It might be concluded from this that the first reaction in photochemical oxidation by the dichromate ion is hydrogen atom abstraction from the organic molecule.

E. J. Bowen

Physical Chemistry Laboratory,
Oxford.
March 14.

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Mechanism of Inactivation of Tobacco Mosaic Virus by X-rays

Inactivation of tobacco mosaic virus by X-rays has been studied by Gowen and Price, by Lea and associates[1] and by us[2]. The fraction surviving is an exponential function of dose with D_0 about $2{\cdot}3 \times 10^5$ r. This value corresponds to a target 3000 A. long and about 40 A. in diameter[2].

If the nucleic acid is the target, as proposed by Epstein[3], then it is possible that X-rays produce their lethal effect by breaking a nucleic acid chain. If this is true, then nucleic acid isolated from heavily irradiated tobacco mosaic virus ought to have a lower average particle-length than nucleic acid from unirradiated virus.

Since nucleic acid isolated from tobacco mosaic virus is a long, thin, fairly rigid rod[4,5], this theory can be put to test by measuring the intrinsic viscosity of isolated nucleic acid. To this end, 2 per cent solutions of tobacco mosaic virus were subjected to various doses of X-rays, and the nucleic acid was isolated by the method of heat denaturation[5]. The concentration of nucleic acid was determined from the height of the absorption maximum at 2570 A. The freedom from protein was verified by noting that the ratio of the extinction coefficients at 2600 and 2800 A. agreed closely with that of tobacco mosaic virus nucleic acid and differed greatly from that of the virus protein[6]. Results are shown in Table 1.

Table 1. Intrinsic Viscosity of Tobacco Mosaic Virus Nucleic Acid following X-irradiation

Intrinsic viscosity (ml./gm.)	Radiation dose (10^6 r.)	Intrinsic viscosity (ml./gm.)	Radiation dose (10^6 r.)
84	0	65	0·46
77	0	37	1·85
74	0	40	1·85

Nucleic acid isolated from X-irradiated virus has a lower intrinsic viscosity and, therefore, a lower average particle-length than that isolated from unirradiated virus. Therefore, the action of X-irradiation is to break the nucleic acid rods. That this breakage occurs as a result of damage inside the virus particle is indicated by the observations that heavily irradiated tobacco mosaic virus possesses essentially the same sedimentation-rate, intrinsic viscosity and electron image size as unirradiated virus. One can show, on the basis of simplified Simha theory, that the effect of breaking once each particle in an initially uniform distribution of rods, with the position of the break being equally likely at any point along the rod, would be to reduce the intrinsic viscosity to exactly one-half of its initial value. This calculation indicates that the order of magnitude is 1 for the number of breaks per rod associated with irradiation doses of about eight times the value of D_0 for inactivation.

This result is consistent with the view that the lethal action of X-rays on tobacco mosaic virus is the breaking of a single molecular chain anywhere in the nucleic acid. A possible reason for the discrepancy between the lethal dose and the dose required to break the rod is that the structure of ribose nucleic acid may be a coil of several strands.

An important deduction from these findings is that the biological activity of tobacco mosaic virus depends on the physical intactness of the nucleic acid. That a comparable degree of intactness of the protein is not required is indicated by the results reported by Schramm[4], to the effect that tobacco mosaic virus which has lost considerable protein still shows full biological activity.

This work was supported by the U.S. Atomic Energy Commission under Contract No. AT(30-1)-913.

Max A. Lauffer
David Trkula
Anne Buzzell

Department of Biophysics,
University of Pittsburgh,
Pittsburgh, Pa.
April 2.

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A New Unidentified Indole Hormone in Maryland Mammoth Tobacco

It has been reported previously[1] that the short-day plant, Maryland Mammoth tobacco, will flower under long day-lengths ($14\frac{1}{2}$–$15\frac{1}{2}$ hr.) if exposed to varying dosages of γ-rays. Recently, we have been investigating the effect of γ-radiation on the endogenous level of the indole compounds occurring naturally in leaf, stem, root and apical tissues of γ-irradiated and normal Maryland Mammoth tobacco. Large quantities of these tissues (300–1,000 gm.) have been extracted with absolute ethanol, employing a technique for extraction and paper chromatography as described previously[2]. Microlitre quantities of the extracts, after acidification and extraction with ethyl ether, were spotted on Whatman No. 1 filter paper and chromatographed in seventeen different solvents. Colours were developed with *p*-dimethylaminobenzaldehyde. 3-Indoleacetic acid was not detected in any of more than thirty-five individual extractions of leaf, stem, root or apical tissues of normal or γ-irradiated Maryland Mammoth tobacco. However, an unidentified indole compound was found in the leaf and apical extracts with R_F values as shown in Table 1.

Eluates of chromatograms containing the unknown have been assayed for activity in the split-pea curvature and tomato-petiole epinasty test. The compound was found to possess activity in both these biological assays. In addition, through the courtesy of Dr. K. V. Thimann and Dr. B. Stowe, of Harvard University, eluates of chromatograms containing the substance were tested and found to