

Short Communication

Future medicine through a new pathology

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Even when an important advancement either in diagnostics, or in methods or in the technical equipment used has been achieved, nowadays Medicine is going through a difficult period.

The number of diseases to which there is no answer and no etiopathogenesis is known is increasing day by day, a condition that implies that no clear and, what is more important, no correct diagnoses are issued, which, in turn, implies that no appropriate and effective treatment is adopted. A “no diagnosis” means also that no prevention measures are applied. The list made available includes roughly 6,000-10,000 new rare diseases (the difference is due to the different organizations that perform the calculations), more and more often combined together as syndromes like, for instance and among many others, the Gulf-War and the Balkan Syndromes or the Chronic Fatigue Syndrome or ASIA (Autoimmune/Inflammatory Syndrome).

The most common pathology or, at least, the one that is most dramatically on the increase, is cancer of all organs and tissues in all its many varieties. Though very common, so far the indisputable identification of its origin is unknown, provided the origin to its roots is one.

Leukemia and lymphomas in all their variety are probably those that grow more rapidly in terms of epidemiology, yet no reliable explanation to that phenomenon has been reached and shared. The only more or less universally-used weapon to fight them is chemotherapy, often a cocktail of drugs, but none of them is addressed to the actual pathogenic agent. Apart from the discomfort of those who are subject to the treatment, the consequence, though often denied, is a far-from-negligible number of failures that should be taken into account. In many cases, those pharmacological treatments aim at preventing the evolution of the carcinogenic mechanism but nothing truly effective is done to hit the heart of the problem, *i.e.*, the “triggering mechanism”.

If we calculated the financial commitment and the human resources spent throughout the world from the end of World War II (*i.e.*, when chemotherapy against cancer slowly started) to now, objectively evaluating the results achieved, we could easily see that the biological route taken is not suitable to identify the triggering mechanism.

The myriad of biological cell parameters identified in cancerous cells are certainly of the utmost interest, but do not give a clear answer to what the pathogenesis of cancer is. The search of “why” is secondary to the search of new drugs or cocktails of drugs to take care of the patients. Besides cancer which, in any case, is of enormous importance, all the new diseases, particularly because they are new, need a new approach, since the present one is unable to provide an answer to the actual patients’ needs. For these reasons, we are investigating those unknown diseases starting from a new point of view: not from the symptoms but from the analyses of what can be found inside the pathological tissues and, more in particular, focusing our attention to what is not

supposed to be there. Just as an example, it is known for a very long time that there are lung diseases caused by physical (not chemical and not biological) pathogens like, for instance, environmental dust. Among them silicosis, asbestosis, some sarcoidosis and, in general, pneumoconiosis, cryptogenic granulomatosis, anthracosis, asbestosis, bauxite fibrosis, byssinosis, chalicosis, siderosis, silicosis, stannosis, talcosis. By means of Scanning Electron Microscopes equipped with an X-ray microprobe of an Energy Dispersive Spectroscopy, we can see and characterize by size, shape and chemistry the particulate matter present in diseased tissues [1,2].

The presence of non-biocompatible and non-biodegradable dust in pathological tissues testifies to the exposure the patient suffered, the biological reaction that has resulted and the morphological cell changes that the histopathologist can see. These results come from a personal data base of more than 1300 pathological tissues investigated within 2 EU research projects (Nanopathology and DIPNA), but the EEA Report about the Air Pollution in Europe 1990-2004 and the IARC Report n.221 [3,4] already stated that particulate matter especially under the 2.5 micron size can trigger cancer. The new approach is focused to verify the mechanism of cancerogenicity.

This approach is interdisciplinary, since different cultural backgrounds in addition to the physical, chemical, medical, histopathological and biological ones are necessary. In particular, an appropriately-trained electron microscopist must take care of the identification and characterization of those foreign bodies in the pathological tissues.

A material scientist must understand the meaning of the chemical composition of those undue presences and, together with a specialist of the environment, understand the origin of the inorganic/organic pollutants detected. Analysing the contamination in terms of morphology, size and chemical composition, it is possible to hypothesize the degree of toxicity and suggest the best medical treatment, be it surgical, pharmaceutical or other. The material/environment scientist, making an appropriate anamnesis, could trace the source of exposure the subject underwent or still undergoes, and put in place, when possible, prevention measures, in case removing the patient from the vicinity of the source. In fact, whenever any treatment of the patient is used, the elimination of a still-existing exposure is mandatory, failing which, only a partial and temporary result can be obtained. This approach was well-appreciated in cases of massive

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exposures like that that occurred in New York on September 11, 2001. In that circumstance, the enormous dispersion of huge quantities of fine and ultra-fine dust caused by the aerosolization of two airplanes and by the collapse of the Twin Towers caused many different diseases among the workers who spent months in the still-burning and smoking ruins, and among the inhabitants of the area. So, as it may seem paradoxical, Ground Zero was and still is a useful open-air laboratory. It represents the “Hiroshima” of nano-sized particles.

In conclusion, a new, less-tied-to-ancient-concepts approach of Medicine, an approach capable of facing diseases as a matter of fact unknown or hardly studied in the past, is necessary.

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