A FACILE PHOTOCHEMICAL ROUTE TO C-5 AND C-6 ALLYL-SUBSTITUTED URACIL NUCLEOSIDES¹ Isao Saito,* Hideyuki Ikehira and Teruo Matsuura Department of Synthetic Chemistry, Kyoto University, Kyoto 606, Japan

<u>Summary</u>: Irradiation of 5-iodouridine or 6-iodo-1,3-dimethyluracil in *aq*. acetonitrile in the presence of allyltrimethylsilane provided the corresponding 5- or 6-allylated product.

The synthetic method for creation of carbon-carbon bonds at C-5 or C-6 position of pyrimidine nucleosides has become increasingly important in recent years.^{2,3} Usually the substitution at C-5 of uridine has been accomplished by reaction of olefins with organo-palladium intermediates generated in situ from mercurinucleosides.² We wish to report an exceedingly facile method for the introduction of allyl group at C-5 or C-6 of uracil and uridine without using toxic mercury. Our approach is based on the photocoupling of allylsilanes to C-5- or C-6-iodouracils and has following important features: (1) the reaction may be carried out with readily available starting materials under mild neutral conditions; (2) allylation of unprotected nucleosides in aq. solvents can be accomplished as well, in contrast to the transition metal-catalyzed coupling where reduction of catalytic activity in the presence of water limits its use with unprotected nucleosides.

A typical procedure for the allylation of 5-iodouridine (1) is as follows. A solution of $\frac{1}{1}$ (70 mg, 0.19 mmol) and allyltrimethylsilane (328 mg, 2.84 mmol) in acetonitrile-water (5:1, 50 mL) was irradiated with a 100 W high-pressure Hg lamp through Pyrex filter (8 h). Removal of the solvent followed by preparative TLC (silica gel, ethyl acetate-EtOH 10:1) gave 3^4



(27 mg, 50%) and uridine (20 mg). A similar procedure with 5-iododeoxyuridine (2) gave $\frac{4}{7}$ (49%) and deoxyuridine (31%).

Irradiation of 6-iodo-1,3-dimethyluracil $(5)^{5}$ with allyltrimethylsilane (15 eq) in aq. acetonitrile proceeded more efficiently to give 6-allyluracil derivative 7^{6} (80%). The same product 7 was obtained in 80% yield from the irradiation of 5 and allyltrimethyltin (15 eq) under similar conditions. The use of aq. acetonitrile as solvent is critically important in order to get high yields of allylated products.⁷ Photoreaction with highly substituted allylsilanes, however, produced an ene-type product as byproduct. For example, irradiation of 5 and 4-trimethylsilyl-2-methyl-2-butene (9, 10 eq) produced 8^{6} (54%) and 6 (19%), whereas the photoreaction of 10 in the presence of 9 (10 eq) gave a mixture of 11^{6} (27%) and 12^{6} (15%) together with 6 (46%).



Apart from this limitation, the present results provide a new access to the carbon-carbon forming reaction of unprotected pyrimidine nucleosides. We are currently investigating the mechanism and the utility of this novel photoallylation.

References and Notes

- 1. Photoinduced reactions. 162
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- (a) H. Tanaka, H. Hayakawa and T. Miyasaka, <u>Chem. Pharm. Bull.</u>, <u>29</u>, 3565 (1981); (b) <u>idem</u>, <u>Tetrahedron</u>, <u>38</u>, 2635 (1982).
- D. E. Bergstrom and J. L. Ruth, <u>J. Am Chem. Soc.</u>, <u>98</u>, 1587 (1976).
- 5. H. Ikehira, T. Matsuura and I. Saito, preceeding paper of this issue.
- 6. All new compounds gave satisfactory analyses and spectral data.
- The use of hydrogen-donating solvents such as alcohols enhanced the formation of dehalogenated products.

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