

# ISOTOPES IN THE STUDY OF TROPICAL DISEASES

While the value of radioisotopes in the treatment of diseases is still somewhat limited, they have already become indispensable in many branches of clinical investigation and diagnosis. The variety of studies that can be made with the help of isotopes is steadily growing, and in many cases the results obtained have put medical knowledge on a much surer foundation than had hitherto existed.

Experts from 15 countries met at a symposium in Bangkok from 12 - 16 December 1960 to exchange information and ideas on the use of radioisotopes in the study of endemic and tropical diseases. Discussions at the meeting, which was sponsored jointly by the International Atomic Energy Agency and the World Health Organization, showed that radioisotopes had enabled medical scientists to gain a better understanding of the nature and causes of a number of diseases which afflict vast populations in tropical areas. It was also felt that this increasing understanding was likely to help substantially in the eventual control of the diseases.

## Nutritional Deficiencies

Among the most serious public health problems in tropical regions are diseases resulting from inadequate or defective nutrition. The exact relationship between dietary deficiencies and various disorders is not, however, always clear. For example, as G. R. Wadsworth of the World Health Organization explained at the meeting, while permanent blindness in children due to malnutrition of pregnant and lactating women can be prevented by increasing the intake of vitamin A, little is known about the function of this vitamin in the tissues or about any other important disorder that might be caused by its deficiency. Isotope techniques can throw new light on these problems. Again, they can be used in determining possible dietary causes of liver diseases or the relationship between nutrition and infection.

A paper presented by a British scientist (A. S. McFarlane) gave examples of isotope applications in the study of protein deficiencies and revealed that these had shed much light on the nature of animal protein reserves. Another scientist from the United Kingdom (D. L. Mollin) spoke on the use of radioactive cobalt and radioactive hydrogen in investigating deficiencies of vitamin B12 and folic acid, and explained how with the help of these materials it was possible to determine whether the deficiencies were due to malabsorption and, if this was so, to demonstrate the nature of the absorption defect which caused the malabsorption.

S. J. Baker, from India, told the meeting how vitamin B12, labeled with a radioactive isotope, had been used in studying the deficiency of this vitamin in cases of sprue, a disease widely prevalent in tropical areas. Use had also been made of fats labeled with radioactive iodine and radioactive carbon for the correct diagnosis of this disease, which is especially important because it may sometimes be difficult to differentiate the disease from certain other disorders such as intestinal tuberculosis, pernicious anaemia and chronic pancreatic disease.

## Anaemias and Goitre

One full session of the meeting was devoted to discussions on isotope applications in the study of tropical anaemias. T. H. Bothwell, from South Africa, pointed out that studies with radioisotopes of iron had contributed considerably to the development of the present concepts of iron metabolism in the human body, special attention having been given to the absorption and excretion of the metal and its movement within the body. These studies had made it possible to define the patterns of the production of red blood cells in a variety of conditions. M. Roche (Venezuela) presented a paper on the use of radioactive chromium in measuring the blood loss due to parasites, as in the case of hook-worm infected patients, and evaluating the importance of the loss as a contributing factor of anaemia.

A paper presented by a Thai scientist (Vikul Viranuvatti) was based on clinical research, conducted under a project financed by IAEA, into the nature of a particular type of anaemia which is common in South East Asia and constitutes one of the major health problems of this region. Treatment of this type of anaemia often involves the removal of the spleen, but it is desirable to know in advance whether an individual patient would benefit from this operation. In the investigations described by Vikul Viranuvatti, some of the red blood cells of the patient are labeled with radioactive chromium and re-injected. Radioactivity measurements over different parts of the body can then indicate whether the spleen is mainly responsible for the anaemia and should be removed.

Another session heard reports on research to determine the causative factors of endemic goitre with the help of iodine-131. Since goitre is associated with the function of the thyroid gland and since iodine tends to concentrate in the thyroid, the radioactive isotope of iodine is especially suited to the investigation of the disease. An interesting aspect of the study relates to the possible role of genetic factors, and according to a paper presented by J. B. Stanbury (USA) there is a

possibility that genetic factors may increase the effect of iodine deficiency in causing goitre. A scientist from the Philippines (P.C. Campos) gave an outline of a scheme for the systematic investigation of the disease in a locality where it is endemic. He also reported on the preliminary results of a campaign of this type which is being carried out in certain areas in the Philippine Islands; the project is being conducted under a research contract awarded by IAEA.

## Insects and Parasites

The last two sessions of the symposium were devoted to discussions on the application of isotopes in the study of insects and parasites which carry or cause diseases in tropical areas. One of the most important of these insects is the malaria-carrying mosquito, and several methods of using radioisotopes in anti-mosquito campaigns were described at the meeting. The basic contribution of isotopes in this field is in providing an extremely sensitive and versatile tool for studying the physiological, biochemical and ecological characteristics of the insects with the object of devising effective lines of attack. It was pointed out that a serious threat to the progress of tropical medicine was the increasing number of insects displaying such high levels of resistance to the established chemical insecticides that their use had had to be abandoned. Labeled insecticides have been extensively used for comparing their absorption, metabolism and excretion by normal and insecticide-resistant insects, and valuable data have thus been obtained on the mechanisms of resistance.

Parasites causing human diseases are of a wide range, from viruses and bacteria to the animal parasites such as amoeba and worms. Radioisotopes are being used for studying the life history of these parasites as well as their relationship to their hosts, i. e. the organs of the body in which they reside. The latter is an interesting and extremely important field of investigation to which the use of isotopes as tracers is particularly suited. P. C. C. Garnham (UK) also drew attention to the possible use of radiation in sterilizing or reducing the virulence of parasites, which he thought might in the long run be even more valuable than the tracer applications of isotopes in this field.

The following scientists served as Chairmen at different sessions of the symposium: D. W. Jenkins (USA), A. S. McFarlane (UK), D. L. Mollin (UK), M. Roche (Venezuela), W. P. Rogers (Australia) and J. B. Stanbury (USA). The proceedings of the symposium are to be published jointly by the International Atomic Energy Agency and the World Health Organization.



Scientists from different countries at one of the working sessions of the Bangkok symposium

## Research Projects

Apart from affording an opportunity for comparing the results obtained so far, the Bangkok symposium showed the need for intensified research in several directions as well as some of the promising lines along which further investigations could be pursued. These indications, it is expected, will not only prove valuable to the participating scientists but also help IAEA in sponsoring appropriate research projects. Besides the two IAEA-supported research projects mentioned earlier, the Agency has placed research contracts with scientific institutes in Greece, Iraq, Israel, South Africa and Venezuela for the study of tropical and sub-tropical disorders by isotope techniques.

As in Thailand, research on the application of isotopes in the investigation of tropical anaemias is under way in Greece and Iraq under contracts awarded by the Agency. In Greece, the Agency is also supporting research on the use of isotopes in the investigation of a liver disorder which is fairly common in tropical and sub-tropical areas. The project in Israel is devoted to a similar subject, viz., the use of radioisotopes for scanning or "seeing into" the liver. Under the research contract placed in the Union of South Africa, isotopic investigations are to be made into the cause and nature of protein deficiencies due to malnutrition, while the project in Venezuela is for a study of disturbances in food absorption caused by hook-worm infection.