

Unfounded pesticide concerns adversely affect the health of low-income populations

August 31 2011

The increasingly prevalent notion that expensive organic fruits and vegetables are safer because pesticides — used to protect traditional crops from insects, thus ensuring high crop yields and making them less expensive — are a risk for causing cancer has no good scientific support, an authority on the disease said here today. Such unfounded fears could have the unanticipated consequence of keeping healthful fruits and vegetables from those with low incomes.

Bruce N. Ames, Ph.D., developer of a widely used test for potential carcinogens that bears his name, spoke at the 242nd National Meeting & Exposition of the American Chemical Society (ACS), being held here this week. With more than 7,500 reports on new advances in science and more than 12,000 scientists and others expected in attendance, it will be one of 2011's largest scientific gatherings.

Ames described his "triage theory," which explains how the lack of essential vitamins and minerals from fruit and vegetables in the diet of younger people can set the stage for cancer and other diseases later in life. A professor emeritus of biochemistry and molecular biology at the University of California at Berkeley, Ames also is a senior scientist at Children's Hospital Oakland Research Institute, where he works on healthy aging. He developed the Ames test, which uses bacteria to test whether substances damage the genetic material DNA and, in doing so, have the potential to cause cancer. He has received the U.S. National Medal of Science among many other awards.

In the presentation, Ames said that today's animal cancer studies unfairly label many substances, including pesticides and other synthetic chemicals, as dangerous to humans. Ames' and Lois Swirsky Gold's research indicates that almost all pesticides in the human diet are substances present naturally in plants to protect them from insects.

"Animal cancer tests, which are done at very high doses of synthetic chemicals such as pesticides — the "maximum tolerated dose" (MTD) — are being misinterpreted to mean that minuscule doses in the diet are relevant to human cancer. 99.99 percent of the pesticides we eat are naturally present in plants to protect them from insects and other predators. Over half of all chemicals tested, whether natural or synthetic, are carcinogenic in rodent tests," Ames said. He thinks this is due to the high dose itself and is not relevant to low doses.

At very low doses, many of these substances are not of concern to humans, he said. For example, a single cup of coffee contains 15-20 of these natural pesticides and chemicals from roasting that test positive in animal cancer tests, but they are present in very low amounts. Human pesticide consumption from fresh food is even less of a concern, according to Ames — the amount of pesticide residues that an average person ingests throughout an entire year is even less than the amount of those "harmful" substances in one cup of coffee. In fact, evidence suggests coffee is protective against cancer in humans.

Unfounded fears about the dangers of pesticide residues on fruit and vegetables may stop many consumers from buying these fresh, healthful foods. In response, some stores sell "organic" foods grown without synthetic [pesticides](#), but these foods are much more expensive and out of the reach of low-income populations. As a result, people — especially those who are poor — may consume fewer fruits and vegetables.

But how does a lack of fresh produce lead to cancer and other aging

diseases? That's where Ames' triage theory comes in.

In wartime, battlefield doctors with limited supplies and time do a triage, making quick decisions about which injured soldiers to treat. In a similar way, the body makes decisions about how to ration vital nutrients while experiencing an immediate moderate deficiency, but this is often at a cost.

"The theory is that, as a result of recurrent shortages of vitamins and minerals during evolution, natural selection developed a metabolic rebalancing response to shortage," he said. "Rebalancing favors vitamin- and mineral-dependent proteins needed for short-term survival and reproduction while starving those proteins only required for long-term health." Ames noted that the theory is strongly supported by recent work (Am J Clin Nutr. [DOI: 10.3945/ajcn.2009.27930](https://doi.org/10.3945/ajcn.2009.27930); FASEB J [DOI:10.1096/fj.11-180885](https://doi.org/10.1096/fj.11-180885); J Nucleic Acids [DOI:10.4061/2010/725071](https://doi.org/10.4061/2010/725071)).

For example, if a person's diet is low in calcium — a nutrient essential for many ongoing cellular processes — the body takes it from wherever it can find it — usually the bones. The body doesn't care about the risk of osteoporosis 30 or 40 years in the future (long-term health) when it is faced with an emergency right now (short-term survival). Thus, insidious or hidden damage happens to organs and DNA whenever a person is lacking vitamins or minerals, and this eventually leads to aging-related diseases, such as dementia, osteoporosis, heart trouble and cancer.

And with today's obesity epidemic, resulting largely from bad diets that lack healthful foods containing vitamins, minerals and fiber, aging-related diseases are likely to be around for some time to come.

Provided by American Chemical Society

Citation: Unfounded pesticide concerns adversely affect the health of low-income populations (2011, August 31) retrieved 19 April 2024 from <https://medicalxpress.com/news/2011-08-unfounded-pesticide-adversely-affect-health.html>

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