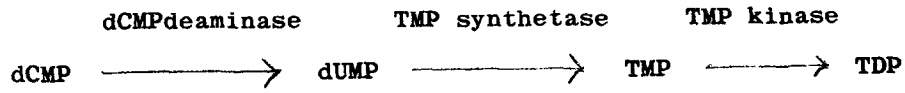
THE EFFECT OF X-RADIATION ON THE FORMATION OF 5'DEOXYCYTIDYLIC ACID DEAMINASE IN REGENERATING LIVER

L. Stevens* and L.A. Stocken

Department of Biochemistry
University of Oxford

Received March 8, 1962

It is well established that low doses of X-radiation given to rats after partial hepatectomy delay the onset in synthesis of DNA which normally occurs after 24 hours. Van R. Potter and colleagues (1960) have shown a delay in the appearance of thymidylate kinase and DNA polymerase when doses ranging from 375 to 1,500 r were given to rats at 6 hours after operation and have suggested that this arrest is the limiting factor in DNA synthesis. Maley and Maley (1960) observed an increase both in 5'deoxycytidylic acid deaminase and thymidylate synthetase levels of regenerating liver at 12 and 18 hours post hepatectomy. They have suggested that there is a sequential induction of the three enzymes.



* Medical Research Council Training Scholar

It seemed to us that if this were so then the effect of X-radiation on thymidylate kinase might be only an apparent one, in that if either 5'deoxycytidylic acid deaminase or thymidylate synthetase were radiosensitive, then this would be manifest as an effect on thymidylate kinase. We therefore gave 500r at 5 hours post hepatectomy to see if this affected the appearance of 5'deoxycytidylic acid deaminase, which normally occurs 12 hours post hepatectomy. The results (Table 1) show that this dose delays the formation of the enzyme and it may therefore be possible that the effects of X-radiation on thymidylate kinase are indirect.

Table 1

THE EFFECT OF 500r TOTAL BODY RADIATION ON THE FORMATION OF 5'DEOXYCYTIDYLIC ACID DEAMINASE IN REGENERATING LIVER

Animal	μmoles 5'deoxycytidylic acid deaminated/1 hour/gm DNA Phosphorus					
	Control			Irradiated		
Non-operated rats	0.0;	0.0;	0.0			
12 hrs post hepatectomy	3.04;	4.42;	1.92	0.0;	0.0;	0.0
18 hrs post hepatectomy	3.90;	1.47;	4.25	0.0;	0.0;	0.0
24 hrs post hepatectomy	2.93;	6.55;	6.35	7.15;	1.82;	3.77
48 hrs post hepatectomy	5.75;	6.05;	8.15	12.2;	10.6;	13.3

The incubation mixture consisted of 170 mM Tris buffer pH 8.0, 25 mM NaF, 2.7 mM 5'deoxycytidylic acid and the equivalent of 35 mg. supernatant protein in a final volume of 1.2 ml. The assay was otherwise the same as the spectrophotometric assay described by Maley and Maley.

Acknowledgement We wish to acknowledge financial assistance from the International Atomic Energy Agency.

References

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