

The Unseen Onslaught on our Health (Konstantinos Kalakhanis)

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This paper deals with the issue of our exposure to environmental pollution, in particular involuntary exposure, that is against our will. The issue is serious, since it affects not only the elderly but even the unsuspecting embryo – and the exposure of such embryos to substances which have come into contact with the mother, again often without her permission.

The human body is a comprehensive system indissolubly linked to the air of the atmosphere, the earth and water. From as early as the time of Hippocrates in ancient Greece, there were studies which focused on the effects on human health of factors such as water, the air, nutrition and changes in the climate. Hippocrates, for example, who conducted a great many studies over the course of his life, recommended that if doctors were faced with the case of large numbers of people coming down with the same disease, they should seek the cause in what they had most in common, that is the air they breathed (Hippocrates *On Human Nature*, 9, 11-13). Within this context, the prominent doctor also wrote another work, *On Airs, Waters and Places*, in which he studied the effect of environmental factors on human health.



It is no coincidence that Hippocrates makes these references, since from his observations he had concluded that in order to determine the causes of diseases, one had to take into account the degree of people's exposure to environmental factors, such as the air. Consequently, the quality of the air to which people are exposed must be an important criterion in deciding where to build cities. It is clear, then, that the human body is a unified system closely linked to the air of the atmosphere, the earth and water and it is obviously difficult to take precautionary measures. It follows that human health is critically affected by exposure to harmful substances, in the workplace, industrial locations and even recreation areas which may occasionally be polluted.

For many thousands of years, this situation did not exist, since people lived in harmony with their natural environment. The turning point came with the industrial revolution (1750-1850), which marked the entry of machinery into the production process and the imperative need for the discovery of new natural resources. Gradually a large number of chemical substances were introduced into the environment and people's exposure to them, voluntarily or involuntarily, had repercussions on their health. These not only affected the bodily functions, but also left traces in the tissues, cells and DNA.

It is indicative that, of the more than 50,000 chemical substances which have been manufactured by industry over the last 50 years, at least 500 collect and settle in the body every day. The human body is being continually exposed to chemical substances, such as pharmaceuticals, preservatives, dioxins, PCBs and pollution

from cars and industrial plants. Also important is exposure to chemicals contained in beauty products, medicines, foods and water, which enter the organism gradually by exposure paths such as the respiratory and digestive systems and the skin. A crucial role in the effect on the organism is played by nutrition, the immune system and genes, as well as the manner in which substances are metabolized (for example, the liver, which metabolizes to various degrees of toxicity).

For thousands of years, people lived without the presence of such substances, in a 'clean' environment, and thus did not possess the appropriate mechanisms to break them down and expel them. These substances upset the endocrinal system, by interfering with the action of hormones. We carry this chemical 'charge' around with us and our organism cannot expel it, because it does not know how to metabolize it.

The way in which chemical substances act, especially in combination, is quite complicated, because of their interference with the natural functions of the organism. In particular, they alter the gene expression, change the agglomeration of tissues within cells, alter cell metabolism, alter the production of intracellular substances and the monitoring of cellular function.

A direct consequence of the actions of harmful substances on the body is the manifestation of health problems such as:

- **Neoplasias** (abnormal growths), many of which are linked to the consumption of pharmaceuticals such as diethylstilbestrol, which causes cancer of the cervix and uterus.
- **Congenital abnormalities:** birth defects, cleft lip or palate, hare lip (the effect of dioxins).
- **Changes to the embryo** which show in adults as low fertility, testicular cancer (cf. Niels E. Skakkebaek, male dysgeneisis syndrome) and hypospadias (a congenital condition in males in which the opening of the urethra is on the underside of the penis).
- **The use of thalidomide by pregnant women** (to combat the effects of morning sickness) caused phocomelia, stunted growth in the limbs of their embryos.
- **Polycystic ovaries**, where cysts are formed in the follicles, preventing ovulation.

An important position among the substances which affect human health is held by endocrine disruptors, which are chemical complexes from the environment which interact with hormone receptors to bind substances. The cellular receptors, in fact,

which for thousands of years remained 'pure', are now subject to the action of external chemical substances. Sources of these substances are insecticides, herbicides, industrially-developed beauty products and so on.

On exposure to endocrine disruptors, the harmful substances are absorbed through the entry point of the mouth, spread and are expelled through the kidneys and the sweat glands. The toxic and inactivated substances are metabolized in the body, but each person reacts differently to them, and it is possible that they will react with the DNA. A critical period is considered to be that of organogenesis (formation of the organs), when the expectant mother must not come into contact with harmful substances, especially during the first three months of pregnancy.

The final signs of the action of hormone disruptors are:

- Reproduction problems
- Neurological problems
- Immune system problems
- Impact on the embryo
- Impact on the open windows of exposure
- Cancer

From the above, it is clear that there are many chemical substances in the environment which can harm the human organism, if it is exposed to them for any length of time.