UC Berkeley

UC Berkeley Previously Published Works

Title

The politics of reproductive hazards in the workplace: class, gender, and the history of occupational lead exposure.

Permalink

https://escholarship.org/uc/item/40r726qg

Journal

International journal of health services : planning, administration, evaluation, 27(3)

ISSN

0020-7314

Author

Morello-Frosch, RA

Publication Date

1997

DOI

10.2190/cxkq-1rtb-qp9h-qrpt

Peer reviewed

eScholarship.org Powered by the California Digital Library
University of California

THE POLITICS OF REPRODUCTIVE HAZARDS IN THE WORKPLACE: CLASS, GENDER, AND THE HISTORY OF OCCUPATIONAL LEAD EXPOSURE

Rachel A. Morello-Frosch

Over the past two decades, several U.S. companies have sought to bar women from jobs that expose them to potential reproductive hazards, justifying these exclusionary policies by their professed concerns for the well-being of unborn children and potential liability. Although recent court cases have stimulated academic interest in this issue, a historical review of the public health and medical literature reveals that this debate is not new. To understand the logic behind the emergence of "fetal protection" policies, one must examine the scientific history of occupational teratogens and the socio-political and economic forces that have driven scientific research in this field. Using lead as an example, the author argues that research on the reproductive hazards of employment has historically emphasized the risks to women and downplayed the risks to men. This results in environmental health policies that do not uphold the ultimate goal of occupational safety for all workers, but rather reinforce the systemic segregation of men and women in the workplace. Although the political struggle over exclusionary policies has a feminist orientation, it also has important class dimensions and ultimately must be viewed within the broader context of American capitalist production.

. . . no form of scientific research is free from the influence of social values. Our values determine what problems we choose to address; they shape our decisions about the relevancy of specific empirical observations; they even structure our perception of empirical reality.

Lyng (1, p. 42)

The detached eye of objective science is ideological fiction, and a powerful one.

Haraway (2, p. 13)

International Journal of Health Services, Volume 27, Number 3, Pages 501–521, 1997

© 1997, Baywood Publishing Co., Inc.

doi: 10.2190/CXKQ-1RTB-QP9H-QRPT
http://baywood.com

In 1978, women working for American Cyanamid in the paint pigments division at Willow Island, West Virginia, were forced to make a horrible choice: undergo surgical sterilization or accept a mandatory transfer from a job that paid $225 per week including substantial benefits to a janitorial position that paid $175 per week with no benefits. For five of the women, the choice was obvious: in order to keep their jobs, they underwent sterilization (3, 4). In 1989, a federal appeals court in Illinois ruled that Johnson Controls, Inc., could bar women from working in lead-exposed jobs and areas in its battery division unless the women could prove that they were sterile (5). The company had virtually stopped hiring women into production positions (6). In 1991, the U.S. Supreme Court unanimously reversed the lower court ruling in *UAW vs. Johnson Controls Inc.* and declared that gender-specific exclusionary policies constitute discrimination under Title VII of the 1964 Civil Rights Act as amended by the Pregnancy Discrimination Act of 1978 (7). This landmark decision culminated decades of legal conflict over exclusionary hiring policies. However, it has not resolved the overarching dilemma of employer responsibility for ensuring occupational health and safety in situations where there are perceived or real biological differences in workers' susceptibility to reproductive hazards.

The National Institute for Occupational Safety and Health estimates that up to 20 million workers are currently exposed to substances and job conditions that pose reproductive risks (8). Over the past two decades, several U.S. companies have discouraged or sought to bar fertile women from taking jobs that expose them to potential reproductive hazards. Thus, it is not surprising that an estimated 100,000 jobs have been closed to women because of so-called company "fetal protection policies" that ostensibly attempt to prevent the possibility of birth defects from fetuses' exposure to toxic chemicals (9). Most of these companies have publicly justified their exclusionary policies by professing moral or ethical concerns over the need to protect the "unborn child, the most helpless member of society" (9). Employers have argued that providing equal access for women to all jobs is unrealistic. Hazard abatement to ensure "safe" or "zero-risk" exposure levels for women of childbearing age is too costly; exclusionary hiring practices protect the fetus from the risk of toxic exposure and shield companies from expensive tort litigation (10, p. 187). Some employers maintain that because damage to offspring caused by male exposure is more difficult to prove than damage caused by in utero exposure, excluding women makes companies less vulnerable to "fetal damage" lawsuits.

These policies have drawn boundaries between male and female workers by perpetuating the stereotype that women workers are inherently more susceptible to occupational hazards, regardless of the weight of the scientific evidence on particular toxic substances (10, p. 187). To understand the logic behind the emergence of "fetal protection" policies, one must examine the scientific history of occupational teratogens and the sociopolitical and economic forces that have shaped the assumptions behind scientific research in this field. The study of

occupational lead exposure and its health effects will be used as a case example for developing the arguments in this article. I would contend that scientific research on the reproductive hazards of employment has historically emphasized the dangers to women and downplayed the dangers to men. This trend is based less on scientific evidence and more on the social construction of women's biology as weaker and more vulnerable to environmental hazards and work in general. Moreover, such policies effectively render a father's crucial role in infant health and well-being virtually invisible. This situation leads to environmental policies that do not uphold the ultimate goal of occupational health and safety for all workers and their families, but rather reinforce the systemic segregation of men and women in the workplace. Although recent court cases have stimulated academic interest in this issue, a historical review of the public health and medical literature reveals that this debate is not new.

Most important, the struggle over exclusionary policies reveals only one dimension of the politics of occupational risk assessment and must be viewed within the broader context of capitalist production conditions. Although gender discrimination in the workplace is not unique to capitalist modes of production, understanding the specific form it takes within the context of this particular socioeconomic and political system is important. Indeed, the polemical issue of fetal protection has taken on a feminist identity, yet the class dimensions inherent in this particular struggle over working conditions cannot be overlooked. The implementation of fetal protection policies represents one of many ways in which capitalist enterprises attempt to minimize the costs of production (in this case the cost of guaranteeing safe occupational standards for all workers) in order to maximize profits. By excluding women from hazardous work environments, corporations can avoid improving working conditions, which would raise their direct costs. Concerns about potential liability costs (particularly for larger companies) often outweigh the cost of restricting employment to male workers, who tend to command higher wages than their female counterparts. In the case of Johnson Controls, keeping women off production lines did not place the company at any serious competitive disadvantage since other corporations such as Du Pont, Dow, Goodrich, and General Motors had similar policies (11). However, the strategy of excluding women to offset production costs is not profitable across all industrial sectors, thus making corporate concern for the health of their workers' offspring very selective. Smaller, highly competitive businesses such as dry cleaning, day care, and other service industries that depend heavily on low-wage, female labor have not been as scrupulous about fetal hazards as those male-dominated industries whose jobs may be hazardous but are better compensated and generally unionized.

After briefly outlining the epidemiology of lead exposure, I will discuss the history of scientific knowledge on occupational lead toxicity and evaluate the feminist and scientific discourse on workplace lead exposure and its impact on occupational health policy. I conclude by discussing the political implications of

the feminist struggle against fetal protection policies and its relevance to a larger socioeconomic framework.

EPIDEMIOLOGY OF LEAD EXPOSURE AND TOXICITY

Lead is unique among metals in that it is soft and malleable and produces a surface film (of lead carbonate) that makes it extremely resistant to corrosion. In the 1980s, the United States accounted for over 20 percent of the world's lead consumption, refining approximately 1.1 million metric tons (12, p. 26). This consumption has decreased somewhat with the phasing out of leaded gasoline. Industrial use of lead includes a myriad of production processes, with an estimated 800,000 women and men working in over 120 occupations that entail regular exposure to the substance (4). The automobile industry accounts for a significant portion of lead use, mostly in the production of lead storage batteries and solders used in car manufacturing. Large amounts of lead are also used in the construction industry for metal sheets and pipes, in the production of paints, plastic products, ceramics, and make-up, and in the printing industry.

Measures of population exposures and permissible exposure limits must be viewed within the context that lead has no known biological function in the body, and virtually all types of human exposure are due to the production activities of industrialized societies. Anthropological evidence has documented that one of the largest increases in average human body lead burden occurred as a result of metal smelting during the bronze age. Estimates suggest that "natural" body-burden lead levels could be as low as 0.2 micrograms per deciliter of blood (μg/dl), a measure based on lead concentration analyses on the skeletons of members of premetallurgic societies. In comparison, blood lead levels today in individuals experiencing low-level exposures are approximately ten times this "natural" measurement (13). Current ambient levels in rural areas are usually below 0.2 micrograms per cubic meter ($\mu g/m^3$), but blood levels of up to 10 $\mu g/m^3$ have been measured in some urban centers (14, pp. 119–122).

Research on lead since the industrial revolution has raised crucial epidemiological and political questions about the appropriate definition of adverse health outcomes, proper assessments of exposure levels, who is exposed to how much lead, and the pathways of exposure. Although lead has diverse health effects, one of the primary concerns has been its capacity to cause neuropsychological impairments and neurotoxic effects in children. Lead-based paints have been a major source of exposure for children who ingest paint chips, and 30 million homes have been estimated to be contaminated with leaded paint (15, pp. x–xi). The Second National Health and Nutrition Examination Survey (NHANES II) carried out between 1976 and 1980 found systemic differences in blood lead levels between African Americans and white people across age groups, areas of residence, socioeconomic groups, and both sexes (13). The mean blood lead level among children aged 6 months to 5 years was 15 μg/dl, while for black children

living in urban areas the mean level approached 24 μg/dl. Today, blood lead levels in children have dropped considerably, to 6 μg/dl, largely due to public health efforts to eliminate significant ambient exposures, including phasing out of the use of leaded gasoline. However, levels among urban African American children often exceed 10 μg/dl—a level associated with adverse neurological sequelae (16, 17). Thus, although overall blood lead levels have decreased, the disparity between black and white children has remained consistent over time.

Writing about the history of childhood lead poisoning, Barbara Berney describes the socioeconomic and political issues that are tied to epidemiological research on this problem: "Lead poisoning had an environmental cause, exacerbated by social problems associated with poverty including slum housing, racial discrimination and malnutrition" (18). Although Berney refers specifically to the problems of childhood lead poisoning, her statement raises important factors to consider when deconstructing the scientific discourse on lead toxicity: institutional racism and class domination. Indeed, the issue of lead poisoning links the realms of environmental health and discrimination in very concrete ways. Lead paint tends to be concentrated in older, substandard housing. A legacy of housing discrimination, coupled with redlining within the banking industry, has segregated poor African Americans into substandard, lead-contaminated housing. This, combined with a lack of political will among environmental policy-makers to appropriate the resources necessary to effectively reduce exposures, has placed poor black children at increased risk of lead poisoning. Viewed within this context, lead poisoning epitomizes the biological manifestation of discriminatory political and socioeconomic relations within society (19). In the case of occupational lead toxicity, gender-based discrimination emerges as another significant factor characterizing the history of this polemical environmental issue. In this instance, women's unique capacity to get pregnant becomes what Krieger and Zierler (19) aptly describe as a "gendered expression of biology," in which a biological process is construed to define gender roles in the workplace.

HISTORY OF SCIENTIFIC KNOWLEDGE ON OCCUPATIONAL LEAD TOXICITY

The legacy of occupational lead toxicity has deep historical roots. Medical historians have disputed whether Hippocrates, in his work *Epidemics*, actually noticed an association between lead exposure and abdominal pain, constipation, and pallor in his description of a miner with a severe attack of colic (20, p. 3). Until the early 18th century, most literature focused on periodic colic "outbreaks" which were not consistently associated with lead exposure. Diagnostic terms such as "dry gripes" or "dry bellyache" were used to describe symptoms of severe abdominal pain accompanied by fever or diarrhea and convulsions, all problems that could have been attributed to several causes, including lead toxicity. Thus, lead poisoning, or plumbism, has been described as an "aping disease" because of

its myriad symptoms and the wide range of diseases it imitates, making proper diagnosis difficult. As noted in a 1954 review article on lead poisoning in early America (21):

> Lead poisoning is an aping disease. So protean are its manifestations that it, like syphilis, may simulate a hundred other conditions. . . . Many women have undergone miscarriages as a result of lead action but 300 years had to pass before lead would have been indicted.

Ramazzini, a pioneer in occupational medicine, described lead poisoning in pottery workers and portrait painters in his study conducted in the early 1700s (22). In 1767, Benjamin Franklin analyzed a list of patients in La Charité Hospital in Paris who were diagnosed with symptoms resembling lead poisoning. Franklin showed that every patient had been occupationally exposed to lead (23). Interestingly, the investigation of 1,217 lead workers at the same hospital by Tanquerel des Planches in 1838 is considered the first major modern work that drew public attention to the problems of occupational lead toxicity. Severe lead poisoning cases occurred in painters, potters, and copper and bronze smelters engaged in the manufacture and use of lead compounds. Some cases included women workers. Des Planches described the leaden blue line that appears on the gums of lead-poisoned patients, a symptom that became an important indicator in the determination of duration and intensity of exposure. Several European countries responded belatedly to des Planches's report and subsequent worker pressure by implementing reforms, including the categorization of lead poisoning as a notifiable disease and passage of the Factory Act of 1882, which required white lead factories to conform to certain production standards (14, p. 122).

Thomas Oliver, a British physician, is perhaps the most cited turn-of-the-century authority on occupational lead exposure. He wrote extensively about the dangers of lead poisoning, providing detailed accounts about the pathology of lead exposure and how production methods in mining, smelting, ceramics, white lead manufacturing, painting, and printing adversely affected workers and their families through a variety of contamination mechanisms. Although Oliver saw lead toxicity as an environmental problem, his recommendations for disease prevention reveal a more individualistic "lifestyle"-oriented perspective on occupational disease causality. The physician recommended that workers adopt low-cost occupational hygiene measures to decrease their exposure to lead dust (24, p. 148):

> It is want of personal cleanliness which makes casual labor in lead works more dangerous than constant employment. . . . Bathrooms should be provided at the works, otherwise it is impossible for the men to have a warm bath owing to the poor condition of their homes. The men should be obliged to

> take a bath at least once a week, oftener if they have been engaged in dusty processes.

Oliver suggested that certain habits including personal hygiene, alcohol consumption, and diet influenced worker susceptibility to plumbism. Rather than calling for industry to reduce exposure levels, Oliver's public health approach emphasized fortifying the worker against occupational disease through hygiene and nutrition programs (24, p. 148; emphasis added):

> if food is present in the stomach at the time a workman commences work in a white lead factory in the morning, he runs much less risk of lead poisoning than his comrade who goes to the factory without having broken his fast. *Owners of white lead factories would not only be doing a humane act, but rendering an economic service, if they provided their hands with hot coffee, tea, or milk and bread before commencing work in the early morning.*

Thus, strategies in the occupational arena focused not on the need to protect worker health by cleaning up the workplace, but rather on how to make workers more resistant to lead poisoning. This guaranteed the continued productivity of workers, albeit under unsavory, highly hazardous conditions.

The most important aspect of Oliver's writings on lead toxicity was that they were some of the earliest attempts to directly address the differential effect of occupational lead exposure in men and women. Without providing specific scientific evidence, Oliver strongly argued that women were much more vulnerable to the acute cerebral effects of lead poisoning than male workers: "Females, in my opinion, are not only more susceptible than males, but in them the malady is more apt to assume the worst form, viz., the cerebral type, or what is called lead or saturnine encephalopathy" (24, p. 193). Although Oliver discussed the observed association between *parental* lead exposure and lowered fertility rates and the decreased viability of offspring, his opinion was based less on the issue of reproductive hazards and more on what he perceived to be the general "sexual proclivity" of female workers for lead toxicity. Despite strong evidence indicating the dangers of industrial lead exposure to both men and women (particularly children and young adults), Oliver advocated excluding women from the most toxic lead occupations, rather than compelling employers to decrease exposure levels.[1] His efforts paid off in 1898, when the White Lead Commission effectively abolished the hiring of female workers for jobs in the manufacture of white lead. Unions supported the exclusionary policy, although Oliver thought that their position was motivated more by a desire to decrease the female labor pool in order to keep wages higher and ensure more work for men (24, p. x). Conversely,

[1] The Factory Act of 1891 had officially abolished the employment of children under 11 years of age (24).

the lead industry feared the loss of a cheap pool of labor and vigorously fought this exclusionary policy, but eventually relented. Oliver's description of the evolution of this legislative struggle is quite revealing (24, pp. 152–153):

> I was justified from a medical and social point of view in having pressed for the abolition of female labor in the white beds, stoves, and the dusty processes of white lead manufacture; and while I was much abused for my pains, it is gratifying to know that, by excluding women from these processes, death has been averted, much suffering spared, and that there has not been the dislocation in the trade employers feared, nor the difficulty of obtaining male labor, which was advanced as a reason against the change.

Not surprisingly, industry challenged Oliver's judgment based not on the validity of his scientific evidence, but rather on economic grounds—the potential cost of replacing large numbers of low-wage female workers who were banned by the regulation from working in the lead factories.

Alice Hamilton, a legendary occupational health and labor advocate in the United States, also believed in the greater vulnerability of women to toxic chemicals. Fewer women were employed in lead industries in the United States than in England and other European countries, although by the 1920s American women were entering these occupations in large numbers. Most important, the glazing process in the U.S. pottery trade was considered much more hazardous than that used in England; lead poisoning rates in the United States were as high as 13.5 per 100 workers versus 0.9 per 100 in England (25, p. 239). Rigorous industrial hygiene controls implemented during the turn of the century, first in Germany and later in other European countries, were beginning to pay off in decreased worker poisonings. The U.S. poisoning rates remained high due to a lack of initiative to improve unsanitary and dangerous working conditions (10). In her autobiography, Hamilton discusses her humiliation at the International Congress on Occupational Accidents and Diseases in Brussels in 1910, when she was unable to respond adequately to inquiries from her colleagues about the incidence of lead poisoning across U.S. industries or the regulations covering lead poisoning in the workplace. Ultimately, the director of the Belgian Labor Department declared: "It is well known that there is no industrial hygiene in the U.S., *ca n'existe pas*" (26, pp. 127–128). To Hamilton, the increasing number of women working in the lead trades, coupled with anecdotal evidence of a relatively high poisoning incidence, posed important public health challenges that needed to be addressed (27, p. 5):

> women are beginning to enter the occupations in which exposure to lead is inevitable, and it is very important to look carefully into the question of their employment in such occupations, and to determine whether it will be better to safeguard them by requiring employers to use every known means to reduce or eliminate the hazard of lead poisoning or by prohibiting the employment

> of women entirely in those occupations in which lead poisoning constitutes a considerable hazard.

Hamilton was keenly aware of Oliver's opinion on the exceptional vulnerability of women to lead toxicity and explored this question extensively in her own work. She compared British theories, epitomized by Oliver's work, with the German hypothesis (28) which held that the apparent higher susceptibility of women to the adverse effects of lead exposure was spurious and in fact confounded by women's inferior working conditions and socioeconomic status relative to men. German regulatory concern about lead poisoning and toxic hazards among workers, particularly women, had begun nearly two decades earlier. Hamilton concluded that her observations on occupational lead in the U.S. pottery industry appeared to uphold the German school of thought (27, p. 11):

> the Germans believe that the apparently greater susceptibility of women to lead poisoning is to be explained not by their sex, but by the fact that they are usually more poverty stricken than the men, are under-nourished and obliged to do work for their families in addition to their factory work. . . . Observations in the pottery industry in this country seemed to bear out this theory, for while a much larger proportion of women than of men were found suffering from lead poisoning in the East Liverpool and Trenton districts, it was also found that in these districts the men are members of a strong union, are well paid, and have good living conditions, while the women are unorganized, underpaid, poorly housed, poorly fed, and subject to the worry and strain of supporting dependents on low wages.

Referring to lead as a "race poison," Hamilton's central concern focused on the adverse reproductive effects of lead exposure on pregnant women, specifically the overwhelming evidence of increased incidence of spontaneous abortion, miscarriage, premature births, and neonatal mortality. It was the threat of lead as a reproductive hazard that Hamilton used to justify barring women from the most toxic lead industries. Supporting the prohibition of women working with lead was a direct effort to alleviate the adverse impact of this substance on future generations. Hamilton argued that "a poison which may destroy or cripple a woman's children is a far more dangerous poison than one which only injures the woman herself" (27). From a feminist perspective, Hamilton's position was clearly problematic. Women's rights organizations who were advocating for an Equal Rights Amendment in the 1920s were deeply troubled by the potentially discriminatory impact of protective legislation and sought to overturn such laws.[2] Yet, organized labor was concerned about the potentially adverse effects of the

[2] Jane Norman Smith, New York State chair of the National Women's Party in the 1920s, contended that protective labor laws were devised by AFL members, a majority of whom were men, seeking to restrict women's ability to compete for jobs in industry (29; see also 30).

Equal Rights Amendment on working-class women. The federal amendment calling for equal rights under the law, regardless of sex, had the potential to supersede any protective labor legislation enacted by states that offered minimal protection for female workers. However, during this period the labor movement and the women's rights movement (which was dominated mostly by upper-class women) had very separate political agendas, and Hamilton decisively took a labor perspective, viewing gender-based protective legislation as the most viable alternative for addressing the occupational health hazards faced by unorganized female workers. Given the socioeconomic context of that period, her concern about the plight of working women was a pragmatic one. Protective legislation that restricted women's work in lead-based industries was a way to improve the deplorable conditions of women in the trades. She saw working-class women as doubly vulnerable to their hazardous work environments when they were pregnant and had children, particularly during a period when legislation affecting maternal and child health was relatively weak (10, pp. 202–203). According to a 1926 publication by the Consumer's League of Connecticut (31):

> These are the arguments for legislation of a special kind to protect women in industry. It is quite true that all the evils against which we try to protect women are also dangerous for men and we should work for safeguards for both sexes. But until we have succeeded in introducing a far higher standard of care of the health of workingmen into American industry, it will not be safe to give up the special laws, few and feeble as they are, which do bring about some measure of protection for women.

Unlike in England and other European countries, protective legislation for working women in the United States was piecemeal and largely left to state discretion; federal law did not bar women from some of the more toxic, female-dominated lead industries such as pottery and ceramics, mostly because of industry's staunch resistance to assuming the costs of replacing them. By the early 1950s, Hamilton changed her position on the Equal Rights Amendment. Feeling that women's health in the workplace had finally become an area of legitimate concern to health authorities, she no longer feared the Amendment's potentially dire impact on working-class women and ultimately came around to supporting it (30, 32).

In the early 1940s, a significant problem complicated industry's attempt to mobilize labor to meet the increasing demands of the war effort. Large numbers of men were removed from industrial manufacturing and recruited for service in the armed forces. Now, many of these traditionally "male jobs" were to be filled by women. Indeed, in 1940 it was estimated that nearly 12 million women were in the workforce, and by 1944, 18 million—or more than one-third of U.S. women over 14 years of age—were employed (33, 34). This socioeconomic shift

led to important changes in public health perspectives on workplace hazards to women and their ability to work in certain occupations. Tacit assumptions about the need to limit women's employment in industry were questioned and reexamined. Using Oliver's and Hamilton's data, Anna Baetjer, an industrial hygienist at Johns Hopkins University, reopened the issue of male versus female susceptibility to occupational lead toxicity. Interestingly, Baetjer's inquiry was conducted specifically for the U.S. Army which sought an exhaustive literature review on the ability of women to work in trades "previously considered suitable for men only, and [to understand] what facts are known about the relationship of employment to the health of women" (35, p. iii). Attempting to allay concerns about women working in lead industries, Baetjer pointed to socioeconomic disparities, which can lead to different chronic exposure levels, to explain the differential proportions of lead-related illness cases in men and women. She also described additional studies on fatalities and incidences of acute poisonings related to occupational lead exposures that contradicted theories about women's inherent susceptibility to plumbism. Alluding to Oliver's work, Baetjer argued that "the theory that women are more susceptible than men to occupational diseases has arisen by the repeated quoting in the literature of statements to this effect made by one or two industrial health authorities. In many cases, the statements represented only a personal opinion" (35, p. 147). Although Baetjer acknowledged that lead can act as a reproductive hazard, leading to stillbirths and miscarriages, she supported the right of women to work while pregnant under employment conditions that would allow for temporary accommodation by removing them from hazardous exposures (35, p. 185).

Throughout the 1950s and 1960s, a major portion of lead research focused on childhood lead exposure from domestic sources. Screening programs among children living in urban areas indicated that environmental lead exposures from indoor sources as well as ambient exposures were leading to blood lead levels in excess of 40 μg/dl (18). This coincided with heated battles between the Public Health Service and the lead and petroleum industries over the increasing level of atmospheric lead, mainly due to leaded gasoline.

By the 1960s, health reform efforts had significantly decreased the most egregious lead hazards in the workplace; research was now focusing more on lower-level ambient and indoor exposure from lead paint dust and its impact on children (36). Scientists also renewed concern about the effects of women's lead exposure on the viability of offspring. Studies examined the mechanics of how lead passed from mother to fetus, and it was discovered that lead easily permeates the placenta (37) and that pregnancy can act as a "stressor," releasing lead from maternal skeletal storage sites and thus exposing the fetus (38). Evidence also indicated that nutritional deficiencies during pregnancy, such as lack of iron and calcium, increase fetal susceptibility to lead exposure. Although these findings

were important for understanding the epidemiology of occupational lead toxicity, studies routinely focused on maternal exposures during pregnancy while virtually ignoring paternal prefertilization exposures (39).

In the 1970s–1990s two important developments arose in the study of lead. First, investigators shifted their focus from acute toxicity of lead poisoning and began to look systematically at more subtle and chronic neurological outcomes as measured by cognitive behavior assessments, I.Q. tests, and school attendance (40). Concern centered on "subclincial toxicity" resulting from relatively low-dose exposures in which harmful effects are not manifested in a standard clinical examination (41, 42). Recognition of subclinical effects was made possible by advances in laboratory medicine (through the development of sophisticated biomarkers of exposure and effect) and epidemiology. Second, public health officials, including the Centers for Disease Control and the Surgeon General, lowered the maximum internal exposure limit from 80 to 60 and then to 50 μg/dl for adults, and to 10 μg/dl for children (18). Both of these developments raised concerns about the more subtle effects of prenatal lead exposure in the workplace where legal exposure levels are much higher than the newly recommended limit. Studies continued to emphasize the mechanism of placental lead transportation to the fetus, with the timing of exposure limited to pregnancy.

In the late 1970s, this exclusively female-oriented perspective was eventually broadened to encompass the potentially harmful effects of paternal lead exposure prior to conception. This change came about through organizing and pressure by workers and feminists within the policy and scientific arenas. Moreover, the finding in 1977 that the pesticide DBCP (dibromochloropropane) caused sterility in occupationally exposed men working in formulation plants (43) prompted increased scientific inquiry into the reproductive hazards faced by men in the workplace and the potential risks to their progeny. In the case of lead, subsequent studies have shown paternal lead exposure to be associated with outbreaks of lead poisoning among children through contamination of the home environment by work clothes soiled with lead dust, and decreased fertility due to the direct toxic effect of lead exposure on male germinal epithelium which affects spermatogenesis (43–46). Other studies have linked paternal lead exposures to congenital malformations in offspring and childhood cancer (Wilms' tumor), but scientific understanding of the biological mechanisms of these associations is limited (47, 48). Although mutations are plausible ways by which paternal exposure could cause birth defects and genetic aberrations in offspring, the data on the mutagenicity of lead are not conclusive. Other studies indicate that lead interferes with the sperm maturation process and sperm morphology, which could lead to DNA damage in the process of fertilization (47). Despite this suggestive evidence, there is still a comparative lack of research on the potentially toxic links between fathers and fetuses.

IMPLICATIONS OF REPRODUCTIVE TOXICITY RESEARCH: FEMINIST AND SCIENTIFIC DISCOURSE ON OCCUPATIONAL HEALTH

Over the last 20 years, feminists and civil rights advocates, among others, have consistently argued that scientific discourse is inevitably shaped by the political ideology and social context from which "fact-making" emerges. Yet science is often reified to the point that its connection with human authors is lost. Berger and Luckmann (49, p. 52) argue that scientific reality is socially constructed—perpetually shaped and reshaped by its participants, thus creating a social order that should not be viewed as an intrinsic "part of the nature of things," but rather as a product of human activity and changing consciousness. Ruth Bleier illustrates how prevailing socioeconomic conditions weave themselves inextricably into the process of generating scientific facts (50, p. 5):

> Even though there has always been a strong current of biological determinist thinking in the sciences of human behavior, it surges at times of political and social upheaval. . . . there were many physicians and scientists throughout the last half of the nineteenth century and up to the present who remained dedicated to the task of explaining why women and blacks are naturally fitted, biologically destined, for the social roles they indeed fill and, consequently, for social inferiority and economic dependence.

Thus, the social construction of women's biology as weaker and more vulnerable to occupational hazards is predicated in large measure on the need to justify a gendered division of labor between the unpaid domestic and external wage economies and to maintain the sexual stratification in the workforce that enables capitalist producers to extract increased profits from female workers (51, pp. 37–51). It also justifies industry's need to minimize the socially problematic cost of female reproductive toxicity due to labor exploitation under hazardous working conditions. Indeed, research has conclusively shown that a mother can directly release toxins, such as lead, to her fetus while the weight of evidence linking father and fetus is less compelling due to the paucity of scientific inquiry in this area. Thus, excluding women from the battery manufacturing line appears to be less costly than developing less toxic manufacturing processes. For male workers, the costs are calculated differently based on ostensibly tentative scientific evidence on male-mediated reproductive effects (52). In deciding how to grapple with this scientific uncertainty, corporations have focused more on perceptions of sex roles in the workplace than on hard scientific evidence (52).

As exemplified by the American Cyanamid and Johnson Controls cases, there has been a trend in industry to ban fertile women from jobs where they are exposed to certain chemicals that can harm the fetus if they become pregnant. Screening out the most vulnerable population (i.e., potentially pregnant women) allows industry to avoid the costs of reducing or eliminating toxic exposures in

the workplace. Norman Daniels (53) addresses this issue in his book *Just Health Care*, in which he discusses the dichotomy between two strategies for achieving health protection in the workplace. The first approach modifies the workplace to make it safe for workers; the second modifies the workforce by making it resistant to hazards through such mechanisms as biological monitoring or employment screening (53, p. 184). However, protective policies are often selectively implemented, usually in lucrative, male-dominated industries where women have struggled to gain access, and not in hazardous, low-wage occupations such as dry-cleaning, day care, and the semi-conductor industry that depend primarily on female, low-wage workers (often women of color).

For example, cytomegalovirus (CMV) poses little health risk to men or their progeny but is extremely hazardous for pregnant women, who can pass the virus to the fetus, putting it at risk for serious neurological damage.[3] Day care workers, most of whom are women of childbearing age, are at high risk of contracting the virus from young children (55). Despite this persistent risk to pregnant women, no one has proposed a "fetal exclusionary policy" in day care settings, as replacing this predominantly female workforce would be exceedingly difficult. However, even low-wage, female-dominated industries are not exempted from fetal exclusionary policies; in the *maquiladora* industries along the U.S.–Mexico border, over half of the 500,000 workers are women employed in export assembly plants. A recent investigation revealed that many women experience systemic pregnancy-based discrimination by employers seeking to avoid the costs of temporary accommodations for pregnant workers or compliance with maternity leave requirements under Mexico's labor laws (56).

Clearly, not all theories of occupational lead toxicity were consciously constructed to keep women in their place. But the persistent emphasis within the science and environmental policy arenas on the reproductive hazards faced by female workers, while downplaying evidence of similar dangers faced by men, exemplifies the tacit assumption that women's primary role in society is to bear healthy children. Mary Becker explores this theme in her legal analysis of the Johnson Controls case (57):

> Proponents of these [exclusionary] policies seem to regard all women as pregnant at all times and make the opposite mistakes with male employees: they see male employees only as economic actors and forget that they have biologic connections and responsibilities to their families.

The focus in lead toxicity research on the reproductive vulnerability of female workers and the need for protective legislation has had important policy

[3] CMV, in the human herpes virus group, is one of the most common causes of congenital viral infection. In the United States, approximately 1–2 percent of all newborns are infected with CMV and 10 percent of these have neurological and other development problems (54).

implications leading to growing tension between the employment of women in nontraditional occupations, the hazards of their workplaces, and the commitment of women to keeping their jobs in order to support themselves and their families. This tension has changed relatively little over the last century. The historical division between Alice Hamilton and her feminist contemporaries over the impact of the Equal Rights Amendments on working women continues today among feminist scholars and legal advocates, as exemplified by "equal treatment" proponents on one side versus "equitable treatment" advocates on the other (58). The equal treatment camp condemns most gender-specific accommodations or benefits, fearing that this type of policy intervention will lead to provisions that ultimately protect women out of lucrative jobs. Conversely, the equity proponents argue that strictly adhering to gender-neutral policies is problematic as this approach does not address current barriers stemming from a legacy of discrimination against women in the job market: pay inequity, low levels of union membership (less than 30 percent of union members are women), and sexual harassment, for example (59). Like Hamilton, equity proponents view gender-specific policies as an effective way to level an uneven playing field. Some countries with high levels of union membership have enacted gender-specific legislation requiring accommodation, job reassignment, or fully paid maternity leave for pregnant and lactating women working in hazardous occupations. Quebec has such a law, thanks in large part to the political clout of a strong alliance between women's groups and labor organizations.[4]

Within the U.S. occupational health arena, some scientists have taken issue with research that has been overly restrictive in terms of defining exposure pathways (maternal exposure in the workplace), the timing of exposure (during pregnancy), and the nature of the outcome being assessed (birth defects) (60). This type of disease causation paradigm emphasizes one glaring, undeniable biological difference between men and women—only women get pregnant. Yet two fallacious assumptions underlie this methodological approach. First, all women of childbearing age do not necessarily have children. In fact, it has been estimated that fewer than 2 percent of all blue-collar working women will bear children after the age of 30 (4). Second, exclusion of male workers from the research question falsely implies that they are safe from the adverse health effects of exposure to toxic substances. The paucity of scientific research on paternal exposure pathways has helped downplay the potential costs of male-mediated reproductive and developmental effects. The end result of excluding women is the perpetuation of a dangerous occupational risk through the false impression that other workers are safe.

Political pressure from labor groups and feminists has made scientists aware of the problematic implications of these assumptions, and points out the need to

[4] Thanks to the anonymous reviewer who provided this example.

redirect research in order to compensate for the small number of studies on male-mediated reproductive effects from workplace hazards (39). This process requires expanding exposure timing and pathways to include the prefertilization period, and examining a range of reproductive outcomes that consider both parents as potential routes through which exposures may have an adverse effect (60). Moreover, future research should assess the more subtle, nonreproductive health effects of workplace toxins on all workers and their families.

The Supreme Court's ruling in *Johnson Controls* that fetal protection policies are illegal could have positive implications for future scientific research. The prohibition of exclusionary policies to ensure worker protection will encourage researchers to move beyond simplistic debates about which group is more sensitive to a toxic substance that is clearly harmful to all, and to focus on reducing exposure levels or finding ways to eliminate the exposure altogether through changing manufacturing processes and product substitution. Most important, the Johnson Controls case illustrates the need for occupational health scientists to acknowledge the social implications of their work and the ideological biases they incorporate into the formulation of their research hypotheses. Ruth Hubbard makes an eloquent plea for scientists to emerge from behind their thin veil of objectivity (61, p. 31):

> Awareness of subjectivity and context must be part of doing science because we cannot eliminate them. We come to the objects we study with our particular personal and social backgrounds and with inevitable interests. If we acknowledge them, we can try to understand the world, so to speak, from inside instead of pretending to be objective outsiders looking in.

CONCLUSION

As the above discussion illustrates, the political minefield surrounding scientific research and regulatory policies addressing workplace reproductive hazards has deep historical roots. In the occupational policy arena, the *Johnson Controls* ruling is a double-edged sword. Culminating decades of debate on the legality of employer fetal protection policies, women's rights advocates have heralded the decision as a major victory for working women by giving them "the right to make critical work and family decisions for themselves and their children" (3). Although it is important to acknowledge the significance of the Court's ruling in preserving equality of opportunity for women, the case has left many fundamental occupational health issues unaddressed (62). In effect, the *Johnson Controls* decision has essentially sanctioned equality of exposure to occupational hazards, compelling women and men to make the same hard choices between potential health risks associated with occupational hazards and the economic benefits of employment. Although the Court sought to place "risk-benefit" decisions squarely in the hands of workers, the fact remains that workers have

little power to exert control over this process. Industry continues to dominate this arena, finding new ways to shift the burden of occupational risk to workers through hazard warnings, liability waivers, and the so-called "workers' compensation" system, for example. As Ulrich Beck points out in his article on the politics of environmental risk (63):

> Hazards are produced by business operations, to be sure, but they are defined and evaluated socially—in the mass media, in the experts' debate, in the jungle of interpretations and jurisdictions, in courts or with strategic-intellectual dodges, in a milieu of contexts, that is to say, to which the majority of workers are totally alien. We are dealing with 'scientific battles' waged over the heads of workers, and fought out instead by intellectual strategies in intellectual milieu. The definition of hazards eludes the grasp of workers and even, as things stand, the approach of trade unions for the most part. Workers and unions are not even those primarily affected; that group consists of the enterprises and management.

Policy-makers do not consider the restrictions imposed on workers who must make tough decisions about occupational risks. Limited employment alternatives, managerial control over production, and insufficient information to assess the probability of adverse health outcomes all narrow the scope of workers' abilities to make informed choices, let alone substantively influence the direction of risk analysis debates. For policy-makers, addressing this dilemma in the short-term means shifting the traditional regulatory emphasis on risk management to a focus on risk prevention. Such a shift entails devising effective incentives for the development and diffusion of nontoxic alternatives. This can be achieved by increasing government support for research to develop and test less hazardous production technologies and taxing the use of particularly toxic substances. Both of these approaches, combined with policies that encourage increased worker participation in guaranteeing health and safety in the workplace, could encourage innovation and dissemination of less toxic production alternatives. In situations where the capacity to reduce reproductive risks through new technologies or product substitution may be several years away, labor groups have proposed voluntary job transfer policies with retention of full compensation, seniority, and other benefits, providing a viable interim solution for pregnant women and for men trying to have children (64). Risk prevention in the workplace implies a conscious decision that the human health costs of exposing workers (and in some cases, consumers) to toxic substances outweigh the costs to industry of finding alternative inputs for their production processes. This battle was successfully waged in the movement to eliminate lead from household paint and gasoline. Clearly, shifting the economic burden of occupational disease from workers to employers requires political struggle, and the controversy over exclusionary policies is just one aspect of this ongoing movement.

Perhaps most important, however, is that the rise of corporate exclusionary policies must be viewed within a broader socioeconomic context. It is one of many symptoms of a larger crisis in capitalist production that is characterized by what James O'Connor (65, 66) describes as a dual contradiction of capitalism: the "demand crisis" on the one hand and the "cost crisis" on the other. The first contradiction occurs on the demand side when "capital lowers labor costs (by lowering wages, for example) with the aim of increasing profits, but unintentionally reduces market demand for commodities, and reduces profits" (66). The second contradiction occurs when capital, through various cost-shifting strategies, tends to destroy the conditions of production upon which it depends by plundering finite resources or neglecting hazardous working conditions (which raises health costs), all of which increase production costs and cut profits (65, 66). As aptly described by O'Connor, the second contradiction (67):

> is capitalism's economically self-destructive appropriation and use of labor power, urban infrastructure and space, and external nature or environment—"self destructive" because costs of health and education, urban transport, home and commercial rents, and the costs of extracting the elements of capital from nature will rise when private costs are turned into "social costs."

Thus, although fetal exclusionary policies are often analyzed within a feminist framework, it is important not to lose sight of the particular economic and class dimensions associated with this issue. In the courts, fetal exclusionary policies were constructed as an intolerable situation of gender-based discrimination by employers. Yet this perspective is somewhat limiting. Indeed, a court decision to make protective legislation illegal subsequently seems a hollow victory that simply grants women equality of opportunity to work under extremely hazardous conditions. However, the feminist struggle within the occupational realm is not merely about equal access; it also constitutes part of a larger struggle for what O'Connor labels "more social forms of reproduction and production conditions" (65), which include healthy working conditions for all workers, equitable and sustainable wages, and a workplace free of sex and racial discrimination. Within this larger context, the unity of these demands can force important concessions from industry and state regulatory agencies and have varying potential for socioeconomic and political transformation. For public health advocates, the larger, ongoing challenge of tackling occupational disease requires grappling with the interaction between science on the one hand and political economy on the other, and most importantly, understanding the larger socioeconomic context in which public health movements develop and subsequent changes in occupational health policy are implemented.

Acknowledgments — Thanks to Nancy Krieger, Rachel Schurman, Bill Pease, Michael Goldman, Jann Murray-Garcia, Jamie Robinson, David Eifler, and the

anonymous reviewers for their helpful comments and encouragement on earlier drafts of this article.

REFERENCES

1. Lyng, S. *Holistic Health and Biomedical Medicine: A Countersystem Analysis.* State University of New York Press, Albany, 1990.
2. Haraway, D. *Primate Visions.* Routledge, New York and London, 1989.
3. Faludi, S. Your womb or your job. *Mother Jones* 16(5): 59–66, 1991.
4. Stellman, J., and Henifin, M. S. No fertile women need apply: Employment discrimination and reproductive hazards in the workplace. In *Biological Woman—The Convenient Myth,* edited by R. Hubbard, M. S. Henifin, and B. Fried, pp. 117–145. Schenkman Publishing, Cambridge, Mass., 1982.
5. *U.A.W. v. Johnson Controls, Inc.,* 886 F.2d 871 (7 Cir. 1989) (en banc).
6. Bertin, J. People protection, not 'fetal protection'. *New Solutions,* Summer 1991, pp. 5–9.
7. *U.A.W. v. Johnson Controls,* I., 111 S.Ct. 1196 (1991).
8. National Institute of Occupational Health and Safety. Leading work-related diseases and injuries—United States. *MMWR Morb. Mortal. Wkly. Rep.* 34: 537–544, 1987.
9. Draper, E. Fetal exclusion policies and gendered constructions of suitable work. *Soc. Prob.* 40: 90–107, 1993.
10. Hunt, V. *Work and the Health of Women.* CRC Press, Boca Raton, Fla., 1979.
11. Bayer, R. Reproductive hazards in the workplace: Bearing the burden of fetal risk. *Milbank Mem. Fund Q.* 60: 633–656, 1982.
12. Lansdown, R., and Yule, W. *Lead Toxicity.* Johns Hopkins University Press, Baltimore, Md., 1986.
13. Bellinger, D. Prenatal/early postnatal exposure to lead and the risk of developmental impairment. In *Research in Infant Assessment,* edited by N. Paul, pp. 73–97. March of Dimes Birth Defects Foundation, White Plains, N.Y., 1989.
14. Smith, M., Grant, L., and Sors, A. *Lead Exposure and Child Development: An International Assessment.* Kluwer Academic Publishers, London, 1988.
15. Abel, E. *Lead and Reproduction.* Greenwood Press, Westport, Conn., 1984.
16. Brody, D., et al. Blood levels in the US population. *JAMA* 272: 277–283, 1994.
17. Needleman, H., Schell, A., and Bellinger, D. The long-term effects of exposure to low doses of lead in childhood: An 11-year follow-up report. *N. Engl. J. Med.* 322: 83–88, 1990.
18. Berney, B. Round and round it goes: The epidemiology of childhood lead poisoning, 1950–1990. *Milbank Mem. Fund Q.* 71 3–39, 1993.
19. Krieger, N., and Zierler, S. Accounting for the health of women. *Curr. Issues Public Health* 1: 251–256, 1995.
20. Aub, J., et al. (eds.). *Lead Poisoning.* Williams & Wilkins, Baltimore, Md., 1926.
21. McCord, C. Lead and lead poisoning in early America: Clinical lead poisoning in the colonies. *Ind. Med. Surg.* 23: 120–125, 1954.
22. Ramazzini, B. *De Morbis Artificum Diatriba.* University of Chicago Press, Chicago, 1940.
23. McCord, C. Lead and lead poisoning in early America: Benjamin Franklin and lead poisoning. *Ind. Med. Surg.* 23: 393–399, 1953.
24. Oliver, T. *Diseases of Occupation.* Methuen, London, 1908.
25. Hamilton, A. The prevalence of industrial poisoning in the United States. In *Lead Poisoning,* edited by J. Aub, et al. Williams & Wilkins, Baltimore, Md., 1926.
26. Hamilton, A. *Exploring the Dangerous Trades.* Little, Brown, Boston, 1943.

27. Hamilton, A. *Women in the Lead Industries*. U.S. Department of Labor, Bureau of Labor Statistics, Washington, D. C., 1919.
28. Bluhm, A. *Weyl's Handbuch der Hygiene*. 1897 [cited in 27].
29. Smith, J. Letter to the editor. *New York World*, July 8, 1926 [cited in 30].
30. Corn, J. Doctors afield: Alice Hamilton, MD and women's welfare. *N. Engl. J. Med.* 294: 316–318, 1976.
31. Consumer's League of Connecticut. *Do Women in Industry Need Special Health Legislation?* 1926 [cited in 30].
32. Amster, L. Gentlewoman explorer in the dangerous trades. *Hosp. Pract.* 21: 206–254, 1986.
33. U.S. Department of Commerce, Bureau of the Census. *Sixteenth Census of the United States: 1940. Population, The Labor Force. Occupation, Industry, Employment and Income*, Vol. 3. Government Printing Office, Washington, D.C., 1943.
34. Carola Woerishoffer Graduate Department of Social Economy and Social Research, Bryn Mawr College. *Women . . . During the War and After. Summary of a Comprehensive Study*. Prepared for the Ladies Home Journal, Curtis Publishing Co., 1945 [cited in 35].
35. Baetjer, A. *Women in Industry*. W. B. Saunders, New York, 1946.
36. Graebner, W. Private power, private knowledge and public health: Science, engineering and lead poisoning, 1900–1970. In *The Health and Safety of Workers*, edited by R. Bayer, pp. 15–71. Oxford University Press, New York, 1988.
37. Barltrop, D. Transfer of lead to the human foetus. In *Mineral Metabolism in Pediatrics*, edited by D. Barltrop, pp. 135–151. Blackwell Scientific, Oxford, 1969.
38. Rom, W. Effects of lead on female reproduction: A review. *Mount Sinai J. Med.* 43: 542–551, 1976.
39. Davis, D., et al. Male-mediated teratogenesis and other reproductive effects: Biologic and epidemiologic findings and a plea for clinical research. *Reprod. Toxicol.* 6: 289–292, 1992.
40. Needleman, H., et al. Deficits in psychologic and classroom performance of children with elevated dentine lead levels. *N. Engl. J. Med.* 300: 689–695, 1979.
41. Waldron, H., and Stofen, D. *Subclinical Lead Poisoning*. Academic Press, London, 1974.
42. Landrigan, P. Current issues in the epidemiology and toxicology of occupational exposure to lead. *Toxicol. Ind. Health* 7: 9–14, 1991.
43. Whorton, D. Infertility in male pesticide workers. *Lancet* 1: 1259–1261, 1977.
44. Lancranjan, I., et al. Reproductive ability of workmen occupationally exposed to lead. *Arch. Environ. Health* 30: 396–401, 1975.
45. Assennato, G., et al. Sperm count suppression without endocrine dysfunction in lead-exposed men. *Arch. Environ. Health* 42: 124–127, 1987.
46. Baker, E., et al. Lead poisoning in children of lead workers. *N. Engl. J. Med.* 296: 260–261, 1977.
47. Sallmen, M., et al. Paternal occupational lead exposure and congenital malformations. *J. Epidemiol. Community Health* 46: 519–522, 1992.
48. Kantor, A., et al. Occupations of fathers of patients with Wilms' tumor. *J. Epidemiol. Community Health* 33: 253–256, 1979.
49. Berger, P., and Luckmann, T. *The Social Construction of Reality*. Doubleday, New York, 1966.
50. Bleier, R. *Science and Gender: A Critique of Biology and Its Theories on Women*. Pergamon Press, New York, 1984.
51. Sayer, A., and Walker, R. *The New Social Economy: Reworking the Division of Labor*. Blackwell, Cambridge, Mass., 1992.

52. Kirp, D. Fetal hazards, gender justice and the justices: The limits of equality. *William and Mary Law Rev.* 34: 101–139, 1992.
53. Daniels, N. *Just Health Care.* Cambridge University Press, New York, 1985.
54. Murph, J. The occupational risk of CMV infection among day-care providers. *JAMA* 265: 603–608, 1991.
55. Murph, J. Day care associated cytomegalovirus: Risk for working women. *J. Am. Med. Women's Assoc.* 48: 79–82, 1993.
56. Human Rights Watch Women's Rights Project. *No Guarantees: Sex Discrimination in Mexico's Maquiladora Sector.* Human Rights Watch, New York, August 1996.
57. Becker, M. Can employers exclude women to protect children? *JAMA* 264: 2113–2117, 1990.
58. Robinson, J., and Giacomini, M. A reallocation of rights in industries with reproductive health hazards. *Milbank Q.* 70: 587–603, 1992.
59. Klitzman, S., et al. A women's occupational health agenda for the 1990's. *New Solutions,* Spring 1990, pp. 7–17.
60. Hatch, M. Mother, father, worker: Men and women and the reproductive risks of work. In *Double Exposure: Women's Health Hazards on the Job and at Home,* edited by W. Chavkin, pp. 161–179. Monthly Review Press, New York, 1984.
61. Hubbard, R. *The Politics of Women's Biology.* Rutgers University Press, Brunswick, N.J., 1990.
62. Wallace, E. Fetal protection policies in retrospect: Does United Auto Workers v. Johnson Controls answer difficult questions about toxic workplace hazards? *Environ. Law* 22: 355–386, 1992.
63. Beck, U. From industrial society to the risk society: Questions of survival, social structure and ecological enlightment. *Theory, Culture and Society* 9: 97–123, 1992.
64. Lessin, G., and Mirer, F. A labor perspective on workplace reproductive hazards: Past history, current concerns, and positive directions. *Environ. Health Perspect.* 101: 199–204, 1993.
65. O'Connor, J. Capitalism, nature, socialism: A theoretical introduction. *Capitalism, Nature, Socialism* 1: 11–38, 1988.
66. O'Connor, J. Is sustainable capitalism possible? In *Is Capitalism Sustainable?,* edited by M. O'Connor. Guilford Press, New York, 1994.
67. O'Connor, J. On the two contradictions of capitalism. *Capitalism, Nature, Socialism* 2: 107–109, 1991.

Direct reprint requests to:

Rachel Morello-Frosch
Center for Occupational and Environmental Health
Division of Environmental Health Sciences
School of Public Health
University of California, Berkeley
140 Warren Hall
Berkeley, CA 94710