Medical Applications of Atomic Energy.

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THERE CAN BE few aspects of medicine which have not been influenced in some way or other by the use of radioactive isotopes, these new man-made radioactive substances which the atomic age has brought with it.

Perhaps the direct results of treatment with radio-isotopes have not been quite as dramatic as at first hoped, but steady progress has been made in ameliorating or sometimes curing cancer and in treating certain types of blood disease or thyroid disease. New ways of treatment, too, are constantly being evolved.

The element cobalt, for instance, made radioactive in an atomic pile, can be used to replace more expensive deep X-ray machines in the treatment of cancer; this can be done because the rays from the radioactive cobalt are fairly similar in nature to the X-rays produced in powerful and advanced types of deep X-ray therapy machines. It is likely in the future also that this radioactive cobalt may be replaced in many cases by certain of the waste products from atomic piles, which may be considerably cheaper. (This applies particularly to a waste product called Cesium.)

Similarly, radioactive isotopes can often be used as a substitute for radium in local applications to tumours. Each isotope has different characteristics in the depth to which its rays penetrate in the tissues, and therefore different isotopes may have advantages in differing circumstances.

Certain insoluble radioactive isotopes in fine watery suspensions are useful in some particular forms of cancer where they can be introduced into body cavities whose walls are cancerous. Thus their rays actually shine on the cancer from inside the body.

In some cases of cancer of the thyroid gland, the cancer will take up iodine from the blood stream in the same way that the thyroid gland itself takes up this element. This occurs because the secretion of the thyroid gland is an iodine-containing substance and therefore if the cancer is of the type which produces hormone it will require iodine for this purpose. If now a weak solution of radioactive iodine is injected into the blood or taken by mouth, then the radioactive iodine will also concentrate in the thyroid gland and the thyroid cancer, and the rays from this comparatively large amount of radio-iodine will finally kill the cancer. Unfortunately, a high enough concentration of iodine to do so only occurs in some forms of cancer, but this form of treatment may be very successful in such cases.

It should be mentioned also that radio-iodine is used not only for treatment of cancer of the thyroid, but also for treatment of certain selected cases of overactivity of the thyroid.

Radioactive phospherous is another useful radio-isotope and is very successful in treating one or two rare and severe forms of anaemia. In these conditions the radio-phosphorus when injected into the bloodstream tends to concentrate in the bone marrow where the blood is formed, just as radio-iodine concentrates in the thyroid gland.

There are a number of ways in which radio-isotopes may be used in the diagnosis of disease. Perhaps the best-known is in testing the thyroid gland for increased or diminished activity. Here one gives the patient a very small dose of the radioactive form of iodine—a considerably smaller dose than that required for treatment. If the thyroid is overactive it will concentrate a higher proportion than usual of the administered dose; if it is less active than usual it will concentrate less iodine. Now merely by placing a Geiger counter or similar instrument so that it is directed towards the thyroid in the patient's neck, one can measure the proportion of radio-iodine taken up by the gland and therefore get a good idea as to whether the thyroid is working too actively or normally, or perhaps not working hard enough.

Above all, however, it is in medical research that radioactive isotopes have proved so valuable. For instance, by attaching radioactive atoms to any substance that one wants to trace through the body, such as a drug, one can follow its progress from one part of the body to another by the rays it gives off. These rays require to be detected, of course, by some such instrument as a Geiger counter, for human beings have no sense organ which can detect the rays from radioactive substances or the similar X-rays.

There are a great number of instances which could be quoted where radioactive isotopes have been useful in medical research, so many in fact that the introduction of radioisotopes has been compared in importance to the invention of the microscope as a research tool in medicine. To name only a few cases, researches into penicillin, vitamins, anaemias, the formation and repair of teeth, have all benefited from the use of isotopes.

Radio-isotopes have given us a much more vivid picture than we had before of the ebb and flow of processes in the body. They have shown us how the chemical substances forming particular organs are continually being withdrawn and broken down and further material is at the same time being built up to keep the whole structure in equilibrium.

The knowledge that is being gained by medical research with radio-isotopes will surely have a great effect on the treatment of disease in the future, and in fact it has already begun to influence the practical day-to-day work of doctors.

As radio-isotopes are employed in medicine, industry and research in wider and wider fields, it is important that they be used in such a way that they do not bring harm in their train. Excess radiation can cause damage to the body, either soon after a large exposure to rays, as was seen at Hiroshima and Nagasaki, or much more slowly after innumerable small overexposures extending perhaps over many years of careless handling of radioactive substances. There are, however, well-recognised ways of avoiding this harm by not exceeding certain limits of radiation; these limits are recommended by a body of scientists with representatives from many nations which is known as the International Commission on Radiological Protection. For each type of ray and each type of isotope there has to be laid down a fixed safety limit. Consequently, a great deal of experimental work has had to be done and is still going on, to ensure that these limits have the backing of the most modern research.

Polio Vaccine.

SPEAKING ABOUT THE new polio vaccine at St. Paul's Cray, Kent, on 4th April, Miss Pat Hornsby-Smith, Parliamentary Secretary to the Ministry of Health, said that the memory of the unfortunate incident in the early trials in the United States still bulked unduly large in the minds of many parents in this country. That chapter was ended a year ago and the world had benefited from the added knowledge resulting from that misfortune.

"It cannot be stated too often," Miss Hornsby-Smith went on, "that since the tightening-up of the safety tests and precautions in the United States after that incident 10 million children have been vaccinated against polio without a single mishap. In Canada also one million children had been protected also without a single mishap. These are vitally important and reassuring facts of which everyone should be aware."

The British-made vaccine was being subjected to the most stringent safety tests known, as advised by a Committee of the Medical Research Council. The tests went even further than the revised tests used in the United States. Three types of safety tests will be carried out by the manufacturers. The same series of tests will also be carried out independently on each batch of the vaccine by the National Institute for