The Chemicals Market Cannot Generate Green Chemicals Unless the Data Gap is Closed

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Abstract

The chemicals market is not a properly operating free market. Lack of publicly available information about the health and safety attributes of chemicals on the market – the Data Gap -- is making it impossible for those who buy chemicals to identify safer alternatives. When those who prefer green chemicals cannot identify and then purchase them, their demand cannot drive the market to supply green chemicals in favor of older, more hazardous chemicals. California has the capacity to take targeted steps to close the Data Gap, steps the state should take to foster a chemicals market that is capable of steadily innovating incrementally safer chemicals in response to market demand.

Comments

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The prospect of comprehensive chemicals policy reform by California raises many issues. I wish to call more attention to one particular issue that is not commonly explored in debates over the regulation of chemicals, although it is raised by Wilson, M. P., et al. "Green Chemistry in California: A Framework for Leadership in Chemicals Policy and Innovation," California Policy Research Center (2006) (http://coeh.berkeley.edu/news/06_wilson_policy.htm) ("the UC Report"). These comments are informed by my personal experience for over 15 years as an intellectual property attorney in the biotechnology industry and by my professional interest in the role of government in stimulating industrial innovation.

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One of the many lenses through which the UC Report views chemicals policy is the lens of the chemicals market. The UC Report clearly raises the following question:

> **Does the chemicals market, including the incentives provided by the legal and regulatory systems, adequately motivate industrial investment in green chemistry?**

The answer to this question, which the Green Chemistry Initiative must squarely face, has to be "no." To reach this conclusion, one need do little more than consider the following two facts brought forth in the UC Report:

- The 3,000 or so High Production Volume ("HPV") chemicals (those made or imported at over one million pounds per year) constitute more than 99% (by weight) of the chemicals in commerce in the U.S.

- Of today's HPV chemicals, only 248 (about 8%) were introduced after 1979 (when the original TSCA Inventory of chemicals then in commerce was created). See UC Report, at p. 43; National Pollution Prevention and Toxics Advisory Committee, "Broader Issues Workgroup Thought Starter," at p. 4 (October 6, 2005) (see http://www.epa.gov/oppt/npptac/pubs/documents.htm).

In other words, of the individual chemicals that together constitute over 99% by weight of the chemicals market, 92% were in the market 30 years ago. Of how many industries can it be said that its product line has changed so little in 30 years? The chemicals industry claims to be an innovative industry. If it is, it would seem that the industry is innovative not at developing new and safer chemicals, but mostly at finding new ways to use and formulate existing chemicals.

This low rate of replacement of existing commercial chemicals is remarkable in view of the prevailing recognition that many of these chemicals, and not just a few, are likely to constitute some type of hazard. Basic research over recent decades has shown that many chemicals have a wide variety of adverse effects that often emerge many years after very low levels of exposure (including carcinogens, mutagens, reproductive toxins, neurotoxins, immunotoxins and others). The Canadian government has recently completed a review of the 23,000 chemicals registered for commerce in Canada and, despite data gaps, was able to identify over 4.000 chemicals as of sufficient concern to warrant further study (see http://www.ec.gc.ca/substances/ese/eng/dsl/cat_index.cfm). The European Commission, in developing REACH, concluded that 70% of the chemicals evaluated under its new chemicals program between 1981 and 2003 were shown to have one or more dangerous properties. European Commission, *Extended Impact Assessment,* COM(2003)644 final, SEC (2003) 1171/3 (October 29, 2003) ("EC Extended Impact Assessment"), at page 27 (http://ec.europa.eu/enterprise/reach/docs/reach/eia-sec-2003_1171.pdf). While the data gaps make it difficult to estimate precisely what proportion of chemicals on the market are likely to present a threat to human health and the environment, it is also difficult to dispute the European Commission's conclusion that under the EU's regulatory system that preceded REACH (and closely resembled the U.S.

TSCA), a "significant proportion of all chemicals will enter the environment and reach sufficiently high concentrations to induce adverse effects." Id. In the United States and in California, we face this very same issue.

What can account for such slow innovation of safer alternatives despite the technological promise of green chemistry? One reason is that our regulatory system is ineffective at removing hazardous chemicals from the market or restricting their use. As the UC Report describes in detail, the Data, Safety and Technology Gaps undermine the effectiveness of both federal and California environmental statutes. The weakness of the regulatory system permits chemicals manufacturers and industrial users of chemicals to externalize the damage associated with their products, rather than incorporate the cost of that damage into the price of their products. Because society therefore bears these externalized costs, manufacturers have little incentive to develop safer alternatives.

Although not directly addressed by the UC Report, the Data Gap also compromises the efficacy of the tort liability system. Plaintiffs injured by toxic chemicals must prove that they were exposed to particular chemicals and that those exposures caused their injuries. This burden is impossible to carry when people are exposed to chemicals that no one knows are toxic. Even the product liability laws, purportedly grounded in strict liability, require proof that the product caused the damage, proof that cannot be provided when such information does not exist. Under both our tort and regulatory systems, then, damage simply lies where it falls when it is caused by hazards that are unrecognized because of the Data Gap.

But there is another reason, and that is the major focus of these comments. The Data Gap directly undermines the operation of the chemicals market and prevents it from operating as a properly functioning free market ought to act. While this issue is discussed in the UC Report (see UC Report at pp. 23, 37-55), it is worthy of a somewhat more detailed explanation. The thrust of these comments is also described in Guth, J., Denison, R. and Sass, J., "Require Comprehensive Safety Data For All Chemicals," Background Paper for Reform No. 5 of the Louisville Charter for Safer Chemicals (2005) (www.louisvillecharter.org) (to be published in 2007 in *New Solutions Journal*).

Over the last several decades, the field of information economics has demonstrated the crucial role of information in the proper operation of a market economy, and the serious economic consequences of "imperfect information" and "information asymmetries." For an overview of information economics, see Stiglitz, J. E., "Information and the Change in the Paradigm in Economics, Part 1," 47 *The American Economist* 6-26 (Fall 2003); Stiglitz, J. E., "Information and the Change in the Paradigm in Economics, Part 2," 48 *The American Economist* 17-49 (Spring 2004) (available at http://www2.gsb.columbia.edu/faculty/jstiglitz/papers.cfm). See also Stiglitz, J.E., *Globalization and Its Discontents*, pp. 73-74, 261n.2, W.W. Norton & Company, Inc. (2003).

In the language of economists, an ideally functioning free market is one in which consumers are free to buy the goods and services they desire, which are then produced by

the market according to the laws of supply and demand. But for demand to reflect what consumers truly value, consumers must have access to all information that would affect their choices. Without this information, the prices people pay for goods and services will not reflect their true preferences, and people will inadvertently buy goods and services they would not buy if they had more information. When this happens, the market is said to be "inefficient" because it is not producing goods and services according to the true desires of consumers. Lack of information causes a "market failure" by preventing the laws of supply and demand from driving the market to produce what people really want.

Information economists have focused on the damaging economic effects of what they call "imperfect information," including both nonexistent information and information that is available to some, but not all market actors. They have shown that imperfect information and the resulting market failures and economic inefficiencies are pervasive in all economies, including the U.S. economy. They have shown that the market itself often does not provide incentives for creation and disclosure of information and, to the contrary, often provides incentives for market actors to conceal information in order to gain market power and entrench themselves in the market. They also have shown that the market often simply cannot correct these market failures.

Government can take steps to correct this type of market failure in order to make the market more efficient, i.e., responsive to informed consumer demand. Government can require that the needed information be produced and made widely available to the market. Well-known examples of such government action include the securities laws (requiring accurate financial disclosures by public corporations) and the drug laws (requiring pre-market proof that drugs are safe and effective). These laws were adopted after serious threats to the proper operation of the financial and drug industries arose, threats that the market alone was unable to redress. Though these laws impose some burden on the affected industries and are by no means perfect, they have plainly strengthened those industries by making them more efficient in the economist's sense of being more responsive to the desires of investors and consumers, thus enabling the economy to produce financially stronger companies and better drugs.

Turning to the chemicals market, many market actors are capable of using chemical safety information when they buy products, including information about the hazardous properties of chemicals as well as how they are used and disposed of. Industrial users of chemicals in particular are often technically sophisticated enough to choose the safest chemical that will suit their purposes, if they can get the information they need. Similarly situated are many other market actors, including:

- public health professionals trying to evaluate and prioritize risks to the public;
- purchasing organizations including those created by hospital groups;
- state and local governments and others attempting to purchase safer products;
- green building and other green standard setting bodies;
- consumer organizations, and indeed many consumers, attempting to identify safer consumer products;

- health-affected groups, citizens and community groups attempting to use information provided by the right-to-know laws to reduce pollution in their communities;
- workers attempting to ensure safe workplaces; and
- environmental and public health activists trying to motivate corporations to green their activities through market-based environmental and health protection campaigns.

However, the Data Gap -- the pervasive lack of safety information in a publicly-available, credible and reliable form for the majority of chemicals in commerce -- is impeding their efforts. While market actors can sometimes avoid products they know are hazardous, the data gaps render them unable to choose products that they know are safer. They are at constant risk of failing to choose what is in fact the safest alternative and of unwittingly choosing a product that turns out later to be equally or perhaps even more hazardous than the chemical they avoided. Because they cannot accurately select and buy safer alternatives, the demand by these market actors for safer products is not being adequately expressed or realized in the market.

One often hears that some of these market actors, especially consumers, are incapable of understanding and actually using chemical safety data, so that making such data available to them would not drive the market toward safer chemicals. This argument ignores the fact that professional analysts often analyze complex information on behalf of market actors, who can then act on those analyses without necessarily understanding the information themselves. For example, most investors do not read the financial information made available to the market by individual companies – they rely on brokers, analysts and mutual fund managers to do so. In as similar recent example in the chemicals market, the Environmental Working Group has studied the ingredients of sunscreens and rated them for relative safety based on the information available about those ingredients (see http://www.ewg.org/node/21774). Clearly, readily available chemical hazard information would drive the large and growing demand for greener and safer products and would ensure that more chemical safety information would indeed be used by the market.

The Data Gap also prevents chemical manufacturers from innovating and marketing safer chemicals even when they want to. Innovation cannot occur unless a firm has the willingness, opportunity and capacity to change its technology, and information about technological alternatives is fundamental to these preconditions for innovation. See Ashford, N.A, "An Innovation Based Strategy for a Sustainable Environment," in Hemmelskamp et al. (eds.), *Innovation-oriented Environmental Regulation: Theoretical Approaches and Empirical Analysis*, pp. 67-107 (2000). Broad information about which chemicals are safe and which are toxic is the fundamental technological knowledge that would-be green chemists must have in order to design safer chemicals – without a full understanding of which chemicals are safe and why, green chemists cannot succeed. Moreover, when manufacturers are unable to fully understand and openly discuss the comparative safety of chemicals in the market, they cannot promote their own products as safer alternatives. Thus, even those who do sell safer chemicals cannot fully claim an

advantage in the marketplace, and indeed may not even know they have such an advantage. By preventing manufacturers from gaining any reward in the marketplace for safer chemicals, the data gaps reduce the commercial incentive to develop safer products and reduce industry investment in green chemistry.

There is also an asymmetry between pre-1979 and new chemicals (i.e., all chemicals introduced after 1979) that would seem to be causing even further distortion of the market. Though imperfect, TSCA does enable some opportunity for government scrutiny of newly introduced chemicals that does not apply to all older chemicals. This unequal playing field constitutes an additional regulatory preference for older chemicals. One of the explicit objectives of the EU's new REACH chemicals regulation is to level the playing field for all chemicals and eliminate the preference for older chemicals.

Some industry groups argue that the chemical industry possesses substantial chemical safety information that is not publicly available. But even if this is true, the mere existence of such information does the broader market no good. Information that is known by some market actors but not others is a type of imperfect information that causes market failures just as certainly as does nonexistent information. Information used by inside traders is an example.

Industry groups also often argue that the HPV Challenge Program is filling the Data Gap. (For a recent critique of the completeness and quality of the data being produced by this voluntary program, see Denison, R. "High Hopes, Low Marks," Environmental Defense (2007) (http://www.edf.org/pressrelease.cfm?contentID=6658)). However, this program *at best* will provide the OECD SIDS (Screening Information Data Set) data. The SIDS dataset is a far smaller data set than REACH will require for high tonnage chemicals. It is only a set of screening level data that, while perhaps useful as a long-overdue starting point for evaluating these chemicals, is not likely to be sufficient to allow regulation under current law. Nor does this screening level data permit a reasonable evaluation of the safety of the HPV chemicals for human health and the environment, which is what the market needs in order for demand to drive innovation of safer chemicals. (For a comparison of the SIDS data set and the REACH high tonnage data set, see Appendix to Guth, J., Denison, R. and Sass, J., "Require Comprehensive Safety Data For All Chemicals," Background Paper for Reform No. 5 of the Louisville Charter for Safer Chemicals (2005) (www.louisvillecharter.org) (to be published in 2007 in *New Solutions Journal*)).

In sum, the lack of credible and reliable publicly-available chemical safety information is dampening the influence on the market of the many social forces attempting to drive the innovation of the safer chemicals, and it is undermining the ability of industry itself to innovate those products.

Why should the chemicals industry strive as it does to maintain such a flawed market? Unfortunately, it is an all too common story. The chemicals market is a classic example of a market dominated by mature firms that seek to block changes that would encourage innovation and entry into the market of new competitors that will gain market share. See

Ashford (2000), cited above. Also, fear of liability and regulation that could result from proof their products are unsafe causes firms to perpetuate the information gaps and use them to protect their products and entrench themselves in the market. Thus, acting rationally in their self-interest, they resist actively studying the environmental health effects of their products, produce studies that all too often are designed to exonerate their products, resist independent study by others of their products and oppose measures that would encourage more information disclosure and foster innovation of safer substitutes by competitors. As a result, threats to human health and the environment can only be discovered too late, once chemicals become widespread throughout industry and the environment, and after the impacts have grown large, obvious, distinct and undeniable. If we seem condemned to struggle to protect the environment and human health by belatedly confronting substantial threats caused by entrenched and powerful industries, it is because our current chemicals market ensures that we are locked into this position.

One advantage of a government strategy of remedying a market failure by closing data gaps is that its relative cost can be low. In the case of the chemicals market, the cost of closing the Data Gap would constitute a minimal percentage of product prices. After all, information about a particular chemical only has to be produced once. The great bulk of existing untested chemicals must be dealt with only one time; thereafter the information requirements for new chemicals on an ongoing basis would become a much-reduced and manageable task. One estimate of the direct and indirect costs of compliance with the EU's October 2003 REACH proposal (and not just the data requirements) was less than 10 billion euros over an 11 year period, less than 0.15% of the chemical industry's sales revenue over that period. Ackerman, F. and Massey, R., *The True Costs of REACH*, Global Development and Environment Institute, Tufts University (2004). The cost of REACH as actually passed is estimated by the EC to be much lower (see http://ec.europa.eu/enterprise/reach/faq_en.htm#cost). See also a 2004 overview of 36 studies on the expected impact of REACH on business and European society (http://www.eu2004-reach.nl/downloads/Comprehensive_Overview-v2.pdf). Moreover, each dangerous chemical that is replaced or prevented from ever reaching the market would not damage human health or the environment or need to be cleaned up. The European Commission determined that the costs of its chemical information and other requirements for 30,000 chemicals under the 2003 REACH proposal were far outweighed by the benefits expected from reducing human disease. European Commission, *Extended Impact Assessment,* COM(2003)644 final, SEC (2003) 1171/3 (October 29, 2003) ("EC Extended Impact Assessment"), pp. 24-29 (http://ec.europa.eu/enterprise/reach/docs/reach/eia-sec-2003_1171.pdf). Most importantly, however, a chemical information requirement would underpin a marketplace that rewards innovation of safer chemicals and encourage creation of a sustainable, safer chemical industry. This industry of the future is what the EU is setting out to create by implementation of their REACH regulation. As the UC Report makes abundantly clear, without taking similar steps, California and the U.S. risk being left behind.

To remedy the market failures being caused by the Data Gap, California should require the chemicals industry to provide to the public and government a basic level of health and safety information about its products as a condition of entering and remaining in the

public marketplace. The information must be reliable and it must be comprehensive, that is, sufficient to permit the reasonable evaluation of the safety of chemicals for human health and the environment. It must be a firm, mandatory requirement that applies to existing as well as new chemicals. There must be an established deadline for provision of the required information for chemicals already on the market. The intellectual property value of the discovery of safer chemicals should be recognized while also providing for the public's need to know. Some government oversight of data quality may be required, but excessive intrusion into the industry development process should be avoided. These and other elements of a data requirement are discussed in more detail in Guth, J., Denison R. and Sass, J., "Require Comprehensive Safety Data For All Chemicals," Background Paper for Reform No. 5 of the Louisville Charter for Safer Chemicals (2005) (www.louisvillecharter.org), to be published in 2007 in *New Solutions Journal*.

While a federal program to close the Data Gap may have advantages, it is in California's interest and well within its capability to take meaningful, targeted steps toward closing the Data Gap that would significantly improve the operation of the chemicals market in California. There are many ways the State could target its efforts.

- California could focus on closing the Data Gap for chemicals sold at high volume within the State. The targeted chemicals could be further limited by targeting chemicals that also have a high volume within the United States to ensure chemicals bearing the burden of the information requirement have a national economic base.

- California could tier the required data sets according to volume in commerce, as in REACH.

- The required data sets could be structured as stepwise requirements wherein further data would only be required if warranted by reliable screening level data.

- The required data could be harmonized with other data requirements, such as those of REACH. For example, California could require that manufacturers of California high volume chemicals provide the REACH high volume data set to the state and the public.

- California may be able to devise more efficient and more useful tests than those employed by REACH. State entities such as California's Office of Environmental Health Hazard Assessment (OEHHA) have considerable expertise that the state could draw on to consider this possibility.

Conclusion

Green chemistry has enormous technological potential. But this potential will not be fully realized across the breadth of our economy unless the market motivates industry to

invest in green chemistry at a scale that is commensurate with both the industry's resources and with what is at stake for our society. This requires the market to provide commercial rewards to those who develop safer alternatives. The market cannot provide these rewards unless all those who demand safer chemicals are able to evaluate the safety of the chemicals in the market.

Established chemical companies will resist this analysis. Nevertheless, the Green Chemistry Initiative should envision and seek to foster a chemicals market that is capable of steadily innovating incrementally safer chemicals in response to market demand. It should seek to foster a market that looks like many other competitive markets in California, such as the electronics and biotechnology industries. In those evolving and competitive industries, the industrial sector itself remains strong even though individual companies regularly relinquish their market leadership and decline because they fail to remain on the cutting edge. The Green Chemistry Initiative should focus on the strength of the chemicals industry and on the needs of society as a whole, not the continued strength of existing dominant companies and their existing products.

The full success of green chemistry requires the Data Gap to be closed. California should take steps to close it.