Fact or Fiction?

Jack W. Dini
1537 Desoto Way
Livermore, CA 94550
E-mail: jdini@comcast.net

The Carcinogenic Body

What do radiation, hypochlorite, nitrogen oxide, cyanide, ozone, formaldehyde, hydrochloric acid, 1,4-dioxane, trichloroethylene, and chloroform have in common? One answer is that they all bring to mind scary, perhaps carcinogenic agents, created in most part by industry. Another answer is that these are all created by ourselves, within our own bodies, without any help from outside forces such as industry or the environment. So here's the dilemma if you're one of those folks who dream of a pristine place, free of industry and other pollution created by humans—you can't get away from these contaminants. By virtue of being human you create them every day. There's more: the average human body contains enough sulfur to kill all fleas on an average dog, carbon to make 900 pencils, potassium to fire a toy cannon, fat to make seven bars of soap, phosphorus to make 2,200 match heads, water to fill a ten gallon tank, and enough iron to make a three inch nail.[1]

Comparison of Several Common Radiation Risks.*

Action	Dose (mr/yr)	Cancers/yr if all US pop. exposed (assuming linearity)
Potassium 40 naturally in own body	30	2,500
Medical X rays (annual US 2000)	40	3,000
Cosmic radiation at Denver	65	5,500
One transcontinental round trip by air	5	400
Average within 20 miles of a US nuclear plant	0.002	0.2

** From: Richard Wilson and Edmund A. C. Crouch, Risk- Benefit Analysis, Second Edition, (Cambridge, Harvard University Press, 2001), 115*

Metabolism

A carcinogen is something that can cause damage in DNA, thereby leading to cancer. Chemicals are one type of carcinogen, but there are others. Radiation and even heat can cause damage to DNA. Here's a not-well-known fact and the key point of this column from James Trefil: "Surprisingly, the greatest number of carcinogens facing human cells do not come from outside the body, but are the normal by-products of human metabolism."[2]

As a result of metabolism, formaldehyde is present in our blood at concentrations around 3 ppm.[3] As I mentioned in a previous column ("Toxic Humans," *P&SF*, March 2002) many organic compounds of concern to the EPA are normal by-products of mammalian metabolism. At least 15 of these products, including 1,4-dioxane, trichloroethylene (TCE), and chloroform are on the "List of Hazardous Air Pollutants" to be regulated under Section 112 of the Clean Air Act. The EPA concerns itself at ambient-air concentrations less than one-ten thousandth the level found in normal intestinal gases.[4]

Cyanide and thiocyanate are naturally present in urine and blood, but this does not necessarily indicate poisoning. Courtney Young reports, "It is known that KCN reacts with water and ammonia under pressure to produce adenine, which is a building block to DNA. HCN also promotes polypeptide formation from amino acids; polypeptides then complex to form proteins. In this regard, cyanide is necessary to all forms of life and its presence does not mean imminent illness or death."[5]

At the concentration secreted by the stomach lining, HCl (pH 2.0) is deadly to living cells and powerful enough to dissolve zinc. This raises the question, why don't we just corrode ourselves from the inside out? Farb and Armelagos report that "for most people a complex physical-chemical barrier that is not yet fully understood prevents the acid from corroding the stomach wall. During the digestion of a meal, which stimulates the secretion of hydrochloric acid, many tiny hemorrhages do occur in the lining of the stomach; these are usually superficial, and heal quickly."[6]

Radiation

Our blood contains potassium 40, from which we get an internal dose of around 30 millirems of radiation in one year.[7] Charpak and Broch report, "A 150 pound human being has radioactive material

giving rise to 10,000 nuclear particle emissions per second, a small fraction of which are detectable, while the majority end up being absorbed within the tissues."[8]

The accompanying table is a list of some radiation exposures and estimates of yearly deaths in the U.S. from these exposures. Wilson and Crouch, who provide these data, estimate their calculations could be off by 30 percent or more. Yet, even with this factor thrown in, note how many people could theoretically be dying from their own body radiation! So, if you're an alarmist, here are some numbers to keep you awake at night. Furthermore, you can't expect help from activist groups or regulators. How are they going to regulate Mother Nature and the way she chooses to provide us with life?

However, another view is not so alarmist. Wilson and Crouch also point out that, "If there is a threshold dose below which risk is not increased (or is even reduced), all of the numbers in the table could be zero." This is another way of saying that if there is such a thing as radiation hormesis (the concept that high doses of radiation are harmful while low amounts are beneficial to humans) then all bets are off for worry-worts. And there are plenty of data that indeed show radiation hormesis is real. A large body of evidence show conclusively that whole-body exposures to low doses of ionizing radiation reduce cancer mortality rates. (See my column, "Radiation Hormesis," published in this journal in May 2000). One last item about the table—note that the exposure to a nuclear power plant is insignificant compared to the rest of the items. It's off the low end of the chart.

Bacterial Invaders

"Every time your white blood cells combat a bacterial infection, they pour out mutagenic oxygen radicals and hypochlorite, which is the same chemical found in Clorox," says Bruce Ames of the University of California at Berkeley. "They also create other oxides that cause damage, such as superoxide and nitrogen oxide. Chronic infection, in fact, causes about 20 percent of cancer, probably due in good part to these oxidants."[9]

Ozone is a familiar component of air in industrial and urban settings where the gas is a hazardous component of smog. Guess what? Recently, investigators at The Scripps Research Institute (TSRI) reported that the human body makes ozone.[10] One hypothesis is that we do this as part of a mechanism to protect ourselves from bacteria and fungi. The jury is still out on answering this question, but clearly we humans do produce ozone without help from industry or the environment.

Summary

Should we worry? Hardly. The body has an incredibly efficient system for repairing genetic damage, including that caused by radiation or any of the thousands of mutagenic chemicals (natural as well as man-made) that we are exposed notes Bernard Cohen.[11] But the next time you hear someone talk about the chemicals (or radiation) discussed in this article remember James Trefil's words that the greatest number of carcinogens facing human cells don't come from outside the body but are normal by-products of human metabolism.[2]

References

1. "The Incredible Human Body, Part 2," www.bibleufo.com/humanbody2.htm; accessed September 9, 2004.
2. James Trefil, *Human Nature*, (New York, Times Books, 2004), 99.
3. James P. Collman, *Naturally Dangerous*, (Sausalito, California, University Science Books, 2001), 35.
4. J. M. Orient, "Microorganisms, Molecules, and Environmental Risk Assessment: Assumptions and Outcomes," Chapter 12 in *Standard Handbook of Environmental Science, Health and Technology*, J.H. Lehr, Editor, McGraw-Hill (2000), 12.50.
5. Courtney A. Young, "Cyanide: Just the Facts," in Cyanide: *Social, Industrial and Economic Aspects*, Courtney A. Young, Larry G. Tidwell and Corby G. Anderson, Editors, (Warrendale, Pennsylvania, The Minerals, Metals & Materials Society, 2001), 97.
6. Peter Farb and George Armelagos, *Consuming Passions*, (Boston, Houghton Mifflin Company, 1980), 23
7. Richard Wilson and Edmund A.C. Crouch, *Risk-Benefit Analysis, Second Edition*, (Cambridge, Harvard University Press, 2001), 115.
8. Georges Charpak and Henri Broch, *Debunked*, (Baltimore, The Johns Hopkins University Press, 2004), 106.
9. Michael Fumento, *Bio Evolution*, (San Francisco, Encounter Books, 2003), 138.
10. "Scientists at The Scripps Research Institute Make Strides in Addressing Mysteries of Ozone in the Human Body," The Scripps Research Institute, February 28, 2003, www.scripps.edu/news/press/022703.html.
11. Bernard L. Cohen, "Basic Facts About Radiation," in Issues in the *Environment*, Kristine Napeir, Editor, American Council on Science and Health, 62, (1992).