
NANOPATHOLOGY
THE HEALTH IMPACT OF
NANOPARTICLES

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ANTONIETTA M GATTI

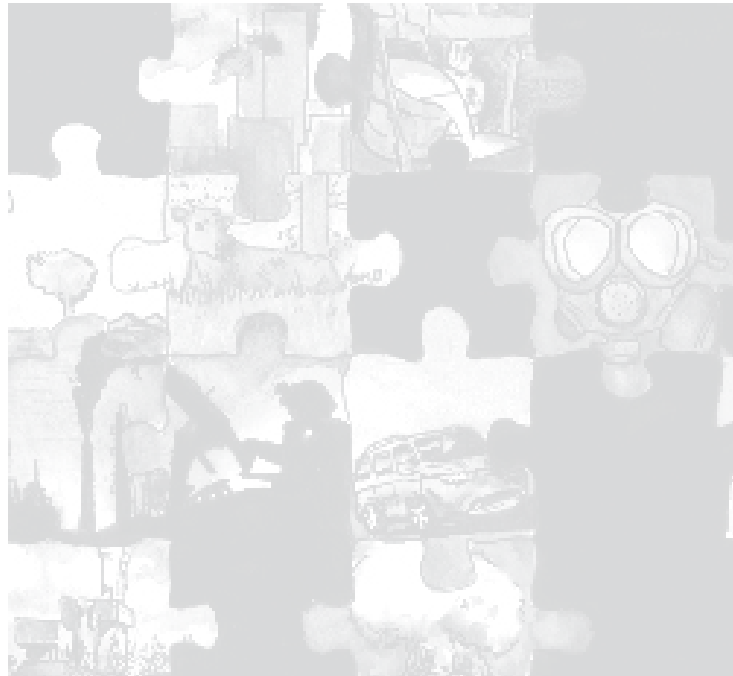
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The Health Impact of Nanoparticles

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*This book is dedicated to those who are neither young nor
old enough to know everything, but know, as we do,
that they don't know anything.*

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Preface

Nanotechnologies can represent a real innovation for human society and life. The possibility of “bottom-up” construction makes man look like God, but the wise man knows that every progress can have a negative side and too often, when he realizes that, disasters have already occurred.

The primary *raison d'être* of this book is to help society avoid the repeat of the mistakes made by the Curies and their followers when they discovered radioactivity and started, on the wings of enthusiasm, to use it on people affected by a number of diseases, and did that without being able to anticipate the harmful side effects of those therapies.

A new trend has spread all over Europe, meetings after meetings dedicated to radiotherapy were organized, and people have even started to wear necklaces with beads of Cobalt core.

It was only a few decades later, after having paid a high price in terms of deaths, that the side effects of radioactivity became evident, but now we can use radioactive materials in a safe way daily, taking advantage from this phenomenon and the technologies it had generated.

The new frontier opened by nanotechnology especially in medicine looks extremely exciting. In the future we might see nanodevices equipped with nanomotors inserted in the blood vessels and driven to areas damaged by an infarction to destroy the thrombus or the atheroma and restore circulation, or toward the pneumothorax area to seal the lesion. Or even devices that act like guardians to check the onset of inflammations in precancerous areas.

All these may look like a dream, but, it is a dream fast becoming a reality and, before, it becomes real, it is crucial that we verify how organisms, tissues, cells react to the presence of nanoparticles, i.e. foreign bodies whose behaviour is still largely unknown.

Recent European research projects (Nanosafe1, Nanosafe2, Nanoderm, Nanopathology) have explored the possible risks of nanoparticles on human health, and their results are controversial. Some assert the safety of nanoparticles through *in-vitro* tests, others are more doubtful and less optimistic, while a few scientists have already presented clinical evidences of the presence of nanoparticles in pathological tissues [A.M. Gatti, 2005]. Besides other pieces of evidence, unintentionally released, nanosized particles were found in soldiers who served in former Yugoslavia during the Balkans War (1993-97). It is widely known that the explosion of Depleted Uranium bombs can develop a temperature exceeding 3000°C [Annual Report, 1978]. The magnitude of this combustion is capable of vaporizing everything. As soon as the vaporized materials cool down, nanosized particles are created and are scattered in the environment. The inhalation or ingestion of those mainly metallic particles by humans and animals can bring about pathological effects [Nemmar A. et al., 2002]. Warfare is not the only one to be blamed for the formation of nanoparticles as a pollutant. Car engines, industry, incineration and high-temperature procedures in general are just a few examples of particulate pollutants producers. It is easy to conclude that in more than one instance, the environment is already contaminated by nanosized particles.

It has been proved that 100-nm-sized particles when inhaled can bypass the lung barrier in 60 seconds and reach the liver in 60 minutes.

It may not be possible to eliminate nanoparticles from the environment, but, awareness of their possible adverse effects on human health is important. More research are needed to determine the safest procedures to handle them.

This book intends to help society change its mind set as in the words of John Steinbeck, Nobel Prize Winner, 1964,

“The ability to think differently today than yesterday is what separates the wise from the stubborn.”

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