



Testing Pesticides On People: Is It Moral? Is It Useful?

The issue of testing pesticides using human subjects has created one of the most explosive environmental debates to arrive in Washington in years. Although the National Academy of Sciences had given a green light to such testing, the Environmental Protection Agency abruptly canceled a proposed pesticide exposure study involving children when Democratic senators threatened to block the nomination of Stephen L. Johnson as EPA administrator last April unless the research was abandoned.

The study — called CHEERS, for Children’s Health Environmental Exposures Research Study — would have paid some 60 families in Duval County, Florida, who use pesticides and cleaners in their homes \$970 a month to allow researchers to monitor their health to obtain “real world” exposure information. Part of the controversy came from concerns that poor parents were, in effect, being “bribed” into intentionally dosing their children. Part of it came from the fact that funding for the study was augmented by \$2.1 million from the industry.

Last summer Congress mandated new EPA regulations, insisting on a ban on testing of

children, infants, and pregnant women. The legislators meanwhile placed a nationwide moratorium on human testing and put EPA under a strict schedule on the rulemaking. The agency is limited to a 90-day comment period and must publish a final rule by February. Until the blowup last spring, EPA had been considering data on a case-by-case basis since 2003, after the industry won a court battle against a Clinton administration prohibition against human volunteers .

EPA introduced a proposed rule in September setting standards for intentional dosing studies submitted by industry to the agency and also those conducted by industry or academic researchers for their own purposes. Unlike CHEERS and other observational studies, intentional dosing research is usually aimed at discerning the lowest level at which effects are seen. Representative Hilda L. Solis (D-California), one of the sponsors of the congressional moratorium, comments on the controversy and the proposed rule in this FORUM. Although we invited EPA to join the debate, a spokesman for the Office of Prevention, Pesticides, and Toxic Substances said the agency would not be able to participate.



Lisa M. Campbell
Founding Shareholder
Bergeson & Campbell, P.C.

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University at Buffalo

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Henry I. Miller
Fellow
Hoover Institution
Competitive Enterprise Institute

“False positives in the animal testing of various kinds of products, including pesticides, can force companies to forego the introduction of perfectly useful and safe products into the marketplace.”



Representative Hilda L. Solis
Ranking Member
House Energy and Commerce
Subcommittee on Environment and
Hazardous Materials

“The proposed rule, despite its claims, allows intentional testing on pregnant women and children. . . . These exceptions occurred despite the clear congressional mandate that all [such] testing is prohibited.”



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President and Chief Executive Officer
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“Anti-pesticide activists often argue that human clinical studies are undertaken only because there is an expectation that human data will make pesticide use less restrictive. This is clearly not the case.”

THE FORUM

Rhetoric That Hides The Issues At Stake

LISA M. CAMPBELL

The debate over whether human data should be used to assess potential risk from chemical products, and in particular pesticide products, has been raging for at least seven years.

Before it became controversial in the late 1990s, EPA routinely relied on studies of human subjects for some pesticide products and many other substances, and, in fact, acknowledged, along with many other government agencies and other scientific entities, the superiority of such studies in evaluating potential risks to humans.

The current controversy intensified when on July 26, Congress added language to the fiscal 2006 EPA appropriations bill that imposes a moratorium on EPA's ability to consider human testing for pesticides until it issues a final rule, no later than January 29, 2006. Although EPA has taken great pains to address the difficult scientific, programmatic, and ethical issues, the proposal is not likely to end the debate anytime soon. This is particularly so because EPA has proposed that its rule apply only to pesticide products, rather than making the proposal more broadly applicable to all products and substances regulated by EPA, as it had earlier planned to do.

Critics of the pesticide industry fear the proposal does not sufficiently discourage tests involving humans. Many in the pesticide industry, although supportive in general, since the proposed rule fundamentally accepts the premise that such tests when ethically conducted are useful in making pesticide regulatory assessments, are concerned that the proposed rule and the debate itself ignore the facts regarding the conditions of human testing and instead are driven by inflammatory rhetoric

that simply does not reflect the realities of the issues. This concern is heightened by EPA's focus on pesticides only, which leads to an incorrect and misleading conclusion that pesticide products somehow pose different and more challenging ethical issues than other types of products, when the reality is that the pesticide products, like other chemical products, provide many societal benefits and, in fact, are often composed of the same chemicals that make up other non-pesticidal products, such as drugs.

EPA has utilized human data for decades, and has readily acknowledged a scientific preference for such studies. However, EPA's new procedures might apply to thousands of studies regarding hundreds of pesticides and, potentially, other substances, not just those that were initially the focus of the controversy — dosing studies conducted in laboratory clinical settings to establish the bounds of toxicity. This change could potentially subject to regulation studies of products in use that involve products already marketed and approved by EPA and to which many are now routinely exposed and that are ill-suited to the proposed rule requirements.

For example, the new rule could apply to tests of insect repellents as they are used in accordance with label directions, when they are used by humans in this manner routinely. Likewise, hundreds of household cleaning products are considered pesticides if they make disinfectant claims; yet humans use these products in their daily lives and are exposed routinely to them.

An EPA rule that applied broadly to studies of approved and marketed products would be unworkable and is unnecessary. When pressed, EPA has been unable to estimate the number of products to which the rule as proposed may apply, which is itself troubling, and may result in eventual regulatory impact challenges (e.g., Small Business Regulatory Flexibility Act).

This unnecessary and problematic potential regulatory expansion can be addressed if EPA carefully

and explicitly articulates that the proposed rule applies only to the clinical laboratory studies that have been the focus of the controversy and does not apply to studies of products used in accordance with label directions, even if the study conditions are otherwise controlled by the researchers conducting the study. Such "product-in-use" studies number in the many thousands and provide invaluable information. This information is critical for EPA, society, and manufacturers to assess exposures of those using the products.

Tests involving human subjects have improved EPA's estimates of risk — in some cases making standards more stringent. To forbid their use would only make EPA risk assessments less precise and less scientifically sound (and in some cases, less protective than they would be otherwise). These are just a few of the issues that have framed the debate over the years, and EPA's forthcoming proposed rule raises many others. The resolution of this debate will have a profound impact not only on pesticide products, but on risk assessment principles generally, especially regarding the appropriateness of tests conducted using children or other sensitive subpopulations.

The rules should not be radically different for tests involving pesticides than for other products, such as drugs, chemicals, household cleaners, cosmetics, and related products, when often the same chemicals can be used for many different categories of products; there is no scientific or ethical basis for making such a distinction.

Lisa M. Campbell is a founding shareholder of Bergeson & Campbell, P.C., a Washington, D.C., law firm focusing on chemical, pesticide, and other specialty chemical product approval and regulation; health and safety law; chemical product litigation; and associated business issues. The views expressed in this column are solely those of the author. She was assisted in the preparation of this article by James V. Aidala.

THE FORUM

Rule Violates The Nuremberg Code

AARON COLANGELO

The pesticide methoxychlor is a chemical cousin of DDT that is toxic to the nervous system. In a 1970 study, researchers intentionally dosed 16 prison inmate “volunteers” with this pesticide and then examined tissue from their testicles and bone marrow to evaluate the chemical’s effects. In another human study, conducted just last year, college students were paid \$15 an hour to be placed in a chamber and gassed with a chemical fumigant for up to one hour on several consecutive days. About 10 percent of the subjects in the fumigant chamber reported adverse effects that were severe enough to “interfere with activities of daily living or sleeping.”

For obvious reasons, many people find these and other tests of pesticides on people to be repugnant. However, chemical manufacturers have been fighting to have EPA use human chemical tests when deciding whether certain weed and bug killers are safe. The manufacturers’ goal is simple: weaken safety measures by claiming that human tests show a pesticide to be less harmful than other evidence indicates.

A law adopted in August 2005 requires EPA to establish standards for human testing with toxic chemicals and insists that the rule comply with minimum ethical guidelines. In particular, EPA’s rule must be consistent with the principles of the Nuremberg Code, among other enumerated ethical touchstones. The Nuremberg Code, developed after the war crimes trials following World War II, is a bedrock declaration of the basic ethical standards necessary to guard against unscrupulous human research.

EPA recently proposed a rule

in response to the new law, but regrettably endorses the systematic testing of pesticides on human subjects. EPA’s proposal gives a green light to the chemical industry to conduct laboratory experiments that intentionally expose people to pesticides in order to weaken safety standards. The rule falls far short of the ethical principles in the Nuremberg Code, as well as many other legal, ethical, and scientific standards.

For example, the Nuremberg Code states that the voluntary consent of test subjects to participate in a study is “absolutely essential.” The subject must have the legal capacity to consent, and must be able to exercise “free power of choice” without any element of duress. However, EPA’s rule authorizes certain pesticide tests on children, even if a child’s capability is “so limited” that he or she “cannot reasonably be consulted” to assent to the test. EPA also fails to adopt specific protections for research on prisoners, despite the clear element of duress inherent in research on inmates. These and other provisions in the rule impermissibly allow testing on vulnerable people who cannot provide true informed consent, in violation of the first and most important principle of the Nuremberg Code.

The Nuremberg Code also declares that experiments must avoid all unnecessary physical harm and mental suffering. EPA’s rule violates this requirement by proposing to accept existing human tests even if they were intended to cause harm. Specifically, for tests that are either underway or already completed before EPA finalizes its rule, the agency may accept those tests as long as they were not “intended to seriously harm participants” or otherwise “fundamentally unethical.” The Nuremberg Code requires researchers to avoid all unnecessary harm, not just “serious” and “intentional” harm.

Moreover, the Nuremberg Code requires that the degree of risk in an experiment should never exceed the “humanitarian importance” of the problem to be solved,

and demands that the information sought be “unprocurable by other methods or means of study.” Yet intentional human pesticide tests have no humanitarian importance, because they are unnecessary in light of other available research approaches. EPA can regulate pesticides by examining epidemiological research, animal tests, and other laboratory studies, as it has for decades. Furthermore, unlike pharmaceutical tests that hold out the promise of therapeutic benefit to the test subjects themselves — and to society at large — pesticide human studies are conducted by the industry for private financial gain only. Therefore, no risk is acceptable, because no humanitarian goals are served.

EPA has the responsibility to restrict, rather than facilitate, chemical industry tests on people. With the manufacturers’ enormous profit motive in the mix, EPA’s acceptance of these human tests raises the specter of ethical abuses at the expense of the poor and politically powerless — the people who often participate in industry’s human experiments. Under EPA’s proposal, economic coercion will induce low-income and vulnerable people to endure the significant health risks of unnecessary chemical tests.

Aaron Colangelo is a Staff Attorney at the Natural Resources Defense Council in Washington, D.C.

THE FORUM

The Ethical Bar Drops To Unacceptable

ALAN H. LOCKWOOD

Pesticide manufacturers have conducted more than twenty intentional dosing experiments in which humans were given pesticides in order to measure their toxicity. More are on their way. Although research involving human participants has been a critical component of medical progress, it is essential that this research adhere strictly to sound ethical principles, including beneficence, informed consent, and an appropriate balance between risks and benefits. EPA is making rules to regulate these tests. Unless there are drastic changes in the proposed rules, the agency will fail to create a sound scientific and ethical framework for past and future tests.

The World Medical Association's Declaration of Helsinki, the global medical ethics standard, states that human research must seek to improve treatments and the understanding of disease and that the welfare of the subject must take precedence over science and society. The toxicity tests in question fail to meet these requirements. These studies appear to be motivated by the economic threat posed to the \$12-billion U.S. pesticide market by a provision in the Food Quality Protection Act, passed unanimously by Congress in 1996 after studies showed that infants and children were exposed to dangerous levels of pesticides. EPA regulates pesticides by establishing tolerances, the legal amount of a pesticide in food.

Pre-FQPA tolerances were set by dividing the "no adverse effect" dose in an animal by two factors of 10: an interspecies factor accounts for the possibility that humans are more susceptible to pesticides than animals, and another accounts for individual differences among peo-

ple. The FQPA added a children's protection factor of 10. Industry-sponsored testing is designed to eliminate the interspecies safety factor by showing that humans may be less sensitive to pesticides than animals. This would negate the child-protective effects of the FQPA and, not coincidentally, convey an enormous financial benefit to manufacturers. Reversion to a state where children are regularly exposed to excessive amounts of pesticides is unacceptable.

Federal regulations that protect research participants classify children and pregnant women as vulnerable populations deserving special considerations. There are many reasons for this: children are unable to give consent; developing organs are highly susceptible to the effects of toxins during windows of vulnerability; immature enzymatic and immune systems are unable to cope with adult stressors; and differences in food, water, and air requirements contribute to the dictum of pediatrics that children are not just little adults.

Although the introduction to the proposed rules seems to preclude toxicity testing in children and pregnant women, numerous loopholes cloud the issue. The agency goes out of its way to create mechanisms by which "neglected or abused children" might be included in tests. Another provision allows the deliberate dosing of children when the research "is crucial to the protection of public health." What are the boundaries? Does this mean that a manufacturer might claim an exception because the product will improve crop yields and help feed more people? These and other loopholes must be closed. The agency should preclude all testing involving pregnant women and children — with no exceptions.

The proposed rule deals only with studies intended for submission to EPA. There appears to be nothing to stop a manufacturer from conducting a study without this intent (wink, wink), then reversing course once results were known. In addition, protections

for children and others studied outside the United States are inadequate. There should be one high standard applied to all human studies, as envisioned by the Helsinki Declaration.

There is also a substantial controversy over what to do with the results of over 20 completed studies that have been submitted to the agency. I have reviewed six of them in great detail. They are all flawed by serious ethical or scientific deficiencies, or both. All enrolled too few subjects to be statistically valid — some enrolled as few as six subjects. (Remember, Vioxx was tested on thousands and used by millions before it was withdrawn because of drug-related complications.) Consent forms were inadequate — one implied that ingesting the broad-spectrum organophosphate insecticide chlorpyrifos would enhance mental performance. The methods and endpoints of the studies were inadequately chosen to detect minimal effects. The proposed rule would allow the agency to rely on these data unless the studies were "fundamentally unethical" and "intended to seriously harm" participants. This lowers the ethical bar to an unacceptably low level.

EPA's mission is to protect human health and the environment. It should seize this moment to become a leader in the important task of adopting contemporary ethical and scientific principles as it engages in this important rule-making task.

Alan H. Lockwood, M.D., is Professor of Neurology and Nuclear Medicine at the University at Buffalo. He serves as the Chair of the Institutional Review Board, Veterans Administration, Western New York Healthcare System, and Chair, Environment and Health Committee, Physicians for Social Responsibility, Washington D.C.

THE FORUM

The Real Pests In The Human Testing Debate

HENRY I. MILLER

The politicians and demagogues (by no means mutually exclusive groups!) are at it again — this time over a little-used but vitally important risk assessment procedure: the use of data on human exposure to certain pesticides before they are introduced into the marketplace.

The testing and government licensing of chemicals, including pharmaceuticals and pesticides, require voluminous data. The better the quality and quantity of the data available to regulators, the more certain they can be of potential risks to human health and the environment.

But all data aren't created equal. Toxicologists, physicians, and other scientists agree that in choosing appropriate analyses and studies to be performed, there exists a hierarchy of value of data that can be obtained from various sources and techniques: These are, in ascending order of value, physico-chemical analyses and cell-free assays; cell and organ culture; toxicology studies in animals; and human testing.

Animal testing is a useful part of modern biomedical research and development, but its ability to contribute to our understanding of the risks of products or processes is limited. As public health expert and president of the prestigious American Council on Science and Health, Dr. Elizabeth Whelan is fond of saying, "A mouse is not a little man"; in other words, knowledge gained from rodent studies is not directly, automatically applicable to humans. Not only is there the difficulty of extrapolating findings from laboratory animals to humans (including both false positives and false negatives), but such studies also necessitate exposing animals to many times the level of the substance that would ever be

encountered by humans in normal use of the product.

False positives in the animal testing of various kinds of products, including pesticides, can force companies to forego the introduction of perfectly useful and safe products into the marketplace (or to undertake unnecessary efforts to eliminate chemicals from the environment).

If we foreclose the possibility of data on humans, inevitably we will decrease the confidence of any quantitative conclusions we might draw. The quality of our judgments about safety and risk will suffer, we will make more regulatory mistakes, and public health will be compromised.

A perfect example is a pilot study that EPA had planned in order to monitor in infants and babies the exposure and levels of various common pesticides during normal household usage. The worthy goal of the purely observational study, which was to ascertain whether such routine applications can result in potentially toxic levels of pesticides, would both have benefited the subjects and provided important information to government and industry scientists. However, a handful of Democratic politicians forced EPA to cancel the study, claiming that it required the deliberate spraying of infants with pesticides, with their parents receiving money and other remuneration from the government — gross and repugnant misrepresentations.

In certain situations, animal testing and other analyses cannot provide the data needed to demonstrate that a pesticide can be used safely with no adverse impact on man or the environment. Responsible scientists, as well as an analysis by the National Academy of Sciences, concur that in those situations, clinical studies of volunteers that adhere to strict ethical standards are permissible to provide essential information and pose little risk to participants. The academy endorsed such studies because they can improve "the accuracy of the science employed in regulatory decisions" and provide

an important "societal benefit."

Certainly, in the case of already-conducted, scientifically valid studies, to exclude the use of these data would be an outrageous travesty. Vital information already produced and left unused would not only be wasteful but unethical and irresponsible. Only the most intransigent ideologue would disagree, so the real debate must focus on the prospective use of human studies in which human subjects are intentionally exposed to pesticides.

This might sound like a drastic kind of intervention, but everything considered to be a "pesticide" is not highly toxic — think of hand sanitizers or household disinfectants, for example — and may be only minimally toxic to non-target organisms, such as mammals. Moreover, the studies would be conducted under medical supervision and with full informed consent, and could only be performed when an independent review board agrees that they are essential. These safeguards are intended to ensure that there will be minimal risk.

Members of Congress and others who indulge in demagoguery about the performance of essential pesticide studies in humans increase the risk of pestilence and disease. They compromise the ability of regulators to obtain the most accurate and comprehensive information about possible risks to humans, inhibit innovation, and limit the tools available to control pests. Their actions are unconscionable and insupportable. For those of us who believe that science and common sense should dictate public policy, they are the biggest pests of all.

Henry I. Miller, a physician and molecular biologist, is a Fellow at the Hoover Institution and the Competitive Enterprise Institute. He was an official at the National Institutes of Health and the Food and Drug Administration from 1977 to 1994. Barron's selected his latest book The Frankenfood Myth: How Protest and Politics Threaten the Biotech Revolution as one of the 25 Best Books of 2004.

THE FORUM

Public Health vs. Industry Interests

HILDA L. SOLIS

As Members of Congress, it is our job to ensure that the health of our constituents is being protected, not exploited. That is why I offered an amendment to stop the practice of testing pesticides on humans for one year to the Interior-Environment Appropriations Act for Fiscal Year 2006. I believe that humans — especially pregnant women and children — should not be testing grounds for efforts by the pesticide industry to relax regulations designed to protect public health.

The industry argues that the testing of pesticides on humans is actually meant to improve mosquito repellents and make better swimming pool disinfectants. If this was the only intent, then I challenge them to explain why EPA is currently reviewing more than 20 studies which, rather than being designed to improve the quality of human life, have an insidious purpose.

For example, in one study, college students in San Diego who were paid \$15 an hour to participate were not informed that the pesticide they were inhaling was a suspected neurotoxicant and a World War II nerve gas. In these studies, men, women, or children swallowed insecticide tablets, had pesticides sprayed in their eyes or their noses, or sat in chambers exposed to pesticides. These arguably unethical, dangerous, and sometimes unscientific studies are currently being reviewed by EPA as a means for relaxing regulatory standards on pesticide use.

Unfortunately, studies like these prove that the pesticide industry is more concerned about designing outcomes which can be used to weaken regulations put in place by the Food Quality Protection Act in 1996 than about protecting

public health and improving the quality of life. This motivation, the abysmal track record of the Bush administration in handling this situation, and the serious ethical and moral questions involved are why I continue to fight for the public interest over the interest of the pesticides industry.

I am especially concerned that the administration's proposed rule fails to meet its congressional mandate and to provide the safety that Americans desire and deserve. For example, the proposed rule, despite its claims, allows intentional testing on pregnant women and children in at least three circumstances. It states EPA will accept human studies if they are necessary for the "protection of public health" — a standard which is undefined and which encourages testing on pregnant women and children with the hope that the test will be accepted by EPA. It allows tests which expose pregnant women or children to food sprayed with pesticides up to the current limit, despite lacking evidence that the current limit is protective of children. It also allows tests which were done on pregnant women and children so long as the original intent of the study was not for consideration by EPA. These exceptions occurred despite the clear congressional mandate that all testing on pregnant women and children is prohibited.

Second, the proposed rule only applies to instances where a pesticide company intends to submit the rule to EPA for review, thereby allowing testing without safeguards to occur on humans in all other instances. Third, the proposed rule encourages non-compliance with its own standard. By requiring that studies only "substantially comply" with the rule, the proposal signals that EPA will not demand strict adherence to ethical standards. These are only three of the many problems in the proposed rule which need to be worked out in favor of public health before the U.S. government accepts that human testing of pesticides is an ethical and moral practice.

Under this process, the U.S. government is for the first time proposing a rule that authorizes the systematic testing of pesticides on human subjects. This decision should not be one which comes without serious consideration of first and foremost the morality of testing on humans and how to protect the health of all involved, especially our nation's most vulnerable populations. If the nation plans to allow the systematic testing of pesticides on human beings, then at minimum a clear and definitive policy should be established to protect public health. This policy must adhere to congressional mandate, it must prohibit, without exception, testing on pregnant women and children, protect other vulnerable populations, disallow the exporting of unethical studies to other countries, and where there are gray areas decisions be made to protect public health — not the pesticide industry. This is, unfortunately, not the direction EPA is headed in.

This nation is at a critical moral and ethical juncture, and the approval of this proposed rule should be taken with seriousness. Unfortunately, EPA is choosing to go down a road which provides a false sense of security and continues to leave the health of Americans vulnerable to the almighty dollar. As we move forward, I hope the Bush administration seriously understands its legacy. Will it be to favor pesticide companies or will it put public health and the welfare of Americans first? I hope public health and morality wins.

U.S. Representative Hilda L. Solis (D-California) is a Member of the House Committee on Energy and Commerce, where she is the Ranking Democratic Member of the Environment and Hazardous Materials Subcommittee and a member of the Energy and Air Quality Subcommittee. Solis is also Chair of the Congressional Hispanic Caucus' Task Force on Health and Co-Chair of the Congressional Caucus for Women's Issues.

THE FORUM

Human Studies' Benefits, Science, Ethics

JAY J. VROOM

Controlling pests such as mosquitoes, ticks, cockroaches, rats, and termites is a necessary part of daily living. Mold and fungus, as we witnessed in areas devastated by Hurricane Katrina, pose serious public health threats. Protecting crop yields, combating invasive species, and controlling exotic plant diseases are necessary to feed a hungry world.

Pesticides help society do all of this. They are important tools for protecting people and our environment.

However, if pesticides are to be properly used they must be thoroughly tested to ensure their safety. The pesticide industry is legally and ethically bound to provide regulators with the information they need to determine safe exposure levels for our products and to set standards for their proper use.

The Environmental Protection Agency is currently working to formalize a rule establishing scientific and ethical standards for accepting human study data. However, this rulemaking process has generated a mountain of misinformation and become mired in politics.

Human clinical studies benefit society and protect public health when conducted under ethical and scientific guidelines and with strict oversight. EPA along with the National Academy of Sciences and the pesticide industry are in agreement that the public is well-served by these clinical tests.

In 2004, an NAS panel concluded that human clinical studies "contribute significant and useful knowledge for regulatory standard setting and other forms of public health protection." Their report stated: "High-quality human data are preferred by regulatory agen-

cies for use in assessing the potential of chemicals to cause adverse health effects in exposed populations. . . . If human research were required to understand the risks posed by such products and thus support their regulatory approval by EPA, such research would provide an important health benefit."

But just as importantly, the NAS supported human clinical studies because "animal models may not be adequate to determine the potential toxicity of a chemical and epidemiological studies cannot be conducted in a way that is scientifically relevant to the exposure that is of regulatory concern to EPA. . . . Animal models have little value for assessing adverse effects that cannot be objectively measured, such as those that can be known only because they can be reported by study participants (headaches are a prime example, as are feelings of nausea and dizziness)."

The vast majority of the scientific tests conducted by industry will continue to use laboratory rats and mice. However, "In some cases, intentional dosing of humans may be the only way to obtain the data needed to set regulatory standards to protect public health," explained the NAS.

Although clinical testing is infrequent, when it is conducted study volunteers are well-informed and well-protected. It is important to remember that clinical testing is conducted only with volunteers who have given fully informed consent, only when an independent review board has approved it, and only under strict medical supervision.

Anti-pesticide activists often argue that human clinical studies are undertaken only because there is an expectation that human data will make pesticide use less restrictive. This is clearly not the case. A recent study by Dourson *et al.* in the *Journal of Regulatory Toxicology and Pharmacology* compared differences between public health standard estimates for 43 chemicals derived from available human and animal data. The authors concluded that in 36 percent of the

cases, standards based on human data were more protective than those based on animal data. In 23 percent of the cases, regulatory standards derived from human data were more than three times as protective as standards based on animal data.

Despite claims by some vocal opponents, our industry does not conduct intentional dosing clinical trials on pregnant women, children, and vulnerable populations. Such rhetoric generates sensational headlines, but intentional dosing of these populations with pesticides is a practice that is neither conducted nor condoned. EPA's rulemaking will create a long-awaited federal regulatory standard that affirms existing scientific and ethical standards and includes prohibition of testing on these groups.

Other activist efforts are focused on encouraging regulators to either ignore human testing data or forbid the practice in the future. Defensible science requires consideration of all the relevant data, and EPA is legally bound to review all available studies as part of the risk assessment process. To do otherwise would be unethical, irresponsible, and wasteful.

Congress was correct to instruct the EPA to proceed with rulemaking that formalizes ethical standards for human data studies to improve public health and environmental protections. We believe that rigorous science, strict ethical standards, and the societal benefits of human clinical studies will ultimately prevail.

Jay J. Vroom is President and Chief Executive Officer of CropLife America. The trade association's member companies produce, sell, and distribute crop protection, pest management, and plant biotechnology products used in the United States.