Artemis Shielding

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Is the demise of lead as the standard bearer for attenuation of X-rays and high energy radiation about to occur?

"When the negatives outweigh the benefits, it is time to replace and move On". Anon.

*** 1st in a series of Articles recommending economic replacement of Lead in different applications as an Attenuator for X-rays and high energy electromagnetic radiation. Applications to include lead lined drywall and plywood, protective aprons and clothing, security curtains, FDA compliant curtains for evaluating foodstuffs and mobile barriers.**

By Dr. Paul J. Fenelon, Chief Technical Officer, Artemis Shielding.

Shortly after the discovery of X-rays by Rontgen in 1885 it became obvious that X -rays, a subset of electromagnetic radiation with wavelengths in the 0.01 to 10.0 nanometers range where a very important class of matter with the inherent ability to be a Key Diagnostic Tool for Medical Science. The importance of this class of matter was recognized by the scientific community at large as exemplified by the subsequent host of Nobel Prices in Physics awarded to researchers in this field including Rontgen for its discovery, the Curies for their early pioneering work in the field, Einstein for his breakthrough Photo Electric Effect, Compton for his contribution on Photon Scattering, and the Braggs for their basic research on X-ray Crystallography.

It also became obvious after the discovery of X-rays that exposure, both short term and long term, to this class of matter could be very detrimental to human health. It is noteworthy that this negative aspect was experienced first-hand by Madame Marie Curie who passed away in her mid-sixties due to Cancer of the Blood brought about by overexposure to X-rays. The dilemma on hand then was to find a way to take advantage of the Diagnostic and Therapeutic Benefits of X- rays while at the same time having in place safeguards to control and restrict overexposure. Hence lead, due to its low cost, Malleable nature, high atomic number, high specific gravity, and ready supply, was selected early on as the material of choice, in essence lead became the standard bearer for attenuation of X-rays and still is, to a large extent, today.

History and Toxicology of lead.

Lead (Pb) is ubiquitous and one of the earliest metals discovered (6000 BC) by the human race. Unique properties include, softness, high malleability, ductility, low melting point, and resistance to corrosion, have resulted in widespread use in different industries like automobiles, paint, ceramics, plastics, attenuation of electromagnetic

radiation, ballast, ammunition etc. This in turn has led to manifold rise in the occurrence of free lead in biological systems and the environment.

Lead is regarded as a potent occupational toxin and its toxicological manifestations are well known. The non-biodegradable nature of lead is the prime reason for its prolonged persistence in the environment.

There is no level of lead that appears to be “safe” and lead toxicity is a particularly insidious hazard with the potential of causing irreversible health effects. It is known to interfere with a number of body functions primarily affecting the central nervous system and It is estimated that in underdeveloped countries that “lead poisoning” was responsible for more than 800,000 deaths in 2013.

Be sure to read the next article in this series, Prevention of lead induced toxicity.

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