A scientist who made himself wealthy by conducting risk assessments for industrial clients has now published a paperback book on the _theory_ of risk assessment. CALCULATED RISKS, by Joseph V. Rodricks of Environ Corporation, is the best book we have yet seen on the _theory_ of risk assessment -- lucidly written, and evenhanded so far as it goes.[1] If you want to understand the _theory_ of risk assessment from the viewpoint of a successful risk assessor, this is the book for you.

Unfortunately, since the _theory_ of risk assessment is quite different from the _practice_ of risk assessment, Rodricks's book is little more than an enthusiastic description of the emperor's scientific new clothes.

In loving detail, Rodricks's book describes all the theoretical steps in a risk assessment. What the book does not discuss are:

1. the insurmountable limits of science in determining chemical hazards;
2. the environmental justice problems that government officials create when they use risk assessment to prioritize environmental problems; and
3. the widespread destruction of the environment that is occurring because of our single-minded reliance on risk assessment;
4. other, better approaches to establishing "safety" and to deciding environmental priorities, besides risk assessment.

This week and next, we will discuss these 4 points.

The limits of science: Risk assessors are usually working with information that ranges from slim to none, and this will always be the case because the chemical industry invents new chemicals much faster than the government can test all their various negative effects.

Rodricks acknowledges that our ignorance is vast: "Toxicologists know a great deal about a few chemicals, a little about many, and next to nothing about most," he says [pg. 146].

As Rodricks's book illustrates, the government often doesn't even know what toxic effects to test for. For example, Rodricks's book is as thorough and up-to-date as he could make it in 1992 (when the hardback edition first appeared), and yet it does not even mention chemicals that damage the endocrine system. The endocrine system, in wildlife and humans, is a complex set of bodily organs and tissues whose activities are coordinated by chemical messengers called hormones, which control growth, development and behavior. Bears hibernate because of chemical signals from the endocrine system, and women menstruate under control of their endocrine systems. In the past decade, evidence has accumulated that several dozen pesticides and other industrial chemicals mimic, or interfere with, hormones and thus disrupt the endocrine system. In both wildlife and humans, it is the reproductive system of unborn offspring that is most prone to disruption by hormone-like pollutants.

For 20 years, risk assessors like Rodricks -- well-meaning people inside and outside of government -- have given the green light to exposing people and wildlife to thousands of chemical compounds without understanding that some chemicals mimic, or interfere with, hormones. The very best risk assessments gave the answer "No problem" when in fact there were significant problems.

This is an insurmountable shortcoming of all risk assessments. If there are effects from chemicals that scientists have not suspected and studied, those effects will be ignored in a risk assessment. Furthermore, because it costs roughly $400,000 to $1,000,000 to study a chemical even crudely, major harm must be demonstrated before study commences. Therefore, the risk-assessment method of setting "safe" standards always requires that harm must be done to wildlife and humans before study begins.

Rodricks -- like every other person who makes a living conducting risk assessments -- is not deterred by the absence of information about chemical effects. When good data are not available, risk managers and risk assessors use what is called the "scientifically plausible models" that could describe the dose-response relationship, Rodricks says, and "scientists cannot be sure which is correct." Moreover, the different models "yield sometimes substantially different pictures of the risk for the same exposure," he says. And, "If a risk assessment is to be completed, a science policy choice (the phrase used by the NRC [National Research Council] must be made about the model to be used... SEVERAL SIMILAR CHOICES HAVING TO DO WITH OTHER UNCERTAINTIES ARE NEEDED TO COMPLETE MOST RISK ASSESSMENTS," Rodricks says [emphasis added]. In other words, guesswork is central to every risk assessment.

Interestingly, Rodricks does not elaborate on the "several similar choices" that go into every risk assessment--perhaps because to do so would reveal that risk assessment is not the scientific enterprise it appears to be, but is in fact largely a political exercise. Rodricks does say that, "To base risk assessment and risk management decisions upon such uncertain scientific knowledge is bad public policy" [pg. 227]. Unfortunately, his answer is not to reduce our reliance upon risk assessment but to do more studies, as if more studies will eliminate all the important uncertainties in our scientific knowledge of the effects of chemicals on humans and ecosystems.

Dream on. (See RHWN #377.)

From the viewpoint of someone eager to dump exotic new chemicals into the ecosystem, this is the real beauty of risk assessment: no matter how flimsy the base of information, every risk assessment still gives the same satisfyingly numerical answer. Furthermore, the answer you get is completely dependent upon the "science policy choices" that you made, yet the final result appears to be entirely objective and impartial. A political choice swaddled in scientific trappings. This emperor is really a snappy dresser!

Back to our recently-discovered ignorance about hormone disrupting chemicals. In testimony before Congress last October, Richard Wiles of the Environmental Working Group in Washington, D.C., showed that we now put 220 million pounds of endocrine-disrupting pesticidal chemicals directly onto and into our food supply each year.[2] The pesticide found most often on fruits and vegetables is endosulfan and it is an endocrine-disrupter. Analysis of data from the Food and Drug Administration's (FDA) routine food monitoring program revealed endosulfan on 21 out of 22 samples (95%) of fruits and vegetables heavily consumed by infants and children, Wiles testified.

At the same hearing, Dr. Earl Gray, a section chief in U.S. EPA's Health Effects Research Laboratory, reported his latest findings on a fungicide called Vinclozolin -- a pesticide currently in use with EPA's approval.[3] "Vinclozolin, when administered to a pregnant rat, demasculinizes the male fetuses in a manner identical to the anti-androgenic drug flutamide and in effect these effects are so obvious that all of the males look like females at birth," Dr. Gray testified. He went on to say, "In the rats in vivo [in other words, in studies of living animals] this chemical blocks development of the fetal male rat reproductive system so that they have undescended testes, they develop a vaginal pouch like a female, the penis fails to develop normally, and they retain nipples which male rats do not normally do."-Congressman Henry Waxman (D-Cal.) asked Gray, "Do you think that Vinclozolin could have the same kinds of hormonal effects on
humans?” Gray answered, “I think that is quite possible, and likely.”

Earlier in the hearing, Dr. Theo Colborn, an expert on endocrine-disrupting chemicals, made the point that a single dose of some chemicals can disturb a baby’s normal sexual development. She said, “Nor is it comforting for a woman to realize that it takes only one very low dose, it is called a hit, of an endocrine-disrupting chemical during one of the many critical stages of embryonic development during her pregnancy to change the course of sexual development of her baby.”[4]

So long as we use risk assessment as our chief guide for allowing chemical exposures, we can expect an unending series of unpleasant surprises as today’s “safe” dose is discovered tomorrow to be unsafe.

Joe Rodricks makes a clear distinction in his book between risk assessment and risk management. First you assess the risk, then government acts to protect the public, he says. Oh, this emperor is really looking natty! How does this work in the real world?

At the hearing last October, Congressman Waxman asked EPA’s Dr. Lynn Goldman how long it would take before Vinclozolin would be removed from the American food supply. Note the rich fudge of risk assessor’s language in Dr. Goldman’s response:

“Well, the decision could involve a number of considerations. What we are going to be concerned about is the issue of not only the inherent risk of the pesticide, but also the science that tells us about the exposures that might be expected given the various uses that are allowed under the label, and so that there could be a variety of actions that are taken ranging from, as you suggested, perhaps not even allowing the registration to only allowing the registration on certain uses that are safe, to allowing all of the uses that are currently allowed if we are very certain that we have no exposures that would cause harm to those who might come in contact with it, so the decision -- this piece of information is one piece of the scientific data that needs to be examined to make a good decision about this compound, but obviously a very important piece.”[5]

How could EPA ever determine “uses that are safe?” How could EPA ever become “very certain” that “we have no exposures that could cause harm?” Science simply can never provide such assurances. So EPA will rely on--what else?--risk assessment.

How can we really be sure that no humans or wildlife will be harmed by Vinclozolin? There's only one way: Don't use any Vinclozolin. Pollution prevention.