Chemical Risk Overview

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Worldwide, the average human life span has increased from about 30 years at the beginning of the 20th century to more than 60 years today, and it continues to rise.[1] In the United States, it has reached 76 years according to a recent estimate (figure 1).[2] The freedom to develop and put to use thousands of man-made chemicals has played a crucial role in that progress by making possible such things as pharmaceuticals, safe drinking water, and pest control.

Yet the public perception is that man-made chemicals are the source of every possible ill, from cancer to ozone depletion and from infertility to brain damage. Ignoring that nature produces far more chemicals at far higher doses[3] and that most chemicals are innocuous at low doses, activists capitalize on those fears. They scare the public by hyping the risks to ensure that the government passes volumes of laws and regulations focused on eliminating chemicals without much regard for the tradeoffs.

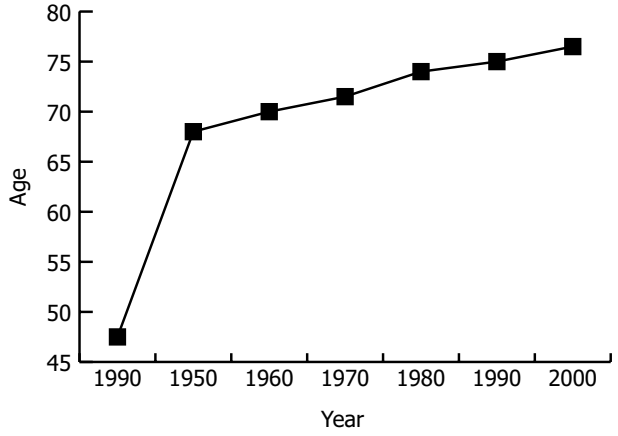
Advocates of such limits want the government to make sure every chemical is safe before

1. Nicholas Eberstadt, "World Population Prospects for the Twenty-First Century: The Specter of 'Depopulation'?" in *Earth Report 2000*, ed. Ronald Bailey (New York: McGraw Hill, 2000), 65.

2. U.S. Department of Labor, U.S. Census Bureau, *Health, United States, 2000: Adolescent Health Chartbook* (Washington, DC: Centers for Disease Control and Prevention, 2000), 7, http://www.cdc.gov/nchs/data/hus/hus00cht.pdf.

3. Bruce N. Ames and Lois Swirsky Gold, "Environmental Pollution, Pesticides, and the Prevention of Cancer: Misconceptions," *FASEB Journal* 11, no. 13 (1997): 1041–52, http://socrates.berkeley.edu/mutagen//AmesGold.pdf.

Figure 1. Life Expectancy



Source: National Center for Health Statistics.

exposing the public. In his 2000 book *Pandora's Poison*, Greenpeace's Joe Thornton calls on society to follow the "precautionary principle," which says "we should avoid practices that have the potential to cause severe damage, even in the absence of scientific proof of harm."[4] We should shift the burden of proof, he continues. Those individuals or firms introducing new chemicals must prove the chemicals are safe before introducing them into commerce, and those chemicals already in commerce which fail to meet this standard "should be phased out in favor of safer alternatives."[5]

The problem is that no one can ever prove that anything is 100 percent safe. Not surprisingly, Thornton also advocates a "zero discharge" policy, which calls for the elimination of all bioaccumulative chemicals[6]. In particular, he has long called for the elimination of chlorine. *Science* magazine quotes him as noting: "There are no known uses for chlorine which we regard as safe."[7] Perhaps in recognition that this standard is politically untenable, he suggested that chlorine use be continued for "some pharmaceuticals" and some "water disinfection," but only until other options become available.[8]

The Dangers of Precaution

But before we call for zero discharge of anything, we should think about what that means. Like anything, chemicals may create new risks, but they have been used to eliminate others—many of which wreaked havoc on civilization for centuries. As the Competitive Enterprise Institute's Fred Smith notes, "Experience demonstrates that the risks of innovation, while real, are vastly less than risks of stagnation."[9] Indeed, he asks, what would the world be like if medical researchers had never introduced penicillin because they could not prove it was 100 percent safe?

Chemicals Transform Our Everyday Lives

4. Joe Thornton, *Pandora's Poison: Chlorine, Health, and a New Environmental Strategy* (Cambridge, MA: MIT Press, 2000), 10.

5. Ibid.

6. For more information on bioaccumulative chemicals, see Michael Kamrin, *Traces of Environmental Chemicals in the Human Body: Are They a Risk to Health?* (New York: American Council on Science and Health, 2003). http://www.acsh.org/docLib/20041110_traces_2003.pdf.

7. Ivan Amato, "The Crusade against Chlorine," *Science* 261, no. 5118 (1993): 153. For more information on chlorine issues, see Michelle Malkin and Michael Fumento, *Rachel's Folly: The End of Chlorine* (Washington, DC: Competitive Enterprise Institute, 1996).

8. Thornton, *Pandora's Poison*, 14.

9. Fred L. Smith, "The Dangers of Precaution," *European Voice* 6, no. 7 (February 17, 2000): 1, http://www.cei.org/pdf/3845.pdf.

Although we don't think much about them, man-made chemicals are essential to almost everything we do. They make our cars run; they clean everything from our teeth to our dishes; they reduce illness by disinfecting bathrooms at home and operating rooms in hospitals; they are used on food products, such as poultry, to eliminate E. coli and other deadly pathogens; and they keep our computers, television sets, and other electronic products running. Consider just a few of the critical functions they perform in making our lives better:

- Chlorination of water supplies has saved millions of lives. For example, since local engineers and industry introduced chlorination in the 1880s, waterborne-related deaths in the United States dropped from 75 to 100 deaths per 100,000 people to fewer than 0.1 death per 100,000 annually in 1950.[10]
- Rather than curtailing the use of chlorination as Thornton suggests, we should be expanding access. According to the World Health Organization, because of such problems as poor sanitation and unsafe drinking water diarrheal diseases (such as cholera and dysentery) kill about 2.2 million people a year, most of whom are children under five years of age.[11]
- The U.S. Centers for Disease Control and Prevention notes that fluoridation of water (fluoride is yet another chemical targeted by environmentalists) has proven a tremendous benefit for oral hygiene.[12]
- Nearly 85 percent of pharmaceuticals currently in use require chlorine to be used in their production.[13]
- Thanks to chemicals used for pharmaceuticals, combination drug therapy reduced AIDS deaths by more than 70 percent from 1994 to 1997.[14] And more recently, researchers estimated that AIDS drug treatments have saved a total of 3 million years of life in the United States since 1989.[15]
- Fifty percent of the reductions of heart disease–related deaths between 1980 and 1990 (total death rate decline of 30 percent) are attributable to medicines and the chemicals that are in them.[16]

10. J. Michael LaNier, "Historical Development of Municipal Water Systems in the United States, 1776–1976," *Journal of the American Water Works Association* 68, no. 4 (1976): 177.

11. "Water-Related Diseases: Diarrhoea," World Health Organization website, http://www.who.int/water_sanitation_health/diseases/diarrhoea/en/, access November 29, 2007.

12. "Ten Great Public Health Achievements—United States, 1900–1999," *Morbidity and Mortality Weekly Report* 48, no. 12 (1999): 241–43.

13. Gordon W. Gribble, "Chlorine and Health: Evaluating Chlorine and Chlorinated Compounds" (New York: American Council on Science and Health,1995), http://www.healthfactsandfears.net/docLib/20040503_chlorine.pdf.

14. Frank J. Palella, Kathleen M. Delaney, Anne C. Moorman, Mark O. Loveless, Jack Fuhrer, Glen A. Satten, Diane J. Aschman, and Scott D. Holmberg, "Declining Morbidity and Mortality among Patients with Advanced HIV Infection," *New England Journal of Medicine* 338, no. 13 (1998): 853–60, https://content.nejm.org/cgi/content/abstract/338/13/853.

15. Rochelle P. Walensky, et al., "The Survival Benefits of AIDS Treatment in the United States," *Journal of Infectious Diseases* 194, no. 1 (July 1, 2006): 11–19

16. M.G. Hunink, L. Goldman, A. N. Tosteson, M. A. Mittleman, P. A. Goldman, L. W. Williams, J. Tsevat, and M. C. Weinstein, "The Recent Decline in Mortality from Coronary Heart Disease, 1980–1990," *Journal of the American Medical Association* 277, no. 7 (1997): 535–42, abstract available at http://www.ncbi.nlm.nih.gov:80/entrez/query.fcgi?cmd=Retrieve&db=PubMed&list_uids=9032159&dopt=Abstract

- Chemicals called *phthalates* (there are several kinds of phthalates) are used in polyvinyl chloride (PVC)—a type of vinyl used for medical tubing, blood bags, and numerous other products. Although environmentalists have tried to ban these products,[17] vinyl medical devices provide numerous lifesaving benefits. PVC is a safe, durable, sterile product that can withstand heat and pressure, as well as produce tubing that doesn't kink. It is particularly beneficial for vinyl blood bags because it stores blood twice as long as the next best alternative and doesn't break as glass alternatives do. With blood shortages looming, PVC blood bags are an essential tool in maintaining and transporting supply.[18]
- Biocidal chemicals may soon find their way into hospital uniforms and other textiles used in hospitals, thereby helping to prevent such materials from carrying bacteria and transmitting them to patients. Diseases acquired in hospitals account for as many as 80,000 deaths a year, and studies have found that bacteria can survive long periods on worker's uniforms—making them vehicles for infection.[19] If antitechnology activists don't try to ban them first, biocidal chemicals may soon help save thousands of lives every year.
- Thanks to modern farming with chemicals, food production has outpaced population growth—providing people in both developed and developing countries with more food per capita. Per capita grain supplies have grown by 27 percent since 1950, and food prices have declined in real terms by 57 percent since 1980.[20]
- Using herbicides to control weeds decreases the need for tilling soil, which, in turn, reduces soil erosion by 50 to 98 percent.[21]
- Because of high-yield farming (which uses chemical fertilizers, pesticides, herbicides, etc.), farmers feed more people while farming less land—leaving more land for wildlife. If farmers continued to use 1950s technology—when most of the world did not use pesticides and fertilizers—they would have to plant 10 million square miles of additional land to generate the food that produced today.[22] That's more land than all of North America (which is about 9.4 million square miles and almost as much as all the land in Africa (which is about 11.7 million square miles).
- Many of us enjoy drinks with artificial sweeteners to avoid extra calories. These chemicals are an important benefit to diabetics. The American Diabetes Association notes the importance of artificial sweeteners—including saccharin—in improving quality of life for diabetics. "Artificial sweeteners are 'free foods,'" says the American Diabetes Association in literature to diabetics. "They make our food taste sweet, but they have

17. Bill Durodié, "Poisonous Propaganda: Global Echoes of an Anti-Vinyl Agenda" Competitive Enterprise Institute, Washington, DC, July 2000.

18. See Angela Logomasini, "Blood Supply Besieged," *Washington Times*, A14, August 10, 2000, https://www.cei.org/gencon/019,01811.cfm.

19. Gang Sun and Jeffrey F. Williams, "Dressing to Kill: Incorporating Biocidal Agents into Textiles Gives Added Protection against Infectious Diseases," *Chemistry and Industry* 17 (1999): 658–71.

20. Dennis Avery, "Saving the Planet with Pesticides," in *The True State of the Planet*, ed. Ronald Bailey (New York: Free Press, 1995), 52–54.

21. Ibid., 74–76.

22. Ibid., 71.

no calories and do not raise blood glucose levels. … They can be added to your meal plan rather than substituted."[23]

- Mercury—a heavy metal that is often a target of environmentalists—is a key component of the amalgam fillings that have eliminated and prevented billions of toothaches during more than four decades of use.[24]

Disregarding such benefits, most of the key U.S. environmental regulatory statutes follow the lead of groups like Greenpeace, focusing on the elimination of chemicals without considering the dangers of not having these technologies. The Clean Water Act, for example, makes the unattainable pledge: "It is the national goal that the discharge of pollutants into the navigable waters be eliminated by 1985."[25] Although we can meet reasonable clean water goals, we can't meet a zero discharge without forcibly halting industrial processes that bring us lifesaving medicine, a safe food supply packaged to ensure that it will last, or even clothing. Likewise, regulations that the Environmental Protection Agency (EPA) issued under the Safe Drinking Water Act actually set zero as the goal for certain chemical contaminants in drinking water—something that is virtually impossible and is totally unnecessary for public health purposes. With such goals, drinking water standards for chemicals are extremely stringent. For example, one standard demands that drinking water not contain any more than 0.03 parts per *trillion* of a contaminant.[26] The high costs of such onerous standards mean that financial resources are diverted from other, more essential needs such as infrastructure upgrades and microbial contamination.[27]

Other statutes simply assume that because an industrial process uses chemicals it is somehow suspect. Under the Toxic Release Inventory (TRI),[28] firms must report all chemical

23. "Sugars and Artificial Sweeteners," American Diabetes Association, Alexandria, VA, http://diabetes.org/nutrition-and-recipes/nutrition/sweeteners.jsp, accessed November 27, 2007. As with so many chemicals, activists once tried to ban saccharin by claiming it was a carcinogen. That myth was dispelled in May 2000 when the Department of Health and Human Services announced that saccharin is not a human carcinogen. Despite that finding, activists complained when Congress eliminated the law that saccharin carry a cancer warning label. See Public Health Service, National Toxicology Program, *9th Report on Carcinogens 2000* (Washington, DC: U.S. Dept. of Health and Human Services, 2000), http://ntp.niehs.nih.gov/index.cfm?objectid=06F2C37B-F88F-23D5-468CA8B9F7C2827B.

24. Mercury has long been a key target of antichemical activists. However, in the early 1990s, public health providers and government researchers debunked claims about the dangers of mercury in amalgam fillings. The American Dental Association called such claims fraudulent, and some doctors had their licenses suspended and paid hefty legal compensation in cases where they had convinced patients to remove fillings on such dubious grounds. For a good overview of the case, see Stephen Barrett, "The Mercury Amalgam Scam," December 23, 1999, http://www.quackwatch.org/01QuackeryRelatedTopics/mercury.html.

25. 33 USC §1251(a)(1).

26. This is the standard for dioxin (see EPA's listing of drinking water standards at http://www.epa.gov/safewater/mcl.html). Dioxin is released into the air from both natural processes (such as forest fires) and industrial processes. Very low (and safe) levels find their way into most foods. For example, Ben & Jerry's ice cream contains 0.79 ± 0.38 parts per trillion of dioxin (see http://www.junkscience.com/dec99/benjerr2.html). Although dioxin is a key target of environmentalists, it has never been shown to cause any illness other than a skin disorder among very highly exposed individuals. See Michael Gough, "Reevaluating the Risks from Dioxin," *Journal of Regulation and Social Costs* 1, no. 3 (June 1991): 5–23.

27. See the policy brief titled "Safe Drinking Water Act Overview."

28. TRI is a program created by the Emergency Planning and Community Right to Know Act, 42 USC §§11001 et seq.

"releases," chemical uses, and processes that use chemicals. Environmentalists say this law encourages firms to reduce pollution. But not all releases constitute pollution,[29] and not all pose public health consequences. At question should not be whether firms use chemicals, but whether they use chemicals responsibly and what is gained in return. Firms can reduce chlorine in attempts to appease environmentalists, but are we willing to drink water swimming with microbial contaminants and give up life-saving pharmaceuticals?

This section of the *Environmental Briefing Book* will open with briefs on two fundamental areas in the risk debate. The first addresses allegations that chemicals are causing a cancer epidemic. The second addresses a newer debate: are chemicals disrupting our endocrine systems and thus causing developmental and reproductive problems? Following those briefs, is an overview of the science underlying methlymercury, which has garnered much news coverage in recent years. Other risk related statutes are found in their sections on water, pesticides, and air quality.

29. For example, releases include materials that have been recycled, chemicals that are properly disposed of in modern landfills, wastes safely managed at the site of a facility, and liquids (such as water) pumped from the ground and reinjected into the ground during oil drilling operations. Though none of these activities would constitute pollution to most people, TRI counts the movements of such materials as pollution. See the policy brief titled "Toxics Release Inventory."

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