

Environmental medicine*

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Abstract

Focusing on chemical pollution, the authors present a general overview of some of the serious problems in the field of Environmental Medicine, deploring the almost complete ignorance of them by Classic Medicine. It makes special reference to toxicity

from incineration centers and dioxins, one of the most dangerous residues.

Key words: Environmental medicine, chemical pollution, incinerators, dioxins.

Before beginning this communication, we would like to emphasize that our intention is by no means to be exhaustive on this theme, but rather, to offer a quick, concise overview of Environmental Medicine, its importance, and the lack of attention given to it by Portuguese doctors, who have neglected one of the most important aspects of Preventive Medicine.

Whenever a focus is given to something new, different or uncommon, it is customary to give an introductory definition that will lend wider support to the subject in hand. Environmental Medicine is concerned with the study and treatment of health disorders attributed to extrinsic risk factors, particularly physical and chemical agents, but also biological ones.

The main causes of death in developed countries today are no longer malnutrition and infectious diseases, but degenerative diseases and cancer. These are no longer seen primarily as hereditary, or an inevitable part of the aging process, rather, they are attributed largely to the individual's lifestyle, social habits, dietary practices and other extrinsic risk factors, many of which are produced and controlled by man himself. In other words, the main causes of death are potentially preventable by modifying extrinsic risk factors to avoid the more obvious effects. But the subclinical effects of these new risk factors must also be taken into account. A paradigmatic example is decreased

intelligence resulting from exposure to lead in the developing brain. Given that there is apparently no safety threshold for this risk, it is possible that all babies born in recent years in areas with high population density have suffered some loss of intelligence as a consequence of early exposure to lead used as an additive in gasoline. Nevertheless, some efforts have been made to mitigate the effects of exposure to harmful substances, particularly through the implementation of safety thresholds. However, testing chemical substances to determine their toxicity requires enormous resources in terms of time and money, which means that many of those in current commercial use have not been tested sufficiently. As a result, what today is considered a safety threshold may, in the future, prove to be a serious error. A striking example of this is lead; in the 1950s it was believed that serum levels of 80 µg/dl were sufficient to protect workers from lead poisoning, but in the 1970s, it was shown that aminolevulinic acid is affected by levels of 40 µg/dl and later, it was discovered that children with levels of 10-15 µg/dl presented learning difficulties. Today, serum values above 25 µg/dl are considered significant for lead poisoning.

A small tip of the huge iceberg of the tragedy of chemical pollution revealed in a report by the USA National Research Council states that of the approximately seventy thousand chemicals currently in commercial use, less than 10% have been tested for their toxic effect on the nervous system, and of these, only a small number have been thoroughly evaluated. There is also very clear evidence that the chemical products spread through the environment can alter the functions of the nervous system.

Regarding the dangers to the immune system, the journal *Science* of April 3, 1992 reports that following the destructive scourge of AIDS, immunologists are

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now facing the alarming increase of another disturbing problem, though much more subtle: environmental pollutants are upsetting the entire immune system, very likely contributing to the increase in cases of diseases related to this system.

“Medicine is a huge, cumbersome beast” (B. Golstein, M. Gochfeld). Indeed, the impacts of changes in society are very slow to reach classical medicine, except, as occurred with AIDS, if there is a dramatic change in mortality and/or morbidity rates. The increasing concern and attention given, by the population, to chemical and physical agents in our food, air, water and soil has had little impact, except in rare and honorable exceptions, like the physicians who founded the “Save our beaches” group in response to the perception of diseases related to pollution from the beaches of the State of New Jersey.

Although the effects of extrinsic risk factors on human health are clearly profound and varied, adequate assessment of its magnitude is not possible based on current knowledge. In addition, there is little information on how much of the work in medicine may be due to problems caused or exacerbated by exposure to chemical or physical agents in the general environment; neither is it known how often the primary healthcare services identify and deal correctly with these problems. Despite the absence of quantitative data, there is ample evidence of the need to improve doctors’ knowledge of Environmental Medicine.

Episodes of severe air pollution cause mortality and morbidity rates to increase, particularly in individuals with cardiopulmonary diseases. Although the effects of chronic exposure to air pollutants is less well-known, a wide range of agents triggers toxic effects when inhaled chronically at relatively high concentrations, including several gases (CO, vinyl chloride, radon), metals (lead, mercury, arsenic, nickel) and dust (asbestos, silica, cotton, coal). The long-term effects of exposure to low levels of other combustion products and their derivatives (such as sulphur and nitrogen oxides, benzopyrene and other particles) are less well understood, but it is noteworthy that their presence in the home has been linked to various disorders in children with chronic exposure to these substances.

The effects of indoor pollution are multiple, and are aggravated by the fact that inhabitants of more developed countries spend most of their lives indoors. Indoor pollution is linked not only to specific syndro-

mes, such as hypersensitivity pneumonias and carbon monoxide poisoning, but also to common respiratory illnesses such as asthma and lung cancer. Since the 1970s, various outbreaks of occupational problems have been reported in buildings not directly contaminated by industrial processes. Two major groups of such episodes can be identified: those characterized by a more or less uniform clinical condition, and those in which workers describe a series of nonspecific symptoms temporarily related to the work; so-called “sick building syndrome”, which occurs in buildings served by closed ventilation systems. Doctors should consider these syndromes in patients with symptoms related to their work environment.

Radon, in closed environments, presents a unique and unprecedented problem. This respiratory carcinogen, derived essentially from soil gases, natural gas, water, and building materials, enters and contaminates all indoor environments. In some houses, the concentrations exceed those allowed in mines, but even the levels found in the majority of homes is associated with a risk of lung cancer estimated at between 0.2% and 1% - a level that is aggravated by synergism with tobacco.

Another class of air pollutants is various types of allergens. “Multiple chemical hypersensitivity”, “20th century disease” or “Environmental illness” of unknown cause, is the most intriguing clinical entity of the 1980s, resulting in a sensitivity or allergy to almost all synthetic chemicals, with symptoms even for mere traces of the sensitizing substance(s). Many patients are unable to work, even in extremely well-controlled environments. In extreme cases, patients become environmental exiles of modern life.

Bacteriological water pollution is still a common problem in the third world, but one that no longer occurs in developed countries, where chemical contamination, much more serious and widespread than nuclear contamination, is beginning to present serious problems. In many parts of the world, the water is contaminated by heavy metals, toxic waste, pesticides, fertilizers, chlorination or ozonation products, the implications of these substances on human health being still largely unknown.

Food is a major source of continual chemical poisoning of humanity. To cite just two examples: look at how is flour obtained: The wheat seed is treated with a fungicide before sowing, during cultivation it receives between two to six treatments with pesticides, treat-

ment with hormones and a heavy dose of chemical fertilizers; after the harvesting, in the silo, the grain is fumigated with carbon tetrachloride and carbon disulfide, and then sprinkled with chlorpyrifos-methyl; during grinding the flour receives nitrosyl chloride, ascorbic acid, bean meal, gluten and amylase. And the cherries for a cherry pie? The cherry trees are treated with pesticides between ten and forty times a year; the cherries are bleached with sulfur dioxide and uniformly stained again with carminic acid and erythrosine; they are immersed in a brine containing aluminum sulfate and, when taken out, they receive a preservative such as potassium sorbate (E202); finally they are coated with beet sugar, which has also received respective doses of fertilizers, hormones and pesticides, the sugar is extracted using lime and sulfur dioxide, bleached with sodium sulfoxylate and isopropyl alcohol, and finally, they are given a blue tint with anthraquinone blue. Increasingly, we need to proscribe and be apprehensive with regard to the consumption of fruit and other agricultural products that may look good to the eyes, but are bad for the health, and prefer home-grown and/or environmentally friendly products instead, which may be less attractive and less standardized, but are much safer and healthier.

Finally, and because this discussion is getting long, I would like to address a topic of immediate interest for our country - waste incineration plants. Portugal is still free of incinerator plants, but is preparing to begin construction in the near future, and with full strength. When others are giving up, we are just beginning! As usual, we're fifty years behind schedule! I remind you all of the great public debate that took place when the installation of nuclear power plants was being investigated in Portugal. Fortunately, public opinion was sufficiently informed of the dangers of atomic energy to prevent its entry into Portugal. But, there was no controversy over the waste incineration plants, which produce waste that is just as dangerous, if not more so, than atomic waste. Why was this? Because of the ignorance of officials and the general public about its dangers, and because of the many millions of stories surrounding the respective business. What should our position as physicians be? To acquaint ourselves scientifically and, I believe there is no other alternative, condemn this real attack on public health in our country.

We don't need to go very far because, fortunately or

unfortunately, the experience of other countries with waste incineration is already extensive enough to form a basis for our – or at least my - opinion. In Austria and Switzerland, no new plants have been built for almost twenty years. In 1992, the state of Ontario, Canada decided to ban the establishment of any new urban solid waste incinerators, and oblige existing ones to either close down or comply with rigorous regulations on gas emissions; the main reasons given for this decision were that:

- Gas emissions from incinerator plants pose a threat to human health and the environment. They generate a wide variety of toxic heavy metals and volatile contaminating organic components that endanger human health, as well as gases which cause acid rain and smog, and contribute to the greenhouse effect.
- Incineration plants create large quantities of slag, ash and other solid residues, many of which are contaminated and need to be sent to treatment plants and special landfills for hazardous waste (which do not exist in Portugal and which no local council wants on their land!).
- The incineration of recyclable materials and other valuable components of urban solid waste direct conflicts with programs whose objectives are to reduce, reuse and recycle waste.
- “Incineration is the most costly option for the treatment of solid urban waste.”

Also in 1992, Act 92-S 2502 law was passed in the State of Rhode Island, USA, banning the incineration of the state's solid urban waste. Some of the arguments presented were as follows:

- Due to the myriad of over four hundred toxic pollutants, including lead, mercury, dioxins and acid gases, known to be emitted by solid urban waste incineration plants, the known and unknown threats that nuclear plants pose to health and the environment are unacceptable.
- Despite the use of the best types of impermeabilization and leachate collection systems, landfills, particularly ash landfills from incineration plants, release toxic leachate into the surface water and groundwater, and present an unacceptable threat to public health, the environment and the limited water resources.
- The incineration of solid urban waste is the most expensive solution for solid waste disposal, with predictable and unpredictable skyrocketing of costs that are a substantial and unreasonable burden for the state and municipal budgets, to the point of putting

public interest at serious risk.”

In May 1993, the EPA (Environmental Protection Agency – US Ministry of the Environment) ordered an eighteen-month suspension on the granting of new licenses for the construction of nuclear toxic and dangerous waste plants in order to review the incineration process, as they had found that not one of the 1,400 hazardous waste incineration plants in the U.S. met the regulations established.

The American Public Health Association, a non-government organization founded in 1872 to represent all disciplines and specialties related to Public Health, spoke out publicly against incineration in an extensive document (policy statement No. 8911). I highlight one paragraph from this document: “Recognizing that 80% to 90% of solid waste can be recycled, reduced, reused or composted, waste incineration is an unnecessary source of combustion that must be eliminated from any rational program to deal with the problem of solid waste (in Portugal our “rational” program is being prepared; building incinerator plants!!!).

On the subject of incinerator plants, I feel it is essential to say something about one of its most controversial products: dioxins. Infinitesimal quantities are deadly to guinea pigs, giving dioxins a reputation of being one of the most toxic known chemicals to man. Its carcinogenic effect is very distinctive. Dioxin does not damage the DNA, but activates the growth genes and cell proliferation. If the cell contains DNA damaged by other carcinogens, dioxins can trigger cancer, setting off cell replication. Thus, dioxins can trigger a series of different types of cancer. Just ten years after the Seveso disaster in Italy, an increase in soft tissue sarcomas, biliary tract carcinomas, multiple myeloma and lymphomas was observed; and the majority of cancers take longer than ten years to develop! Neither does the immune system escape unscathed. Tiny doses of dioxins can affect it extensively. Much smaller doses are enough to suppress immunity than those necessary to trigger any other measurable effects of dioxins. Rats exposed to dioxins produce fewer antibodies. A commonplace viral infection in a normal mouse is fatal in mice injected with traces of dioxins. Also of concern is the fact that dioxins appear to trigger real chaos in the body’s hormonal system, affecting virtually all the organs, in particular causing reduced tolerance to glucose. Another example is seen in a group of workers exposed to dioxin,

who presented lower testosterone levels. Effectively, male rats exposed to dioxins during gestation showed only 30% to 50% normal testosterone levels; their entire sexual development was delayed, and there was an irreversible reduction of about 20% in sperm count. In a study of 128 Philippine children exposed to dioxins during gestation, the children presented reduced IQ, hyperactivity, and retarded development of motor coordination, perception and memory. This occurred even though the mothers had been contaminated several years earlier, as it takes years for the adipose tissue to break down these poisons. In a study of rhesus monkeys (control group vs. group with a daily intake of 5 parts per trillion of dioxin vs. group with 25 ppt/day of dioxin) a very high correlation with endometriosis, infertility and spontaneous miscarriages were observed. A study carried out in Germany concluded that breast milk of many German women contained dioxin concentrations that should be considered unfit for consumption! The situation worsened progressively. Dioxins spread far beyond their industrial sources (paper and herbicide manufacturing and incinerator plants), and are now found in the bodies of any American (in Portugal there are neither studies nor laboratories...) who consumes fish, meat or dairy products. More than 90% of the concentration of dioxins in the human body comes from contaminated food, except in people living near sources of contamination. The EPA attributes responsibility for 350 to 3500 new cancers each year, in the USA alone, to the present levels of contamination. Incidentally, in a 1994 report, the EPA, in response to this issue of safety levels of dioxins, affirms that this level is: “about 300 to 600 times lower for the risk of neoplasia, and about 10 to 100 times lower for other risks, than the levels we already come into contact with every day.”

Fortunately, we have come a long way since the days of Agricola (16th Century), whose real name was Georg Bauer. In his work “De Re Metallica,” he discusses mining and metallurgy activities in detail, describing disease and accidents and their respective methods of prevention, and states that “in the Carpathian mines, there were women who had married seven husbands, all prematurely killed by that terrible waste”. But no less true is the fact that we are creating an endless series of new toxic products, to which we are the first generation to be submitted, and the medium and long term effects of which are entirely

unpredictable. We physicians are in a privileged position to inform ourselves and take up public positions on the problems of environmental pollution that are increasingly affecting us. We are not doing this, but are opting for a “head in the sand” approach, failing to heed our responsibilities.

Do we not all have the notion that neoplasias are appearing increasingly earlier, and in greater numbers, reducing our “satisfaction” in the diagnosis of autoimmune diseases, which are becoming increasingly more common, with increasing numbers of infertile couples, etc, etc? Is it just because more diagnoses are being made, and because nature is being surpassed in its capacity of natural selection?!? How many of our patients may be innocent victims of environmental pollution? Who will study and monitor, epidemiologically and scientifically, the effects on public health of the introduction of incinerator plants in Portugal?

To conclude, I would like to remind us that that we live our daily lives in the HUC with an incinerator plant that regularly spews out a threatening black smoke. It is now possible to eliminate the risks of hospital waste without resorting to incinerator plants. ■

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