

## Editor's comment

### What medicine owes to science



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This issue of *CME* is on nuclear medicine – a field of medicine that could not exist without the knowledge that we have of the properties of radioactive substances.

Radioactivity was first discovered in 1896 by the French physicist Henri Becquerel, while working on phosphorescent materials. He thought that the glow produced in cathode ray tubes by X-rays might be connected with phosphorescence. To examine this, he wrapped a photographic plate in black paper and placed different phosphorescent salts on it. All the results were negative until he used uranium salts, which produced a deep blackening of the plates. These radiations were called Becquerel rays.

However, the plate blackened when the mineral was in the dark, so this had nothing to do with phosphorescence. Non-phosphorescent salts of uranium and metallic uranium also blackened the plate, which meant that there was a form of radiation that could pass through paper that was making the plate black.

Early researchers such as Pierre and Marie Curie, Edward Rutherford and Becquerel

eventually found that many other chemical elements besides uranium have radioactive isotopes.

The early researchers also found that an electrical or magnetic field could split radioactive emissions into three types of beams. The rays were given the alphabetic names alpha, beta and gamma. Alpha rays carry a positive charge, beta rays carry a negative charge and gamma rays are neutral. We now know that there are many other types of decay, but alpha, beta and gamma decay are the most common.

The early researchers into radioactivity also did not realise that radioactivity and radiation were dangerous. The immediate effects of radiation were first seen by the electrical engineer and physicist Nikola Tesla when he intentionally exposed his fingers to X-rays in 1896. He published his observations on the burns that he suffered (and later recovered from), but thought they were caused by ozone and not by the X-ray radiation.

The genetic effects of radiation, including the way in which it can increase the risk of

cancer, were recognised much later. In 1927 Hermann Muller published research about genetic effects and was awarded the Nobel Prize in 1946 for his findings.

In fact, before the biological effects of radiation were known, many doctors and corporations were marketing radioactive substances as patent medicines. Examples were radium enema treatments and waters containing radium to be drunk as tonics! Marie Curie spoke out against this type of treatment, saying that we did not yet know enough about the effects of radiation on the human body. She later died of aplastic anaemia, probably as a result of constant exposure to ionising radiation. By the 1930s, after a number of cases of bone necrosis and death in enthusiasts, radium-containing medical products vanished from the market.

We now use the properties of radioactive materials in specialties such as nuclear medicine to diagnose disease – and in radiotherapy – to treat and palliate disease. But without the work of these early scientists, none of this would have been possible.

*CME* is published monthly by the South African Medical Association  
Health and Medical Publishing Group,

Private Bag X1, Pinelands, 7430 (Incorporated Association not for gain. Reg. No. 05/00136/08). Correspondence for *CME*  
should be addressed to the Editor at the above address.

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