About one-third of all human cancer cases are due to tobacco smoking. An unbalanced diet is responsible for another third of cancer cases. The causes of the remaining third are diverse, such as aging, occupational exposure, hormonal stimulation of increased cell division, DNA-viral infection by various viruses; heavy air pollution might be contributing a little as well. On the other hand, cancer rates have been going down (when adjusted for age), apart from cancer due to smoking (which is still going up, but should go down as people give up smoking).

In the past, a source of cancer was occupational exposure to some synthetic chemicals. The chemical industry was expanding rapidly by the end of the 19th century and consequently some workers were exposed to new chemicals. For example, some were exposed to high doses of 2-naphthylamine for many years, and a high percentage of those workers got bladder cancer. It was at this time that the effect of some industrial chemicals to cause cancer in humans was understood.

As a consequence of this understanding, testing for chemical safety was initiated using rodents as test animals. Since a third of the untreated control animals get cancer anyway, it was necessary to use large numbers of rodents. In order to obtain a maximum response, the rodents were treated daily for their lifetime with the maximum tolerated dose (i.e. the maximum amount that does not kill them). Under these drastic conditions, approximately half of the chemicals being tested turned out to cause cancer. This led to the faulty conclusion that all synthetic chemicals were particularly dangerous in causing cancer. No consideration was taken at the time that “natural” chemicals might also cause cancer and few tests were performed on them; the focus was on industrial chemicals only.

A number of wrong assumptions and interpretations were also made. A particularly relevant one is that the effects of the huge doses given to rodents were extrapolated down to low doses using a linear correlation, which is incorrect. Then the newly calculated risk level was applied to the whole population, which resulted in an inordinate amount of concern about hypothetical risks with little evidence.

Lois Gold, Tom Sloane, and I set up the Carcinogenic Potency Database (CPDB), which compiled the results of 6540 long-term animal cancer tests on 1547 chemical, using both positive and negative experiments that have been published over the past 50 years in the general literature through 2001 and by the National Cancer Institute/NTP through 2004. We analyzed these data qualitatively and quantitatively and wrote over 100 scientific papers relating our interpretations. Some interesting numbers and ideas came out of these analyses. First, over 50% of all the chemicals ever tested resulted in rodent tumors. Second, the CPDB included many natural chemicals, over 50% of which were also found to cause cancer.

The assumption that natural chemicals are benign was wrong. We found that just as many of the natural chemicals are carcinogenic at high doses (i.e. at the maximum tolerated dose as done in animal cancer tests) as the synthetic chemicals. We argued that the high percentage was an artifact for both types of chemicals tested, due to the very high doses, which caused cell death and consequent excess cell division. These effects are the most likely reason for increased rates of cancer. Therefore, these results should not be applied to what the general population is exposed to.

Unlike animals, plants are not mobile and do not have teeth or claws, and do not have an adaptive immune system; thus they cannot run away from predators and thus cannot defend themselves. However, evolution has endowed each plant with the production of a large number of toxic natural pesticides (about 50) to fend off potential predators. Therefore, every plant species produces a different set of defensive chemicals (nature’s pesticides). This system can be thought of as a form of chemical warfare.

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Thus, for example, a portion of broccoli contains approximately 50 natural pesticides. When the toxic chemicals found in broccoli were tested in rodent bioassays, about half of them induced tumors. Similar results are found for the chemicals found in cabbage, roasted coffee, apple, apricot, banana, basil, beer, brussels sprouts, tomatoes, turmeric, and turnip (we wrote a review on this subject). Thus, when these natural chemicals were tested, half of them turned out to be carcinogenic, which is roughly the same percentage as obtained when synthetic chemicals are tested. Gold and I calculated that 99.99% of the total pesticides we ingest are from our dietary vegetables. The ingested amounts of man-made pesticides are trivial in comparison to the levels of nature’s pesticides present in vegetables. We were not arguing that one should give up vegetables but that the estimate of cancer incidence was an artifact of the high-dose testing programs.

In 1962, Rachel Carson published her book, *Silent Spring*. In this book, Rachel Carson said: “For the first time in the history of the world, every human being is now subject to contact with dangerous chemicals from the moment of conception until death.” But Rachel Carson was made of chemicals. Everything is made of chemicals. In that book, Carson would only quote the results of experiments that showed that a chemical did something bad because that would fit her theory, and she would ignore experiments where it was found that that chemical had not done anything bad. She unscientifically assumed that everything “natural” was beneficial. But she ignored a lot of available information. What about arsenic? or aflatoxin and other fungal toxins? or poisonous mushrooms? or many other “natural” toxic and carcinogenic compounds, and the relevant large literature on natural toxins in plants? Thus, *Silent Spring* was not a scholarly piece of work. Unfortunately, it got people on the wrong track.

Rather than spending an inordinate amount of time and resources on small hypothetical risks, we should try to understand what are the mechanisms of the important risks such as unbalanced diets. I recently examined this question in one of my most important papers (that appeared in the October 2018 issue of the Proceedings of the National Academy of Sciences (PNAS)). In this paper, I addressed the question of why an unbalanced diet can cause cancer and shorten the life span, and how to prevent it. As proposed and buttressed by my triage theory, a modest deficiency of 1 of 30 vitamins and minerals triggers a built-in rationing mechanism that favors the proteins needed for immediate survival and reproduction (survival proteins) while sacrificing those needed to protect against future damage (longevity proteins). Impairment of the function of longevity proteins results in an insidious acceleration of the risk of diseases associated with aging such as cancer. Thus, nature trades long-term health for survival and reproduction. Because nutrient deficiencies are highly prevalent in the United States (and elsewhere), appropriate supplementation and/or an improved diet could reduce much of the consequent risk of chronic disease, such as cancer, and premature aging.