



A TOXIC CONVERSATION **DR. DEVRA LEE DAVIS**

My very good friend Andrea Ravinette Martin—the charismatic founder of the Breast Cancer Fund—used to say, "The only way I will know I have really survived breast cancer is when I die of something else."

She did: when she was fifty-six, a new and unrelated malignancy of the brain turned her into a breast cancer survivor.

Three years before a tangled web of glioblastoma multiforme invaded her brain, Andrea was in excellent health. As part of a pilot research study of the Environmental Working Group, she was tested for chemical contaminants. She had never worked in a factory. She had no chemically intensive hobbies like boatbuilding or oil painting.

Yet it turned out that Andrea was a walking toxic waste site. Her body contained nearly one hundred different chemical residues, half of which caused cancer when tested in experimental animals.

Many of these toxins didn't exist when she was born in the middle of the past century. Had they played any role in causing either her breast or brain tumors? Did her frequent use of those clunky first-generation cell phones have anything to do with it? It is sad that we don't know. It is appalling that we can't find out.

Look around and it seems like cancer has become the price of modern life. In America, one out of every two men and one out of every three women will develop cancer in their lifetime. In America alone, there are currently more than 10 million cancer survivors.

Cancer is the second leading killer of Americans, and the leading cause of disease related deaths among children. Yes, deaths have dropped, chiefly because fewer are smoking and more are surviving colorectal, prostate and breast cancer. But more new cases of cancer are arising that have nothing to do with smoking, aging or screening.

How did this happen? How did a disease that was once so atypical become so ordinary? Are we simply talking more about an illness that has always been around?

Some twenty-five hundred years ago, the Greek physician Hippocrates depicted a

tumor as a muddled irritable cavity with spindly legs flaring out of control in all directions. Fascinated with its evil animal-like appearance, he termed it cancer, karkinoma, the Greek word for crab. Like Hippocrates, we are drawn to things of menacing beauty.

To an epidemiologist like myself, the explanations of run-amok cancer processes that routinely capture Nobel Prizes and promising headlines address the how but not the why of cancer. They can tell us about how cells and organs behave when they spin out of control, but say nothing about what makes these things happen to specific groups of people located in a certain area at a certain time.

Why have so many types of cancer not known to be tied with smoking increased from decade to decade in industrial countries and in those areas of the developing world that are becoming industrialized? Why do one fifth of all colorectal cancers in Egypt occur in persons under age thirty, a rate that is ten times higher than in the U.S?

Why are so many people in their thirties and forties in many industrial countries coming down with often fatal cancers of the bone marrow and pancreas—diseases that used to occur only in those in their sixties or older?

What can we do to reverse the trend? How can we get better at keeping cancers from happening in the first place? Despite impressive progress in finding and treating some forms of the disease, more than half of all those diagnosed with cancer will not last a decade.

We have all been told what we are supposed to do to reduce the risk of cancer on our own. We are supposed to eat right and exercise. Even prayer and meditation are touted as good things to do. Smoking, of course, is forbidden. And we are certainly not to drink much alcohol or engage in unprotected sex.

But we all know people who lead perfectly clean, even exemplary lives, like my dear friend Andrea, and still get cancer. They take good care of themselves, and appear to be the very nicest of people, yet somehow cancer hits.

The first thing most cancer patients and their sometimes unthinking friends ask is: What did I do to make this happen? Often, the answer is not a bloody thing.

Sometimes cancer is due to a genetic susceptibility that we get from our fathers or mothers, but mostly it isn't. We know that no matter how careful anyone is about their good and bad habits, where and when we are born and what we work and play with has a lot more to do with whether we get cancer than who our parents happen to be.

For instance, inherited defects do not account for most breast cancers. Nine out of 10 women who develop breast cancer are born with perfectly healthy genes. When I was a girl, one in 20 women got breast cancer in her lifetime; by the time Andrea and I reached middle age, one in seven did. Nobody can explain why.

We do know that we live in a sea of synthetic estrogens and other hormones and routinely are exposed to myriad materials that never previously existed. The producers of these agents take comfort in the fact that any one of them, tested by itself, looks fairly benign when gauged by various scientific measures of carcinogenic potency.

Still, it defies common sense and basic biology to assume that just because a single agent looks all right when tested on its own, we can safely endure encounters with hundreds of such materials all at once.

You would never take all the different pills in your medicine chest in one swallow, even though ingesting one or a few is fine. Why, then, should we accept that there is no danger in being subjected to combinations of agents without precedent in human history?

Biologist Tyrone Hayes of the University of California at Berkeley thinks the tadpoles of the seed-corn fields of York County, Nebraska, are trying to tell us something: one in every three exposed to mixtures of ordinary chemicals in those fields die.

The start of my own scientific career coincided with a short-lived period during the late 1970s during the presidency of Jimmy Carter, when the federal government looked serious about uncovering the causes of cancer.

The National Cancer Institute and other federal agencies began a series of programs to assess the true effects of tobacco and certain widely used industrial chemicals. In 1978 these programs became more than rhetoric.

Until that time the government pretty much took industry reports on the safety of chemicals at face value, without requiring any documentation. This changed when it was learned that the company doing much of the testing for industry, Industrial Bio-Test, could not even find or account for all the animals it had supposedly studied.

Industrial Bio-Test had tested one out of every three chemicals on which the government had any data at all. But without adequate records to show that the testing had been done properly (or at all), the reports of safety based on this work were worthless.

In 1979 the government set up its own experimental laboratory to test the cancer-causing capacity of chemicals in specially bred homogenous rodents, under the U.S. National Toxicology Program. Animals were reared with well established body sizes, types and inclinations, so that their responses to potential cancer-causing agents could be studied carefully in order to predict and prevent cancer and other chronic ailments in humans.

Even before the Industrial Bio-Test scandal, Congress had begun passing rules that appeared to require the government to act to keep cancer-causing hazards out of the market. With more than 80,000 chemicals in widespread use and complete toxicity test

results available on fewer than 1,000, these laws, like the Toxic Substances Control Act of 1976, forced the government to come up with some rational way to review chemicals and separate the good from the bad, the ugly, and the ones we don't even know what to do about.

This was supposed to lead to efforts to come up with standard methods for evaluating risks, for making sense of experimental information, and for estimating ways to protect public health. Instead, the law has generated so much talk and so little action that insiders refer to it as the "Toxic Substances Conversation Act."

After the 1980 presidential election, even these meager efforts began to unravel. The early Reagan administration followed the lead of the Carter administration in its tobacco-friendly positions and also jettisoned programs that sought to rein in cancer-causing industrial sources.

The new Administration curtailed funding for testing chemicals under the National Toxicology Program, while federal support for scientific research aimed at designing "safe cigarettes" grew. The problem with "safe cigarettes" is that, well before the 1980s, it was well known that there is no such thing.

Inhaling thick clouds of smoke into your lungs, raising levels of carbon monoxide in your blood and that of your children, spouses and office mates, whether from burning tobacco, wood or coal, is simply an unhealthy thing to do.

The best wars, to take a line from President McKinley's secretary of state, are short, splendid little affairs, all pageantry and little fighting. The protracted war on cancer has been none of the above. How did we get to this point?

From the start, this national campaign was blocked from dealing with some causes that were long known to cause the disease, like tobacco, solar and x-radiation, synthetic hormones, the workplace and the general environment.

Proof that the world in which we live and work has a lot to do with whether or not we get cancer was either overlooked or kept out of sight altogether, often by folks who had major economic interests in seeing this happen.

Instead, the entire project focused on devising ways to find, treat and cure the disease. We are spending more money than ever to find and treat cancer—some \$100 billion in direct treatment costs alone.

Today, one subsidiary of the global chemical firm Industrial Chemicals Inc. makes a number of cancer-causing pesticides, like atrazine—a compound banned in much of the industrial world--while another division of ICI, AstraZeneca, produces tamoxifen, one of the most widely prescribed cancer drugs in the world.

Could this paradoxical strategy have anything to do with the fact that both the

incidence of cancer not tied to smoking and its treatment options keep steadily increasing, while efforts to restrain environmental causes of the disease remain stymied?

Of course not. Remember that we live in a highly technological, interconnected world. It is safer, and better for your reputation in polite society, to keep reminding yourself that the disease is just so damned complex.

Designated a National Book Award Finalist for *When Smoke Ran Like Water* (2002, Basic Books), Devra Davis is Director of the world's first Center for Environmental Oncology at the University of Pittsburgh Cancer Institute and Professor of Epidemiology at the University of Pittsburgh's Graduate School of Public Health. Her recent book, *The Secret History of the War on Cancer*, was a top pick by Newsweek and is being used at major schools of public health, including Harvard, Emory, and Tulane University. The multidisciplinary Center for Environmental Oncology includes experts in medicine, basic research, engineering and public policy, who will develop cutting-edge studies to identify the causes of cancer and propose policies to reduce the risks of the disease.

President Clinton appointed Dr. Davis to the Chemical Safety and Hazard Investigation Board, (1994-99), and as the former Senior Advisor to the Assistant Secretary for Health in the Department of Health and Human Services, she has counseled leading officials in the United States, United Nations, World Health Organization, and World Bank. She also served as a Lead Author of the Intergovernmental Panel on Climate Change—the group awarded the Nobel Peace Prize in 2007.

For more on Dr. Davis or the Center for Environmental Oncology, please go to www.devradavis.com and www.environmentaloncology.org