Urban Legend: Precaution and Cholera in Peru

RACHEL'S ENVIRONMENT & HEALTH NEWS #823 - Peter Montague & Tim Montague - August 4, 2005 - Anyone who is paying attention to the "precautionary principle" has heard the story that precaution caused a cholera epidemic in Peru in 1991. The story isn't true -- and it was revealed as untrue in 1992 -- but that hasn't stopped it from being told, retold, and told again. It has now taken on the characteristics of an urban legend with a life all its own.[1]

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The Precautionary Principle

As our readers know, the precautionary principle is a modern way of making decisions to minimize harm, which can be described in five parts:

(1) Set a goal by an open, participatory process;

(2) Examine all reasonable ways of achieving the goal, with the expectation that the least harmful way will be chosen;

(3) In the face of uncertainty, shift the burden of proof, giving the benefit of the doubt to nature, public health, and community well- being;

(4) Monitor results, heed early warnings and take further action, as needed, to prevent harm.

(5) Throughout, give a real "say" to -- and honor the knowledge of -- the people who will be

affected by the decisions.

Cholera in Peru in 1991

An epidemic of cholera occurred in Peru in 1991. Cholera is not a regular visitor to Peru -- the last such epidemic had occurred in 1867.[2] Nevertheless, cholera is a powerful killer disease, well-known to public health specialists, and no one takes it lightly. Cholera is characterized by high fever, awful abdominal cramps, and diarrhea so bad that it can readily kill its victim by dehydration unless the lost fluids are replaced.

Cholera can be prevented by putting disinfectants into drinking water supplies. Chlorine is the most common disinfectant, added to municipal water supplies to kill bacteria including the Vibrio cholerae bacteria that can cause cholera. But chlorinating water creates chlorination byproducts in the water, called trihalomethanes, which can cause cancer. In the U.S., with a population approaching 300 million, chlorination byproducts cause an estimated 700 cases of cancer each year.[3] Cholera, on the other hand, can kill thousands quickly if an epidemic gets started.

The Urban Legend of Precaution Causing Cholera in Peru

The "precaution caused cholera in Peru" legend goes like this: In 1991, as a precautionary measure, health officials in Peru stopped chlorinating their drinking water to avoid the danger of cancer from chlorination byproducts -- thus causing the deaths of thousands of Peruvians from an outbreak of waterborne cholera. As the legend has it, this was a case of "risk assessment gone wrong."[4] In other words, Peruvian public health officials balanced two hazards and made a bad choice: they turned off their chlorination systems to avoid a small problem, thus creating a much larger problem. That is how the legend goes.

Opponents of the precautionary principle -- mainly friends of the chemical industry -- seized upon the "cholera in Peru" legend and began to tell it and retell it at every opportunity.

In 2001, Henry I. Miller, a professor at Stanford University -- and a relentless opponent of the precautionary principle -- recounted the "cholera in Peru" legend as follows:

"By the late 1980s, radical environmentalists were attempting to convince water authorities around the world that carcinogenic byproducts from drinking-water chlorination might constitute a potential danger. Mired in a budget crisis, officials in the Peruvian government spun such allegations into the basis for discontinuing chlorination of drinking water in much of their country. That move contributed to the acceleration and spread of Latin America's 1991-1996 cholera epidemic, which killed at least 11,000 of its more than 1.3 million sufferers."[5]

In 2004, C.T. "Kip" Howlett, director of the U.S. Chlorine Chemistry Council, re-told the "cholera in Peru" legend this way:

"In Peru, in the early 1990s, public health officials responded to an antichlorine campaign by stopping proper chlorination of their drinking water. The results were predictable and horrific. Within months, a cholera epidemic swept through the country, eventually causing 1.3 million cases of illness and 13,000 deaths."[6]

It turns out that the "cholera in Peru" story is just plain wrong, and scientists have known it was wrong since 1992. Yet scholars like Henry Miller and Kip Howlett -- and dozens of others who are seeking ways to discredit the precautionary principle -- have continued to repeat it. As we shall see, one can only conclude that either these scholars are intentionally repeating a falsehood, or their scholarly methods are woefully deficient.

The "cholera in Peru" story got its start from a one-page "news" item that appeared in Nature magazine (the British equivalent of our Science magazine) in November 1991.[4] The report said (incorrectly, it turns out), "During the 1980s local water officials, citing the EPA studies of chlorine's cancer potential, decided to stop chlorinating many of Lima's wells." Lima is Peru's capital and largest city. Nature's reporter went on to declare this "a sobering case of risk assessment gone wrong" because the danger of cancer from chlorination byproducts is low but the danger of cholera from drinking water is high if the water contains Vibrio cholerae bacteria.

Eight months later, U.S. and Peruvian scientists debunked this incorrect report when they published a study of the Peruvian cholera epidemic in the British medical journal, Lancet.[7] Lancet is the British equivalent of the New England Journal of Medicine in this country, or perhaps the Journal of the American Medical Association. In any case, Lancet is a scholarly powerhouse in the medical world, so articles published there gain wide readership.

The main author of the 1992 Lancet study was David L. Swerdlow, now at Emory University in Atlanta. Lancet chose to highlight the Swerdlow study with a companion editorial.[3] The editorial began with this statement: "The report by Swerdlow and colleagues in this issue should put an end to two rumours about the cholera epidemic that began in 1991 in Peru." It went on: "The second rumour, reported in a news item in Nature last year, is that lack of chlorination of many water supplies in Peru was a deliberate decision by the authorities, and was based on studies by the US Environmental Protection Agency showing that chlorine may create a slight cancer risk by reacting with organic matter in water to form trihalomethanes."

In other words, Lancet said in no uncertain terms in 1992 that the cholera outbreak did not result from a deliberate decision by health officials. Yet Henry Miller says in 2001 the epidemic was caused by Peruvian officials "discontinuing" chlorination. and Kip Howlett says in 2004 the cholera epidemic was caused by Peruvian officials "stopping proper chlorination."

Professor Miller further embellished the legend by claiming that Peruvian officials had stopped chlorinating water "in much of their country" although the original news item in Nature had said only that authorities had "decided to stop chlorinating many of Lima's wells." Dr. Miller's scholarship created a pile of rich organic fertilizer to help the legend thrive.

The Swerdlow study revealed that the causes of the cholera epidemic in Peru were far more complex that Miller and Howlett would have us believe. Here are some of the causes the Swerdlow study identified:

(a) the absence of water chlorination systems (or other water disinfection systems) in most of Peru;

(b) people tapping into water lines clandestinely to run a pipe into their homes, closing any leaks by stuffing paper and plastic into the cracks, thus providing ways for bacteria to enter the water-distribution system;

(c) local farmers illegally tapping into sewage lines to irrigate their vegetable crops (cabbage, lettuce, carrots) with raw sewage;

(d) low water pressure or no water pressure (when the pumps are turned off, or electrical systems fail), allowing contamination to siphon back into water pipes;

(e) the absence of sewage systems in many communities;

(f) a majority of families storing water in barrels because water delivery systems are intermittent or non-existent in poor neighborhoods, with many people immersing their hands and arms in the barrels to draw water, thus spreading bacteria to their families.

Even though the false story of cholera in Peru was debunked in Lancet in 1992, the legend suited the needs of those who oppose the precautionary principle, and it took on a life of its own. As we have seen, leading scholars and ideological opponents of precaution have fabricated new fictitious elements of the story in the retelling.

In June, a new study of the "precaution caused cholera in Peru" story was published in the journal Risk Analysis.[8] In it, authors Joel Tickner and Rami Gouveia-Vigeant have made substantial efforts to discover whether any Peruvian officials actually stopped chlorinating water -- for precautionary purposes or for any other reasons. They could find no evidence that such a thing occurred.

The new study adds considerable new information to our understanding of the conditions that gave rise to the cholera epidemic in Peru in 1991. It may have started with contaminated fish, which are often eaten raw in Peru. And it seems that global warming may have created conditions in Peruvian coastal waters that allowed the Vibria cholerae bacteria to thrive and proliferate.

Once cholera took hold in the population, poor sanitation was no doubt the major cause of the epidemic. For example, a hospital in the city of Iquitos, where thousands of cholera patients were treated, dumped its untreated sewage into the Belen river upstream from the city's drinking water intake. (Some U.S. cities have similarly non-sensical relationships between sewer pipes and water intake pipes, but they can afford to disinfect their water, killing the bacteria thus introduced.)

Tickner and Gouveia-Vigeant learned that the head of the Lima water treatment system was not worried about chlorination byproducts compared to the risks of cholera, and he never stopped chlorinating Lima's water. Indeed, Peruvian authorities actively encouraged chlorination of water systems, as well as the use of chlorine pills by individuals to disinfect their drinking water. The Peruvian cholera epidemic of 1991 -- which eventually spread to 19 other countries in Latin America -- was caused by an inadequate public health infrastructure that proved unable to control a known hazard -- microbial contamination of water supplies.

But What if the Legend Were True?

Finally, let's ask ourselves: if Peruvian officials HAD stopped chlorinating their water supplies to prevent cancer from chlorination byproducts, would this demonstrate that the precautionary principle is a bad decision-making technique?

Not at all. It would demonstrate that humans are capable of making mistakes no matter what decision-making technique they employ. The question is, "Can your decision-making technique detect and correct errors?" The precautionary approach can do both these things.

Even if someone makes a bad decision using the precautionary approach, it is still a good idea to try to avoid harm by setting goals, examining all available alternatives for reaching the goals, and choosing the least-harmful way. If you made a misjudgment in selecting the least-harmful way, vigilant monitoring and follow-up would reveal your error and you would naturally revisit your original decison.

In sum, if you mistakenly turned off your water chlorination system to avoid a danger from cancer, as soon as you observed cholera spreading, you would turn your water chlorination system back on -- revealing that the precautionary approach is robust in the face of human error, and a sensible way to make decisions under conditions of uncertainty.

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[1] For a definition of an urban legend, see http://www.snopes.com/info/glossary.asp

[2] Imogen Evans, "Cholera on the Rocks," Lancet Vol. 341, No. 8840 (Jan. 30, 1993), pg. 300. Available at http://www.rachel.org/library/getfile.cfm?ID=539

[3] Lancet Editors, "Of Cabbages and Chlorine: Cholera in Peru," Lancet Vol. 340, No. 8810 (July 4, 1992), pg. 20. Available at http://www.rachel.org/library/getfile.cfm?ID=543

[4] Christoper Anderson, "Cholera epidemic traced to risk miscalculation," Nature Vol. 354 (Nov. 28, 1991), pg. 255. Available at http://www.rachel.org/library/getfile.cfm?ID=540

[5] Gregory Conko and Henry I. Miller, "Precaution (Of A Sort) Without Principle," Priorities for Health Vol. 13, No. 3 (Nov. 1, 2001), unpaginated. Available on the web site of the Competitive Enterprise Institute (http://www.cei.org/gencon/019,02243.cfm) and at http://www.rachel.org/library/getfile.cfm?ID=544

[6] William Schulz, "The many faces of chlorine; Howlett and Collins square off about one of the most evocative chemicals," Chemical & Engineering News Vol. 82, No. 42 (Oct. 18, 2004), pgs. 40-45. Available at http://www.rachel.org/library/getfile.cfm?ID=542

[7] David L. Swerdlow and others, "Waterborne Transmission of Epidemic Cholera in Trujillo, Peru: Lessons for a Continent at Risk," Lancet Vol. 340 No. 8810 (July 4, 1992), pgs. 28-33. Available at http://www.rachel.org/library/getfile.cfm?ID=541

[8] Joel Tickner and Tami Gouveia-Vigeant, "The 1991 Cholera Epidemic in Peru: Not a case of Precaution Gone Awry," Risk Analysis Vol. 25, No. 3 (June, 2005), pgs. 495-502. Available at http://www.rachel.org/library/getfile.cfm?ID=545

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