STUDY OF 5-HYDROXYDIHYDROURACIL FORMATION AT POLYU RADIOLYSIS

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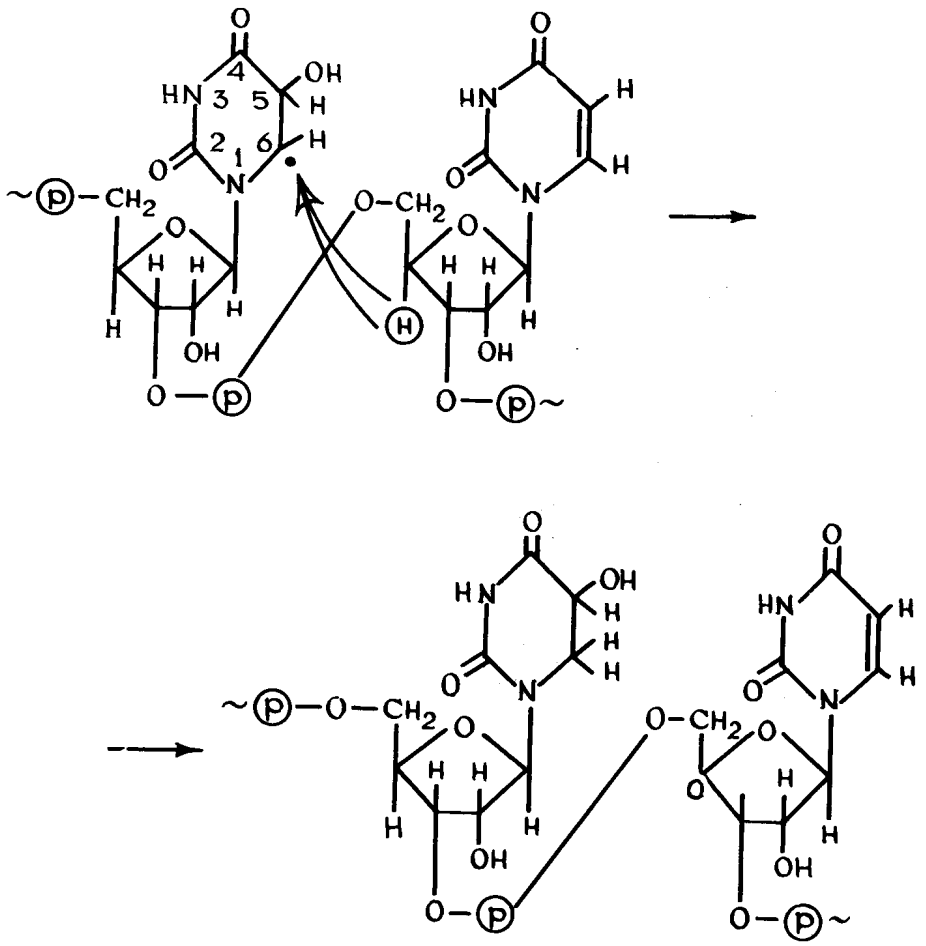
PolyU is widely used as a model compound for the investigation of the formation mechanism of nucleic acid strand breaks induced by ionizing radiation. The studies of the break formation and of the undamaged base release in polyU (1,2) showed that a primary radical in the base abstracted a H-atom from an adjacent ribose molecule. This results in a strand break and release of an undamaged molecule of the uracil. The authors (1,2) believe that the primary radical is the 5-OH adduct of the uracil.



The rupture of the phosphoetheric bond, the damage of ribose and the release of the undamaged uracil

According to this hypothesis, the number of 5-hydroxydihydrouracil molecules must be equal to the number of released undamaged uracil molecules. This means, that to test it one needs to compare the radiation yields of these compounds which was never done before.

We have examined the formation of the 5-hydroxydihydrouracil (1) and the undamaged uracil (U) at the radiolysis of $1 \cdot 10^{-3}$ M (in colulation for a nucleotide) N_2O-saturated polyU solution.

The (1) and the (U) were determined by the HPLC method with the use of a reverse-phased column after a mild hydrolysis of the irradiated solutions. The results were: G(1) = 0.4 and G(U) = 3 molecules per 100 eV. This means that the 5-OH adducts of uracil are not the main precursors of the undamaged uracil and of the strand break. The 6-OH adducts of uracil cannot pretend to this role either, because the measured yield of 6-hydroxydihydrouracil is lower than 0,3 molecules per 100 eV. The yield of 5-hydroxydihydrouracil increases in the presence of a small quantity of radioprotector cysteamine. This is caused by the reaction of the H-atom transfer from the cysteamine SH-group to the 5-OH adducts of uracil (3). The study of the concentration effect of cysteamine ($3 \cdot 10^{-6}$ M — $2 \cdot 10^{-4}$ M) on the yield of 5-hydroxydihydrouracil showed that only 21 per cent of the OH radicals which attack the polyU molecules lead to 5-hydroxydihydrouracil formation. This does not agree with the data (4), where the measured figure is 70 per cent. These discrepances appear to be due to the fact that the 5-OH adduct is not the only radical with reducing properties.

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