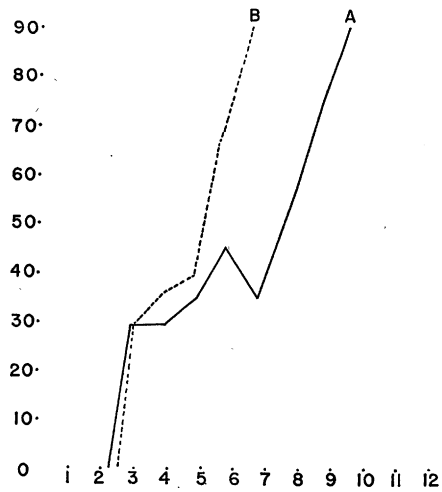

FIG. 2. Experiment on rabbit weighing 2.5 kg. Horizontal line indicates time in min; vertical line indicates angles at which blood surface film is broken. *A*, Normal clotting time, 10 min; *B*, 2 hr after parenteral injection of 2 mg diacetylmorphine; clotting time, 6 min. Note dip in normal curve after 6 min.

tion of the pointer in degrees of the quadrant every minute until the blood is completely clotted. That end point occurs when the radial pointer is in a horizontal position—in other words, at 90°.

It was found when using this instrument that the clotting process does not always proceed in a progressive manner. There are points when the film does not break so quickly, followed by a less resistant surface film. This is quite characteristic of normal blood. Furthermore, we found that the curve representing coagulation angles in relation to clotting times will vary with the thromboplastic or anticoagulating agents employed (Figs. 2, 3). This may eventually prove to be useful in analyzing the clotting mechanism after various drugs. For example, this instrument is

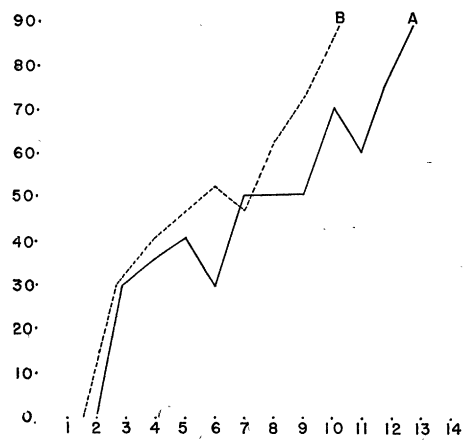

FIG. 3. Experiment on rabbit weighing 3.4 kg. Horizontal line indicates time in min; vertical line indicates angles at which blood surface film is broken. *A*, Normal clotting time, 13 min; *B*, 2 hr after injection of aureomycin; clotting time, 9.5 min. Note dips in normal curve after 6 and 11 min, and 1 dip in other curve after 7 min.

useful in following the effects of heparin when used to determine the imbalance of coagulating and anticoagulating factors in the blood (*2*); also the thromboplastic properties of penicillin (*3, 4*), mercurial diuretics (*5*), amphetamin (*6*), and other drugs.

The advantages of the above-described apparatus are obvious. We eliminate the personal equation involved in picking up the vial and tilting it at no precise angle, as well as shaking the specimen, all of which manipulations may produce appreciable variations in readings. In other words, this method enables the investigator to measure the clotting time more exactly and, at the same time, by plotting the relation curve between clotting time and clotting angle, it is helpful in analyzing the mechanism of the clotting process.

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The Action of Ultraviolet Light on the Pentose Moiety of Nucleic Acids and Related Compounds[1]

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In the present work, the fate of the pentose moiety of nucleotides upon exposure to ultraviolet radiations was investigated. The fact that free carbohydrates undergo complex changes when subjected to ultraviolet light was verified in preliminary studies, in which 2×10^{-4} *M* solutions of glucose and ribose, buffered with phosphate at pH 7.4, were placed in 1-cm rectangular quartz cells and exposed to radiations from an unscreened quartz lamp at a distance of 5 cm from the center of the lamp. Within 60 min both sugars were rendered incapable of reducing the alkaline copper salt reagent of Benedict (*1*) and of giving a positive Molisch test. In addition, the irradiated ribose solution did not react to the *p*-bromoaniline acetate test (*2*), which depends upon the formation of furfural from free pentoses.

In similar experiments with dilute solutions (30 μg/ml) of adenylic acid, cytidylic acid, and yeast nucleic acid, the compounds lost the ability to form furfural within an exposure period of less than 90 min. Both unexposed and irradiated solutions were assayed for furfural-yielding capacity by a modified Reeves and Munro technique (*3*). Moreover, irradiated

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TABLE 1

CHANGES IN FREE AND COMBINED CARBOHYDRATE SOLUTIONS (pH 7.4) DURING EXPOSURE TO ULTRAVIOLET RADIATIONS

Change	Compounds showing change
1. Loss of reducing properties	Glucose, ribose
2. Loss of ability to give a Molisch test	" "
3. Loss of ability to give a *p*-bromoaniline acetate test	Ribose
4. Loss of furfural-yielding capacity	Ribose, adenylic acid, cytidylic acid, yeast nucleic acid
5. Loss of ability to give a Stumpf test	Sodium thymonucleate

solutions of sodium thymonucleate failed to react to the Stumpf test (*4*) for desoxypentosyl purines.

The foregoing data, summarized in Table 1, demonstrate that both free and nucleotide-bound carbohydrates are readily destroyed by ultraviolet light. These results supplement, therefore, previously known viscometric and ultraviolet spectrophotometric findings (*5–7*), indicating that the compounds undergo an extensive over-all photodecomposition.

Finally, a limited study was made of the protection of various compounds on free and on nucleotide-ribose. As gauged by furfural production (*3*), the pentose breakdown was appreciably inhibited in the presence of 1% solutions of thiourea, sodium thioglycolate, acetic acid, sodium acetate, or oxalic acid. The most effective inhibitor was composed of 1% thiourea dissolved in 1% acetic acid. Solutions of ribose, adenylic acid, or cytidylic acid in this medium showed essentially no decrease in furfural-yielding capacity, even after 4 hr exposure to ultraviolet raditions. In contrast, 1% trichloroacetic acid or perchloric acid offered essentially no protection.

No attempt was made in the present study to find optimum conditions, since results will vary quantitatively with differences in the dilutions and dosages, the composition and size and shape of containers used, the wavelength of radiation, etc.

Although there is to date no crucial proof that nucleotide destruction is involved in the damaging effects of ionizing radiations upon living protoplasm, the possibility exists that some such phenomena as described here are factors in the questions of radiation lethality and of the mechanisms of some agents in reducing radiation mortality.

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Plastics in Trace Element Research

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Water culture methods of growing plants were known as early as 1860, when J. Sachs (*1*) and W. Knop (*2*) independently grew plants in nutrient solutions containing the "essential" elements, N, S, P, K, Ca, Mg, and Fe. It was not until approximately two decades ago, however, that studies of culture solutions indicated the important role played by trace elements in the physiological functions of plants.

Trace element studies invariably pose a problem because of contamination. Purification methods have advanced to the point where contamination from the nutrient solution itself is secondary to that introduced from other sources, including the containers. In general, workers using nutrient solution methods advocate the use of Pyrex glass for containers in experiments other than with boron. However, expense and chance of breakage are limiting factors.

As plastics are relatively cheap and have several obvious advantages over glass, it was decided to test some of them for possible contamination caused by Cu, Mn, Zn, or Fe. Several small plastic refrigerator jars, $4'' \times 4'' \times 3''$, plastic cookie jars, $6'' \times 6'' \times 7''$, and a large plastic tote box reinforced with glass threads, $24'' \times 28'' \times 6''$, were cleaned thoroughly in a sulfuric-dichromate solution, after which they were rinsed first with water, then with 2% HCl, and finally with water, double-distilled through Pyrex. They were then filled with a known quantity of a slightly acid, Pyrex double-distilled water, covered, and set aside in the laboratory for 2 weeks. At the end of this period the water was transferred to clean Pyrex flasks and evaporated almost to dryness. After the samples were diluted to a known volume, an aliquot was taken and analyzed for Cu, Zn, Mn, and Fe. These analyses were run in triplicate. In no case was there any contamination from the containers. Tests were not made for boron or molybdenum, but the composition of the plastic should make the containers suitable for research on these elements also.

The small refrigerator jars were subsequently used for studies of the effect of copper on the susceptibility of the Scotia bean to tobacco mosaic virus. A small hole was made in the lid by means of a hot metal bore. The plants were germinated in Petri dishes and at an early stage were threaded through the hole in the lid so that the roots were immersed in the nutrient solution and the leaves extended above the dish. The stem was supported by cotton at the point where it passed through the lid. As the stem enlarged, the cotton was removed. The same technique was used with the cookie jars in copper-deficiency experiments. The tote box, however, does not have a lid and presents a different problem. Support of the plants was provided by stretching a plastic gauze over the top of the box. The plants were threaded through the gauze,