pesticides, such as DDE and DDT.[36] Although the introduction of cholinesterase tests grew out of a modern notion of the body as a discrete and bounded entity, for farmworkers and their advocates, cholinesterase tests corroborated ecological understandings, old and new, that emphasized the inherent porosity of the human frame and insisted that bodies reflected the quality of their surrounding environment. Knowledge, once produced, can be put to work in many different ways. For a middle-class public growing increasingly sensitive to environmental concerns and familiar with a popular discourse of ecology, the scientific evidence of cholinesterase measurements corroborated the experience of workers and helped materialize a link between the local environment and farmworker health.

At the same time, growing concerns over chemical and biological warfare helped "denormalize" the use of OP pesticides in domestic agriculture.[37] In May 1968, 6,400 sheep suddenly died in the Skull Valley of Utah. Newspapers soon reported that the cause was an accidental release of the nerve gas VX from the U.S. Army's chemical and biological weapons installation located in nearby Dugway. Learning that VX was an OP compound significantly changed the public perception of agricultural pesticides. Farmworker advocates began referring to agricultural spraying as "chemical warfare" and to parathion as a "nerve gas." In hearings before the U.S. Senate, several witnesses pushed the connection between the notorious compounds GB and VX and the OP pesticides in wide use domestically, pointing out that parathion and GB had comparable toxicities. Protests over the use of chemical defoliants in Vietnam also resonated with concerns over the domestic use of agricultural chemicals. An increasingly militant agricultural workforce and consumer advocates argued that pesticide poisoning was indicative of an uncontrolled and dangerous modern technology that threatened all human bodies.[38] War itself helped change the meaning of certain synthetic chemicals and make visible their effects on the otherwise marginalized bodies of farmworkers.

By the end of the sixties, the UFW had been able to capitalize on this sense of vulnerability, linking producer and consumer concerns in its promulgation of an ongoing boycott against California's grape growers.[39] Arguing that consumers themselves would not be safe until the use of pesticides was controlled, that the same chemicals posed risks to both those who labored in the fields and those who ate California's produce, the UFW promoted their boycott as an issue of global environmental health as well as one of social justice—though this claim skirted the fact that the substances of

[36] On the UFW, see Jerald Brown, "The United Farmworkers Grape Strike and Boycott, 1965–1970: An Evaluation of the Culture of Poverty Theory" (Ph.D. diss., Cornell University, 1972); Galarza, *Farm Workers and Agri-business* (cit. n. 14); and Sam Kushner, *Long Road to Delano* (New York, 1975). On DDT and DDE testing, see House Committee, *Occupational Safety and Health Act* (cit. n. 22), 1448.

[37] On denormalization of dangerous working conditions, see Arthur McEvoy, "Working Environments: An Ecological Approach to Occupational Health and Safety," *Technology and Culture* 36, suppl. (1995): 145–73.

[38] Seymour M. Hersh, "The Secret Arsenal: Chemical and Biological Weapons," *New York Times Magazine,* 25 Aug. 1968; "Pesticide Jungle: The Growing Menace," *El Malcriado* (Delano, Calif.), 1 Jan. 1969, 5; and "Grower Blasts Pesticides 'Fraud,'" *El Malcriado,* 15 Feb. 1969, 15; Ronald B. Taylor, "Nerve Gas in the Orchards," *Nation,* 22 June 1970, 751–3.

[39] Samuel P. Hays, *Beauty, Health, and Permanence: Environmental Politics in the United States, 1955–1985* (New York, 1987); Robert Gottlieb, *Forcing the Spring: The Transformation of the American Environmental Movement* (Washington, D.C., 1993).

most concern to consumers were *not* those of greatest concern to farmworkers. Nevertheless, the UFW invoked environmental concerns, along with the evidence of both farmworkers and biomedicine, to articulate an ecological vision of the human body and human society, in which all persons, whether workers or consumers, were at risk. Many people found this vision compelling, and what emerged, if only incompletely, was a shared sense of physical vulnerability.[40] Popular notions of ecology and environmental health constructed the bodies of middle-class consumers and farm laborers as enmeshed in the modernized environment, as open, porous, and increasingly at risk. For a time, these concerns over environmental health crossed urban and rural boundaries as well as lines of class and race—albeit somewhat unevenly—generating what sociologist Ulrich Beck has referred to as a "generalized consciousness of affliction" and a call for alternatives to chemically intensive agriculture.[41]

CONCLUSION

In retrospect, the history of the recognition of organophosphate poisoning is less a story of conflicts about knowledge and control between experts and working people than a story of how attention to laboring bodies generated new knowledge about the larger environment and how specific constructions of bodies and environments underlay the production of certain facts. In postwar California, it was the immediate and undeniable reactions of bodies that produced new kinds of knowledge about the landscape and the changes it was undergoing. Yet the potential connection between illness and the environment remained invisible to most. The exception, of course, lay within the discipline of occupational health. However, while occupational health specialists recognized a link between the bodies of farmworkers and the environment of the Central Valley, they articulated that link very narrowly. They believed that their own discipline and skill could manage the interaction between the two, that they could "supervise" and ultimately control the material traffic between bodies and their environments. Though the political influence of California agricultural interests already limited the potential for radical change, never once did those in occupational health suggest that these pesticides should not be used or that the relationship between bodies and environments was so all encompassing that it might never succumb to quantification. Instead, as certainty continued to elude researchers and poisonings persisted, they called for more research, as if one more field study would finally allow them to describe and control how chemicals moved from a complex environment into an individual body. They believed that the techniques of public health, if politically supported, could manage the effects of the new agricultural chemicals on laboring bodies. The old dream of controlling nature emerges in many sites, in public health as well as in modern agriculture.

[40] "Chavez Blasts FDA for Condoning Poisoned Food," *El Malcriado,* 15–30 Oct. 1969, 3; "The Threat of Chemical Poisons," *El Malcriado,* 1 Jan. 1969, 5. See also Senate Subcommittee on Migratory Labor, *Hearings on Migrant and Seasonal Farmworker Powerlessness,* part 6B, 91st Cong., 1st sess., 3275–91. In 1969, the Consumers Federation of America endorsed the UFW boycott, largely on the basis of the pesticide issue. See "Consumer Group Backs Boycott," *El Malcriado,* 15 Aug.–15 Sept. 1969, 15. For other work on the UFW and pesticides, see Robert Gordon, "Poisons in the Fields: The United Farm Workers, Pesticides, and Environmental Politics," *Pacific Historical Review* 68 (1999): 51–77; Laura Pulido, *Environmentalism and Economic Justice: Two Chicano Struggles in the Southwest* (Tucson, Ariz., 1996); and Marion Moses, "Farmworkers and Pesticides," in *Confronting Environmental Racism: Voices from the Grassroots,* ed. Robert D. Bullard (Boston, 1993), 161–78.

[41] Ulrich Beck, *Risk Society: Toward a New Modernity,* trans. Mark Ritter (London, 1992), 74.

Underlying these assumptions about the manageability of pesticides was the belief that modern bodies and modern environments were separate entities and that both could be bounded, monitored, and regulated. Occupational health itself formed part of the modernist project, and blood cholinesterase tests were yet one more technique enabling the surveillance and management of fragile bodies in dangerous environments. Bodies, however, could not be monitored when embedded within a transnational capitalist system that created and demanded mobile labor. Nor could the local environment of the field be contained and managed in the way traditional industrial hygienists and the new environmental regulators ultimately hoped. Bodies as well as environments flowed outside the boxes occupational health experts constructed for them. Plants, soils, chemicals, and cholinesterase interacted with one another in unpredictable ways. In the modern orchard, this entanglement was manifest in the many acute and chronic illnesses suffered by farmworkers, what many would come to call *andando muerte,* "walking death."[42] These walking dead were themselves evidence that the boundaries between bodies and environments were never fast and that the "control of nature" might be more accurately described as its rearrangement.

[42] Statement of Cesar Chavez in Senate Subcommittee, *Farmworker Powerlessness,* 3390 (cit. n. 40).