Progress at Risk

Using the Precautionary Principle as a Standard for Regulatory Policy

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Environmentalists in Europe and America have a new weapon in their arsenal that is aimed at innovative technologies being developed for the betterment of humankind: the Precautionary Principle (PP). There is, in fact, no single formulation of the precautionary principle in universal use but, in short, it means: "No human technology should be used or introduced into the environment until it is shown to pose no threat of harm to humans or the environment" (Graham 1999). Proponents of the precautionary principle argue that using it to frame policy is common sense like the old adage "better safe than sorry."

In one form or another, the precautionary principle has been incorporated both in domestic legislation in Europe and America and in more than 12 international treaties, beginning in 1987 with the Ministerial Declaration of the Second Conference on the Protection of the North Sea, and in domestic legislation and regulations throughout Europe and North America (VanderZwaag 1999). Each of the 12 treaties defines the precautionary principle differently with variations due to the scope of activities covered and the strictness and specificity of the

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control measures demanded. Other treaties and declarations that have adopted the precautionary principle include: the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer; the 1992 Convention on Biological Diversity; the 1992 Climate Change Convention; the 1992 Treaty on European Union; the 1992 Convention for the Protection of the Marine Environment of the North-East Atlantic; the 1992 Helsinki Convention dealing with protection of the marine environment of the Baltic; the 1990 Bergen Declaration issued by ministerial representatives from European countries (as well as Canada); and the 1992 Rio Declaration on Environment and Development.

Proponents of the precautionary principle propose using it to frame regulations for numerous sectors of the economy, including the chemical, plastics, medical technology, and agricultural industries. Citing the precautionary principle, environmentalists have begun a sustained assault on the continued creation and widespread use of "artificial" or human-created chemicals in goods ranging from pesticides to industrial lubricants and from refrigerants to plastic softeners. They are also attacking the burgeoning fields of genetic engineering and biotechnology for medical and agricultural use.

While the precautionary principle may sound reasonable in theory, it would be disastrous if practised. One cannot prove a negative. Every food (including organic foods), product, and tool poses some risk of harm. Without the use of fire, automobiles, antibiotics, coffee, water, salt, and chlorine—to name just a few natural and human-created foods, applications, and tools—human life, in the words of the philosopher Thomas Hobbes, "would be nasty, poor, brutish, and short." Yet none of these would pass the standard set by the precautionary principle.

Among the flaws in the reasoning of the proponents of the precautionary principle, three stand out. First, the distinction between artificial and natural is an artifact of language having no basis in science. It harkens back to a pre-Darwinian view of humankind and their actions as separate from the "natural" world.

Second, proponents of the precautionary principle seem to cling to Barry Commoner's third law of ecology: "nature knows best" (Commoner 1971). This is not a metaphysical claim concerning nature as a conscious entity, though a few environmentalists may hold such a view, but rather a normative claim representing the view common among many environmentalists that the works and workings of nature absent human technological interventions are to be preferred or are "right" when compared to the world as shaped or affected by human actions. This view is subjective, having no basis in science, and, in reality, is rejected as a guide for living by all but perhaps the most extreme environmental radicals in their own lives. Few if any proponents

of the precautionary principle live in caves or refuse lifesaving medical interventions for themselves or their families. "Back to the Pleistocene," as one tee-shirt fashionable in some environmental circles proclaims, may make a nice slogan but it is not a popular political platform or a common lifestyle choice.

These errors lead to a third. Because human actions are artificial interventions that can interfere with nature's evolutionary processes, supporters of the precautionary principle focus their regulatory efforts on preventing type-II errors (i.e., the error of concluding that there is no effect—in this case a negative effect on human health or the environment—where an effect exists) to the exclusion of preventing type-I errors (i.e., the error of concluding that there is an effect where one does not exist).[1] On this view, preventing hypothetical or minuscule threats of future harm should take precedence in regulatory policy over actions to reduce existing dangers with known catastrophic consequences in the present.

How do these flaws play out in practice? Many environmental organizations, including Greenpeace and the Natural Resources Defense Council, citing the precautionary principle for support, argue that the government should end the use of chlorine in plastics, pesticides, and as a disinfectant in water. They argue that chlorine's use increases, even if only by one chance in a million over a lifetime, a person's risk of contracting cancer or of being born with birth defects. In calling for a ban on chlorine use, these groups ignore or heavily discount several important facts.

- Chlorine is an ubiquitous natural element found in more than 1,500 organic and inorganic compounds including plants, animals, salt, and human blood and saliva.
- Chlorine is used to disinfect 98 percent of the world's potable water and is a key ingredient in 85 percent of the medicines and pharmaceuticals.
- Phasing out the use of chlorine would cost more than $91 million in the United States alone and likely lead to millions of deaths worldwide from water-borne diseases like cholera and typhus.

No credible scientific research has shown an increased risk of cancer, developmental disorders, or other illnesses attributable to background levels of chlorine or chlorinated compounds and the largest study of the potential dangers of chlorine to date found the mere presence of chlorine in a compound does not necessarily make it uniquely toxic (Heartland Institute 2000).

Since chlorine is critical to many medicines and to water disinfection, it is doubtful that the proponents of the precautionary principle

will be successful in banning its use, at least in the near future. However, another chemical compound in widespread use is already being withdrawn from the market. On December 31, 1999, the European Commission banned phthalates, a family of six chemical compounds used as softeners in making vinyl flexible. They have been used with no ill effects for more than 40 years in numerous goods including toys, pacifiers, polyvinyl chloride pipes, electronic goods, siding, flooring, packaging, automotive parts, clothing, footwear, and blood bags and tubes.

Greenpeace International seized upon two sets of scientific studies to argue that phthalates could pose a threat of harm and thus ought to be removed from the marketplace as a precaution (Buckley 1999). Phthalates cause tumours in laboratory rats and mice when fed to the animals at extremely high doses for long periods of time. In addition, small amounts of phthalates leach from plastics and vinyl and are thus consumed by teething infants and small children when they place toys in their mouths and absorbed by patients on intravenous drips. In reaction to Greenpeace's publicity campaign and pressure tactics, almost immediately the European Commission banned the sale of certain toys, toy manufacturers stopped using phthalates in toys and pacifiers, and American toy stores pulled toys and pacifiers from their shelves.

Was this reaction justified by the evidence? Not at all. Forced feedings of high doses of phthalates over extended periods to animals with body chemistries more closely related to humans than rats and mice, including hamsters, guinea pigs and monkeys, did not cause tumours to form. Furthermore, despite 40 years of use, phthalates have never been linked to a single human illness, much less a death. Indeed, no recent studies on the issue found a risk of danger from phthalates. Rather:

- The United States Consumer Product Safety Commission reported in a study released in December 1998: "Generally, the amount [of phthalates] ingested does not even come close to a harmful level" (Dawson 2000: 4).
- The American Council on Science and Health, in a study chaired by former Surgeon General C. Everett Koop, found that the phthalate DINP "is not harmful for children in the normal use of these toys" (Dawson 2000: 4).
- A study by a Dutch Consensus Group stated that the possibility of a child's exposure exceeding the acceptable daily intake is "so rare that the statistical likelihood cannot be estimated on the basis of current data" and further found that the risk from phthalates was too small to justify a ban (Dawson 2000: 4).

- A study published in October 1999 by the journal Regulatory Toxicology and Pharmacology states that "the use of DINP in soft vinyl PVC toys and other children's products does not present a significant risk to children." (Dawson 2000:4)

Another factor dismissed by the European Commission when deciding to ban phthalates as a precaution is their usefulness, and their virtues in relation to possible substitutes or replacements. Phthalates are integral to polyvinyl chloride products. These products are durable, moldable, easy to keep clean, resistant to cracks or breaking, recyclable and relatively inexpensive. Medical professionals credit vinyl blood bags for keeping donated blood good for longer periods of time than other containers and this and other medical products have greatly reduced infection rates and the spread of diseases in hospitals. In contrast, alternative softeners to phthalates are more expensive and all contain additives, the toxicology of which has not been studied to the extent that that of phthalates has.

The facts concerning the value of phthalates and the lack of evidence of harm did not deter proponents of the precautionary principle from calling for a ban on their use in Europe and America because, after all, that is just what the precautionary principle is about: ending the use of products until they are proven harmless—technology is guilty until it proves itself innocent.

The proponents of the precautionary principle have focused even more attention on the agricultural industry than they have on the chemical industry. In particular, they have targeted the use of genetic engineering and biotechnology to produce hardier, disease-resistant and pest-resistant crops. They most recently demonstrated this at the United Nation's "Extraordinary Meeting of the Conference of the Parties," held to negotiate the terms of the Biosafety Protocol in Montreal in January 2000. At the behest of the supporters of the precautionary principle the draft language of the protocol stated: "Lack of full scientific certainty or scientific consensus regarding the potential adverse effects of a living modified organism shall not prevent the Party of import from prohibiting the import of the living modified organism in question . . ." (United Nations Environmental Program 2000: 32).

At the present time there is very little evidence to show that bioengineered crops pose a threat to human health or the environment. The United States is the world's leader in genetic engineering and the biomodification of crops. Biotechnological modifications have made tomatoes more resistant to cold, and soybeans, cotton, and corn immune to selected herbicides used to control weeds. More than 50 percent of the American soybean crop—parts of which end up in more than 60 percent of processed foods—has been genetically modified since 1995 (Jenkins 1999).

Though all genetically modified foods rate criticism from the supporters of the precautionary principle, corn genetically modified to carry the Bacillus Thuringiensis bacteria (Bt-corn) stands out among biotechnological crops for raising an alarm among scientists not aligned specifically with environmental organizations. Bt-corn was developed as a way of controlling the European corn borer, an insect that causes millions of dollars of losses to corn growers each year. Bt-corn effectively prevents corn borer infestation, reducing the need for costly pesticide applications. These characteristics gave it growing popularity among corn growers. However, in 1999, laboratory studies showed that should Bt-corn pollen drift out of the fields in sufficient amounts and fall onto milkweed plants on which Monarch Butterflies lay their eggs and upon which newly hatched Monarch caterpillars feed, the caterpillars die at a rate far above average (Milius 1999: 391).

This was enough evidence for environmentalists to call for an end to the use of Bt-corn. Several organizations threatened to call for a consumer boycott of companies that used Bt-corn in their processed foods. The reaction from the food industry was quick and affected more genetically modified foods than Bt-corn. In a preemptive move to avoid negative publicity from a boycott and a publicity campaign threatened by the Sierra Club and the United States Public Interest Research Group, baby food manufacturers Gerber and Heinz announced that they would stop using genetically modified crops in their products. Frito-Lay told its farmers that it does not want Bt-corn for use in its chips. Seagram said that its wines and spirits would be free of biotechnological crops (Ritter 2000). And, food processing and shipping giant Archer-Daniels Midland (ADM) instructed its farmers to segregate biotechnological crops from conventional crops.

However, the lead scientist involved in the research that found the link between Bt-corn and mortality among Monarch caterpillars indicated that it was far too soon to say whether Bt-corn posed a real threat to butterflies or other beneficial insects, much less humans. He stated, "Our study was conducted in a laboratory and, while it raises an important issue, it would be inappropriate to draw any conclusions about the risk to Monarch populations in the field based solely on these initial results" (Milloy 1999: 21). His caution had merit. Further research confirmed his laboratory findings but found little evidence that Monarchs faced a threat outside of the lab. Monarchs avoid laying eggs on milkweed plants surrounded by corn and, on milkweed plants in areas adjoining corn fields, they prefer to lay eggs on the upper leaves of plants rather than the lower leaves where corn pollen builds up. In addition, corn pollen found on milkweeds along the immediate edge of corn fields (50 grains/cm^2) was found at levels less than those used to pro-

duce caterpillar deaths in the laboratory (135 grains/cm^2) and this level fell to between 1 grain/cm^2 and 15 grains/cm^2 10 meters from the cornfield edge (Milius 1999). While more research is merited, when all the evidence is weighed it seems unlikely that Bt-corn affects Monarch caterpillar mortality outside in the field and there is no evidence that it poses any harm to humans. In light of these and other findings, ADM subsequently dropped its requirement that farmers segregate GM grain from non-GM grain (Fumento 2000: A24).

Because the absence of substantial evidence of harm has not stemmed the call for preemptive regulation of biotechnology and genetic engineering, more than 600 scientists signed a letter presented in Montreal to the Biosafety Protocol negotiators in which they argued that the precautionary approach "which demands that new technologies be proved absolutely safe before they can be used" necessarily ignores the very real dangers of doing without the new technologies (Consumer Alert 2000). A more progressive approach would balance the risk of introducing new biotechnologies against the much more pressing risks of hunger and poverty.

The scientists argued that genetically modified crops are the best hope for feeding the world's growing population. They went on to point out that there is no scientific reason to believe that the use of recombinant DNA techniques or other advanced biotechnologies inherently poses new or more dangerous threats to biodiversity, to other aspects of environmental quality, or to human health, than do traditional methods of plant breeding or cell culture. Their views were reinforced on April 5, 2000, when the National Research Council (NRC) issued its comprehensive report on genetically modified foods. The NRC researchers found that "there is no evidence suggesting [genetically modified food] is unsafe to eat." They went on to report that there is "no strict distinction between the health and environmental risks posed by plants genetically engineered through modern molecular techniques and those modified by conventional breeding practices" Associated Press 2000: 5A). As Holman Jenkins wrote recently, "biotechnology might go awry in 105 unexpected ways, but the result would be a nuisance rather than a catastrophe" (Jenkins 1999: A23). At least for the present, the concerns raised by the 600 scientists who protested the inclusion of the precautionary principle in the draft Biosafety Protocol convinced negotiators to strip that particular provision from the final version of the interim Protocol.

Why is all of this important? Approximately 800 million people do not currently get nutritionally adequate diets. Four hundred million people currently suffer from Vitamin A deficiency, including millions of children who go blind each year. The human population is growing,

especially in countries where people are already malnourished, and will probably plateau sometime in this century at between eight and nine billion people.

With approximately six million square miles under cultivation—an amount of land equal in size to the United States and Europe—the world currently produces more than enough food to feed the earth's six billion people. Malnutrition and the most famous instances of mass famine and starvation occur due to distribution systems that break down primarily during wars (civil and otherwise) or when starvation is used as a political tool under totalitarian regimes.

Most countries are becoming more open and democratic. And, in democratic countries, no longer fearing the iron boot of oppression, people demand higher standards of living. They look to the West and in many regards they want to live as well off as people in the developed world—this is natural. However, feeding nine billion people (and their pets) diets similar to those enjoyed by people in industrialized countries will require the production of approximately three times more food by 2050.

If all of the world's farmers adopted the best modern farming practices with high inputs of fertilizers and pesticides, it might be possible to double current crop yields on the same amount of land—but we need to triple yields to feed the coming generations.

Alternatively, if we went totally "organic," eschewing the use of "artificial" fertilizers, pesticides, and biotechnologies, we would have to double the amount of land under active cultivation. This would be disastrous for wildlife and native plants, as the lands most likely to be converted to agriculture are forests, rangelands, and other wildlands. Massive losses of biodiversity from land conversion for organic food production is especially likely since the relatively undeveloped tropics, the most biodiverse region on earth, is also where population growth is occurring and where hunger and malnutrition are most prominent.

There is a third option: the judicious use of biotechnology; being quick to regulate or end the use of products that are shown to cause harm.

Agricultural biotechnology is already improving lives. For instance, Dennis Avery of the Center for Global Food Issues at the Hudson Institute points to the success of the Rockefeller Foundation's "golden rice" project (Avery 1999). This genetically altered rice was modified to contain beta-carotene (which readily converts to Vitamin A) and new genes to overcome iron deficiency. The Rockefeller Foundation reports that golden rice is preventing thousands of cases of childhood blindness and reducing the amount of anemia suffered by more than 2 billion women in rice-dependent countries.

Technologies being tested include a biotechnological rodent contraceptive. Rodents consume substantial portions of the world's cereals and grains so reducing rodents' reproduction rates would increase the amount of food available for human consumption without increasing crop yields or land under cultivation.

Avery estimates that using bioengineered agricultural products already in existence, those currently being developed or tested, and those that are likely to be discovered, we could increase food production the three-fold needed for nine billion people to eat well—and all without increasing the amount of acreage in production. In addition, in its report on genetically modified foods the NRC concluded that any negative impact on non-target species, such as beneficial insects, is likely to be smaller than that from chemical pesticides. Indeed, the NRC found that using bio-engineered pest-protected crops in place of conventional crops with chemical pesticides could lead to greater biodiversity in some geographical areas.

Using biotechnology we can provide the world's future population with enjoyable, nutritionally adequate diets. Otherwise we cannot, at least not without arguably unacceptable environmental consequences. In the United States, biotechnological foods undergo careful review by three federal agencies before they are approved for use: the Food and Drug Administration, the Department of Agriculture and the Environmental Protection Agency. Turning our back on lifesaving, welfare-enhancing, thoroughly tested bioengineered products when there is ample evidence of the ills they can prevent and little or no evidence that they threaten any harm would irresponsibly condemn millions of people to unnecessary suffering and early deaths—that would be playing God with a vengeance.

Does this mean the precautionary principle has no utility whatsoever? Not at all. In the words of the Social Issues Research Center (1999), in Oxford, England, "If we apply the precautionary principle to itself—ask what are the possible dangers of using this principle—we would be forced to abandon it very quickly."

Note

1 Tickner 1997. For critical comments concerning the regulatory bias of the proponents of the precautionary principle in relation to type-I and type-II errors, see Cross 1996.

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