

PHOTOREACTION OF THYMIDINE IN THE PRESENCE OF LYSINE

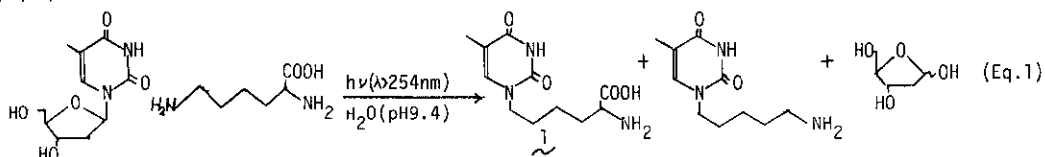
—PHOTOCHEMISTRY OF NUCLEIC ACID BASE—

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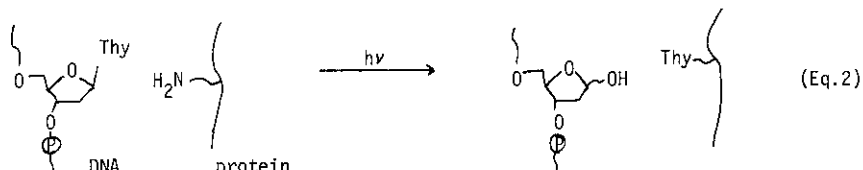
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As a model of the photo-cross-linking of proteins to DNA, we have investigated the photo-reaction of thymidine and DNA in the presence of lysine. We found that photo-excited thymidine readily undergoes addition with lysine to produce N-1 substituted thymine 1 and 2-deoxy-D-ribose (Eq.1)



This type of photoreaction was found to be specific for thymidine and lysine. Thus, irradiation of lysine with other nucleosides such as guanosine, adenosine, uridine and cytidine did not produce the corresponding photoadducts. Likewise, irradiation of thymidine in the presence of primary alkylamines such as n-butylamine, cyclohexylamine and ethanolamine provided the corresponding N-1 alkylated thymidine in good yield.

Irradiation of DNA in the presence of lysine also produced the same photoadduct 1, indicating that a similar type of photoreaction is occurring between thymine contained in DNA and lysine. The present photoreaction can induce the transfer of thymine group from thymidine (or DNA) to lysine part with the liberation of ribose, and it requires only the presence of ϵ -amino group of lysine. It seems possible that a similar reaction can take place between DNA and lysine residues in protein.



This type of photochemical reaction is potential utility for the specific modification of DNA. The mechanism of this novel type of photoreaction will be discussed.