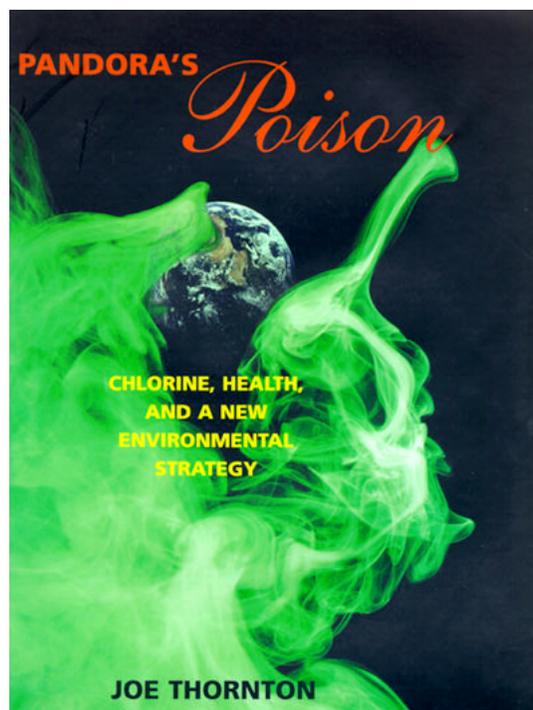


Pandora's Poison: A Review

Cheryl Gussenhoven
University of Idaho
Principles of Environmental Toxicology
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Abstract

Joe Thornton's novel, *Pandora's Poison* attempts to bring about an environmental awareness of organochlorines that parallels the efforts of Rachel Carson's *Silent Spring*. With the advent of Carson's book came a desperately needed tipping of the scales in terms of environmental awareness. From the 1950's to the '70's the chemical industry had experienced a feverish growth in an effort to achieve "better living through chemistry." Although the chemical industry succeeded in producing thousands of pesticides, pharmaceuticals, and numerous other chemicals that improved efficiency and quality of life in some respects, nearly everyone had failed to see the immediate as well as long-term ramifications, until Carson revealed the compelling evidence of impending disaster in *Silent Spring*. Once again, according to Thornton, the chlorine industry continues to produce billions of tons of organochlorines while exposing the global population to chemicals that are bioaccumulative, persistent, carcinogenic, mutagenic and teratogenic in addition to neurotoxic and endocrine disrupting. Meanwhile, he asserts, the majority of the population assumes an unknown amount of risk. *Pandora's Poison* is divided into three primary sections in which Thornton outlines the problems associated with organochlorines from a toxicological perspective, he then proceeds to target the chlorine industry as the responsible party, and finally presents his solution to the problem of organochlorines. Thornton contends that the attempts to control the use and release of contaminants under the Risk Paradigm have failed miserably and that it is time for a new, more effective approach, which he identifies as the Ecological Paradigm.



INTRODUCTION

A biologist and research fellow at Columbia University's Center for Environmental Research and Conservation, Thornton formerly served as research coordinator for Greenpeace. He uses the idea of shifting paradigms from that of the Risk to the Ecological Paradigm, as the impetus for his argument. A paradigm, according to Thomas S. Kuhn, is a body of concepts, phenomena, and techniques, which provide the model for scientific research (Kuhn 13). This same definition can be used to describe the paradigm through which environmental decisions are made and Thornton reduces it to "the tools and concepts of the current system" (Thornton 7). According to Thornton, the Risk Paradigm has directed environmental decisions to manage pollution via permits and by limiting chemical production, use, and release. It assumes that ecosystems have an assimilative capacity to absorb and degrade pollutants without irreparable damage and that organisms can tolerate some amount of chemical exposure without experiencing adverse effects. In addition, the Risk Paradigm focuses on determining maximum release rates from acceptable exposure levels (Thornton 7). Thornton contends that the Risk Paradigm has failed miserably in protecting the environment and its populations. In his book, he notes the Chlorine Chemistry Council's (CCC) contention that:

Chlorine and chlorinated compounds are essential to modern society. They are used to meet the most vital needs of modern life, including protecting the water supply, in 85 percent of all medicines, 96 percent of all crop-protection chemicals, in hospital and food-handling cleanliness, keeping swimming pools safe and food fresh and free of contamination . . . almost 40 percent of all U.S. wages and income depend in some way on chlorine and the products of the chlorine industry (Thornton 364).

However, he asserts that the Risk Paradigm has permitted the production and use of organochlorines at an unconscionable price to society and the environment. Improved technology and techniques for measuring contaminant levels as well as a better understanding of their low-level impact has lead to a decrease in threshold levels, he argues. Thus, we cannot trust the science of today, because these thresholds will undoubtedly be reduced as the technology continues to improve and the true risk is revealed. Essentially, the Risk paradigm leaves the public at the mercy of that which cannot be measured, regardless of the unknown risk. Thornton stresses that the Risk Paradigm is unsuccessful because toxicology and regulations fail to consider mixtures of chemicals and their potentially additive or synergistic effects. He accuses the regulatory system of being blind to epidemiological studies, focusing only on the “simple cause-effect, single-chemical model (Thornton 83).” Finally, Thornton specifically identifies molecular level changes such as genetic mutations and endocrine disruption, which induce effects that are incompatible with the typical toxicological threshold model. This model assumes that an organism can be exposed to a certain dose of contaminant without experiencing irreparable damage (Thornton 84). Accordingly, it is time for a shift in paradigms, a new approach for solving the problems of environmental pollution.

BACKGROUND

Thornton uses the evidence against organochlorines from epidemiological and laboratory studies, the damage they have done and have the potential to inflict, to support the shift to a new paradigm, the Ecological Paradigm. He states that with more than 11,000 organochlorines in commerce and only a minute fraction of the data

required to determine whether they are safe or hazardous, it would be reasonable to prohibit all chlorine use. Like removing the pump handle from a potentially hazardous source, Thornton proposes eliminating chlorine from production. He states that it is impossible to monitor and manage all of the potential sources and exposure routes as the Risk Paradigm has attempted. The Ecological Paradigm, according to Thornton, recognizes the limits of science. He contends that we can never adequately model, predict, or diagnose the impact of individual chemicals in natural systems. The Ecological Paradigm embraces this concept and the precautionary notion, through which we would error on the side of caution rather than lack of knowledge. This paradigm would require zero-discharge of all pollutants and clean production, which would eliminate use, and generation of toxic chemicals. Also, the Ecological Paradigm includes a Reverse Onus approach, requiring those who want to produce a chemical to prove that it is not harmful by conducting a lifecycle assessment of the product. In summary, Thornton contends that the

Ecological Paradigm amounts to a program of continued reductions in the production and use of all synthetic substances, with priority given to chemical classes that are known to persist, bioaccumulate, or cause severe or fundamental disruption of biological processes (Thornton 11).

As Kuhn states, a paradigm shift comes about when the current body of concepts or techniques has come to the end of their usefulness and new problems require a different approach. Thus, the basis for the Ecological Paradigm is set forth, providing for a new approach to environmental regulation of chemicals.

DISCUSSION

Pandora's Poison was published in 2000, thus it is at the forefront of summarizing data on chlorine and organochlorines. Scientists in general agree with Thornton's analysis of the physical properties of organochlorines. For the most part, organochlorines are persistent, and are known to bioaccumulate (Hoyer et al. 1998). Many are extremely volatile and transport readily but resist transformation in the atmosphere, thus leading to global contamination. However, on the issue of resultant health effects due to low-level chronic exposure to organochlorines, there are two distinct and opposing points of view. The Chlorine Chemistry Council (CCC) adamantly proclaims that, despite assertions by various groups, current environmental levels of organochlorines have not been proven to cause any adverse effects on human health.

However, the evidence accumulating against the CCC's contention is rather convincing. Human evidence has been accrued via epidemiological studies, an increasing number of which continue to provide updated information. The endocrine disrupting chemicals are a primary topic of concern in both research and regulatory legislation and organochlorines are not irreprehensible. In fact, the House Commerce Committee unanimously passed legislation to reauthorize the Safe Drinking Water Act and further restrict the use of chlorine in water disinfection as well as chemicals that mimic estrogen (*Chemical Marketing Reporter* 1996). A recent study by Porta et al. (1999) has demonstrated the link between the mutation of the K-ras gene by organochlorines and the incidence of pancreatic cancer. Furthermore, several other studies were conducted to investigate the relationship between organochlorine compounds, namely dieldrin, DDT, and PCB's, and the incidence of breast cancer in

women. The results suggest that dieldrin and its estrogenic properties result in an increased risk for breast cancer in women (Hoyer et al.1998). Also, Hoyer et al. sites numerous additional studies that have obtained similar results. Finally, this study notes, in support of Thornton's argument, that the synergistic and additive effects of various compounds has not been rigorously investigated, though they should be.

However, it should also be noted that not all organochlorines were linked to the genetic mutation leading to pancreatic cancer; hexachlorobenzene and hexachlorocyclohexane did not appear to have the same negative health effects in humans (Porta et al.1999). This evidence precludes Thornton's contention that organochlorines should be treated as a class and banned as such. Also, the use of monochloramine for disinfection of drinking water is being investigated for prevention of legionaire's disease. Regardless of its ability to react with organics in the water and form organochlorines, monochloramine also has the potential to reduce the incidences of legionella's disease by 8100 cases in the U.S. alone (Kool et al. 1999).

Although Thornton does an exemplary job of establishing the issues in common parlance, the reader is left with an overwhelming notion of the task at hand. Thornton presents a solution, yet it appears even more complex and daunting than the problem. Once more, he has also placed the blame on the chemical industry and those who regulate it; when in fact, an equal portion of the responsibility lies in the hands of consumers. There is no doubt that those producing a substance should be held responsible for endangering the lives of those who use the product. Take, for example, the case of Firestone and their release of tires to the general public, when the tires allegedly did not meet product specifications. Firestone is now under investigation for

placing people's lives at risk. However, now that people understand that there may be an additional risk involved in purchasing the Firestone product, it is likely that fewer will purchase them. The same situation applies with chemical products. People have what corporations call buying power; demand for a product is what keeps it in production. Thus, the fact that people purchase products of chlorine chemistry only serves to stimulate the chlorine industry and their use of organochlorines. With increased awareness of the potential risk involved in using these products, consumers are able to make well-informed decisions on what to purchase. Thornton failed to make this fact clear and subsequently empower those who could have an impact on the production of chlorine and its products by refusing to purchase them or demanding replacement products. For instance, Thornton recognizes that chlorine use for bleaching pulp and paper, solvents in dry-cleaning, and producing PVC plastic accounts for 60% of all chlorine use in the United States. However, with the advent of the environmental movement, the demand and subsequent production of unbleached and recycled paper has increased. Dry-cleaning is another non-essential service that people could easily impact in terms of demand. Finally, the use of PVC in the modern home for pipes, window frames, siding, floor tiles, wall coverings, and upholstery to name only a few, can often be replaced with wood, metal, and ceramics. People often blame the government for problems related to health and the environment. However, it is very clear that in the case of chlorine and organochlorines, people have the ability to make choices to reduce their use.

An essential part of establishing a valid position is recognizing the argument of the opposition. Thornton does this very well in chapter nine of *Pandora's Poison*. He

states the primary concerns of those opposing a chlorine sunset and his solutions. The first objection involves the potential displacement of workers and communities dependent upon chlorine chemistry for employment and financial support. Thornton recommends that a taxation of chlorines and organochlorines be initiated which will be used to support those individuals that are leaving the industry and trying to reestablish themselves in another. This taxation of the chlorine and organochlorine industry would also pose as a disincentive for chlorine use. The second argument is that Thornton's Ecological Paradigm is inflexible and therefore unworkable. That it fails to weigh the costs and benefits of phasing out organochlorines. For instance, in the case of the introduction of a miracle-working, life-saving drug, laws with their foundation in the Ecological Paradigm will prevent its use. However, Thornton proposes that the chlorine industry will maintain the ability to refute the removal of any single compound so long as it can be demonstrated that the chemical will not pose a hazardous threat. Thus, he defends his Ecological Paradigm by responding to the objections of his opposition.

CONCLUSION

Thornton presents his case well. His points are well made and documented and he does an admirable job of making the reader feel violated and perhaps even angry with the chlorine industry and the government. In fact his statement referring to the extensive use of PVC in the modern house, "like the Romans who sipped from lead cups, ran drinking water through lead pipes, and bathed in lead basins, we have built our house of poison, unaware of its consequences," Thornton effectively reminds us that we are not infallible and that even the strongest empire can succumb to an invisible

threat (Thornton 319). Thus, we should not be so arrogant as to assume that we could not fall prey to the same mistake. In addition, while giving the reader a general understanding of chlorine and the production of organochlorines and a sense of the complexity of the chemistry involved, Thornton does not overwhelm the reader with intricate chemistry and an infinite list of numbers and concentrations to wade through. At the same rate, he does provide a list of references to which one may turn for more information. Although some would deem Thornton's proposal to eventually eliminate all use of synthetic substances an extremist one, his book will certainly serve to increase the awareness of the general population. As in the case of Rachel Carson's *Silent Spring*, the issues will be discussed and small steps will be taken toward improving our understanding of the environment and our place within it.

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