Comments and Communications

Radioactive Needles Containing Cobalt 60

As a part of the broad program entailing applications of radioisotopes in fundamental research and therapy in progress at the Ohio State University College of Medicine during the past 8 years, studies planned in July 1946, following the announcement in this journal of the availability of radioisotopes generated in the pile at Oak Ridge, were begun in October 1947 with Co^{60}. Sufficient progress has been made to warrant a preliminary report of our studies, since they indicate that the gamma radiation emitted by the isotope will prove useful in a manner similar to the present application of radium in the treatment of radiosensitive neoplasms.

Because of difficulties encountered in machining pure cobalt rondels, we are using an alloy wire composed of 45% cobalt and 55% nickel. ("Cobanic" wire was kindly furnished by the Wilbur B. Driver Company, Newark, New Jersey.) Radioautographs of needles fashioned from the wire demonstrated uniform radioactivity per unit length after they had been irradiated in the pile at Oak Ridge, and measurements made with a Geiger-Müller counter proved that the amount of radioactivity present was in proportion to the mass. Chemical separation of the components of the alloy, carried out by Harmon L. Finston, of the Department of Chemistry, The Ohio State University, showed that the radionickel generated during exposure of the needles in the pile is very slight in amount and does not contribute significantly to the total radioactivity of the needles. A needle 3 cm long, 1 mm in diameter, and weighing 0.193 gm was measured soon after irradiation and showed 2.97 milliroentgens/hr at 1 m and gamma radiation equivalent to that from 4.08 mg of radium when the gold leaf electroscope was surrounded by 1 cm of lead. (These values were determined by L. F. Curtiss at the National Bureau of Standards.) This specific activity is suitable for many purposes; if desired, it should be possible to increase it several fold simply by longer irradiation in the pile.

Animal studies support radioautographic evidence that the soft beta radiation present should be removed by filtration to minimize periacicular necrosis in applications where only the effects of the gamma radiation are desired. This can be accomplished easily by enclosing in thin, strong, and inexpensive casings of stainless steel or Monel metal.

The alloy is strongly magnetic, and we find it convenient to handle it with a small, long electromagnet (suggested by Paul C. Aebersold) instead of the forceps commonly employed in handling needles containing radium. We have found the half-value thickness of the gamma radiation in lead to be 0.41". The emission of gamma rays having such high energy, together with the ease of handling and availability, indicate that Co^{60} should prove especially useful in telecobalt installations. The alloy is quite malleable and can easily be machined to any desired shape before it is made radioactive. Another advantage over radium is that the radioactive wire can be bent to fit lesions such as tumors in bone. In addition, there is no danger of loss by leaks or breakage.

Clinical evaluation will be undertaken soon in collaboration with Dr. Joseph L. Morton, of the Radiology Department of The Ohio State University, after completion of animal studies now in progress. A more detailed description of the radioactive alloy needles and their properties will be presented at the American Radium Society Meeting in Chicago, June 20–22.

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Influence of Butyl Alcohol on Shape of Snow Crystals Formed in the Laboratory

In the course of laboratory measurements on the number of ice-forming nuclei contained in various smokes, a microscope was set up in a refrigerated box for the purpose of counting snowflakes. A supercooled cloud was formed in the refrigerated box at $-20°$ C by the Schaefer technique (*Science*, November 15, 1946, pp. 457–459). Smoke containing silver iodide nuclei was introduced into the cloud, and the snow crystals which formed were allowed to fall on a slide, where they were examined under a microscope. The crystals thus produced were predominantly in the form of flat hexagonal plates.

Without any intentional change in the experimental setup, it was noticed that the type of snowflakes produced had changed from the hexagonal plates to hexagonal prisms having a length of the order of 5 times their diameter. It was found that hexagonal prisms were produced until the air in the box had been cleaned out by displacing it with air from the compressed air line. When this was done, the flakes formed were once more hexagonal plates. The cause for this change in the shape of the crystals was finally traced to the presence of a small amount of normal butyl alcohol vapor in the laboratory atmosphere which had resulted from accidentally spilling some of this liquid.

The modification of crystal shape caused by traces of butyl alcohol vapor was found to vary considerably with its concentration in the air in the cold chamber. When the partial pressure of the butyl alcohol was of the order of 10^{-6} atm or less, no effect was noticeable. At a partial pressure of the order of 10^{-5} atm, the long prisms were formed. At still higher partial pressures, the effect diminished, and hexagonal plates formed once more. The effect of the butyl alcohol vapor on the crystals was found to be similar whether the cloud was seeded by silver iodide smoke or by passing a piece of solid carbon dioxide through it.

The modification of habit produced in the presence of butyl alcohol is similar to the changes which have been reported in the habit of crystals grown from solutions to which various substances have been added. For example, sodium chloride, which usually crystallizes as cubes from

aqueous solution, forms octahedra if urea is added to the solution. The suggested explanation for this change of crystal habit is that adsorption on the crystal faces changes their relative rates of growth, thus modifying their shape.

It seems probable that butyl alcohol alters the shape of the snow crystals in a similar manner. Apparently, at very low concentrations of the vapor the effect on the rate of growth is small on all faces. However, as the vapor concentration is increased, a point is reached at which the rate of growth of the sides of the prisms is greatly reduced relative to the rate of growth of the prisms' ends. At higher vapor concentrations, the adsorption apparently causes less relative difference in the rates of growth of the various faces, and the effect on the shape of the crystal is less pronounced.

Isobutyl alcohol and allyl alcohol have been found to have an effect similar to butyl alcohol, and it is presumed other higher alcohols would behave in a similar fashion. Ethyl alcohol did not show the effect and, if anything, seemed to favor formation of hexagonal plates.

V. J. Schaefer of this laboratory has extended the scope of these experiments, and a report of this work will appear in the near future.

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The Berlin Botanic Garden

During the last war *Science* published a report that the great botanical museum of the Berlin Botanic Garden had been largely destroyed as the result of air raids in 1943. In recent letters from Dr. Joh. Mattfeld of that institution I have received information concerning the salvaging of portions of the herbarium and library that is of importance to botanists in general and to systematists in particular. Following is my translation of extracts from these letters:

Berlin-Dahlem. 11 January, 1948

For Christmas we had a great joy. Our specimens and books that we had saved from the fire, and some that later we had acquired new, had been evacuated as a measure of safety against new bombings. Then they were transported by the garrison force to an unknown destination, so that we had to assume that they had been deported. For two years this material was lost to us—we had no idea where it had gone. Now all this material has suddenly been brought back to Berlin and is freely available to us. But we cannot bring it to Dahlem immediately since Dahlem belongs in the American sector and our material lies in the Russian sector of Berlin, near the University, Unter den Linden. It is not permissible to bring articles from one sector to another. But I have not given up hope and tomorrow will make further efforts to save this material.

The material referred to was part of the most valuable that our Museum possessed. It includes the Willdenow Herbarium . . . and thousands of types which we had selected from several families, especially of the Monocotyledons and Archichlamydeae, shortly before the fire. Also the books are mostly old, priceless, illustrated works which had escaped the fire in a bank treasury.

Berlin-Dahlem. 18 March, 1948

After lengthy negotiations we have been able this week to bring over all of our material. It filled eleven trucks. The loss from damage by water is probably 5 per cent and so is bearable. We are endlessly happy that we have this valuable material, since it is indispensable for botanists of the whole world and therefore has great significance for the international relations of our Museum. Naturally the preliminary rearrangements make several difficulties because in the ruins of the Museum only a few rooms were at first made available, and because most of our cases and shelves were burned. Wood is wholly unobtainable, but at least a mason is working on the preparation of some additional rooms.

Among the material that has just been returned to us, we find parts of Bornmüller's herbarium. We had bought this private herbarium for our Museum before the war. We had moved about half of it to Dahlem at the time of the catastrophe and it was burned along with our herbarium—that is, the families up to but excluding the Umbelliferae according to the DC.-Boissier system. The second half Bornmüller had retained in Weimar, but part thereof was in boxes in our evacuation-stock cleverly deposited in a mine-tunnel. The first (part of this second half) I hauled in two trucks from Weimar to Berlin-Dahlem in 1946, along with Bornmüller's library, which we had also bought. The remainder has now been returned to us.

Prof. Bornmüller has a tragic fate for a botanist in that he is almost blind. However, in spite of his 86 years, he is still mentally amazingly clear and alert; and so much the more does it oppress him that he can carry on no more botanical work.

The news that the Willdenow Herbarium and thousands of types and many valuable reference works have been restored to the Berlin Botanic Garden will be gladly received by botanists throughout the world. It is to be hoped that the military representatives of the United States will be as helpful as possible in advancing the rehabilitation of this great botanical institution.

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Measurement of Diffusion Coefficients in Liquids by Radioactive Tracers

For the purpose of an investigation on hydrocarbon oils the writer has developed a novel method of measuring by means of radioactive tracers the diffusion coefficient in liquids. In contrast to the various existing techniques, the activity is followed by a Geiger-Müller counter *during* the diffusion process. This is made possible by using a suitable thin, highly porous structure, containing the solvent, into which the solute diffuses from the solution which is located below the porous structure. The counter tube is placed on top of the latter. If the equations involved in the diffusion and radioactive absorption process and the effect on counts of the distance of a sample from the counter are known, the observed rate of increase of counts per minute can be evaluated in terms of the diffusion constant. A diffusion test takes about 2 hrs to complete. Results on aqueous and organic solutions of uranyl nitrate have been obtained to date. A paper on this subject is in the course of preparation.

Andrew Gemant

The Detroit Edison Company