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SHORT NOTE

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LOW ENERGY ELECTROMAGNETIC PERTURBATION OF AN ENZYME SUBSTRATE

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It has been reported recently by Comorosan and his colleagues[1-4] that irradiation of enzyme substrates in crystalline form with light from either a mercury or a tungsten lamp causes, at particular irradiation times, an increase in the initial velocity of the enzyme-catalyzed reaction. A similar phenomenon occurs for the growth rate of auxotrophic strains of yeast when the required substance (e.g., amino acid) is irradiated in dry form prior to addition to the culture medium,[5] or when a drug such as tetracycline is similarly treated and then used to inhibit the growth of the culture. These observations have been confirmed by Sherman et al.[6] for lactate dehydrogenase using pyruvate as substrate; and by Bass and Crisan[7] using tetracycline on yeast. The present note concerns the phenomenon as observed with urease after irradiation of crystalline urea.

Urease activity was measured by a modified Nessler procedure, the optical density of the final colored solution being read on a Beckman spectrophotometer at 610 nm. The enzyme was a lyophilizate from Merck containing 5 units/mg. Aliquots of a standard solution of urea were pipetted into small glass or plastic beakers and evaporated to dryness in an incubator at 30°C. The crystals were irradiated for defined periods of time (0, 20, 25, or 30 sec) with light from a high-pressure Hg lamp supplied by Professor Comorosan, the light passing through a 546 μm filter of bandwidth 40 nm and transmittance 30%. The distance from the lamp to the sample was 13 cm, the optimum reported by Comorosan et al.[3] Timing of the irradiation was by hand using a stopwatch, a sliding shutter over a 3 cm x 1.5 cm slit in a shield between the sample and the light source being moved manually.

The irradiation times which Comorosan and his colleagues had found to induce an increased reaction velocity in the urease system were 25, 55, 85, 115, 145, and 175 sec. The parameters used by Comorosan[2] to define the response are, therefore, for urease, t_m = 25 sec, τ = 30 sec. We studied only the first, or 25 sec, "signal" and neighboring irradiation times in this initial investigation. The results were as shown in Table 1. It is clear that a significant increase in the reaction velocity was observed only after a 25 sec irradiation of the crystalline urea, other irradiation times giving no detectable response.

This confirmation of the "Comorosan effect" in the urease system adds further evi-

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Table 1.

Sample	Number of Samples (6 duplicates of each)	Mean OD 610 nm per 5 min reaction time
Nonirradiated urea (controls)	30	0.236 ± 0.00463 s.d.
20 sec irradiated urea	20	0.234 ± 0.00506 s.d.
25 sec irradiated urea	30	0.255 ± 0.00616 s.d.
30 sec irradiated urea	20	0.235 ± 0.00527 s.d.

dence to the existence of a new phenomenon which promises to be of as much interest to physicists as to biologists. In preliminary experiments, we have also observed the effect using glucose-6-phosphate as substrate for glucose-6-phosphate dehydrogenase, and using a yeast auxotroph requiring histidine and tryptophane. A detailed physical and biological investigation of this interesting phenomenon seems warranted.

REFERENCES

1. S. Comorosan, S. Vieru and D. Sandru, *Int. J. Radiat. Biol., 17,* 105 (1970).
2. S. Comorosan, *Enzymologia, 42,* 31 (1972).
3. S. Comorosan, S. Vieru and P. Murgoci, *Biochim. Biophys. Acta, 268,* 620 (1972).
4. S. Comorosan, P. Murgoci, S. Vieru and D. Crisan, *Stud. Biophys., 38,* 169 (1973).
5. S. Comorosan, B. Vladescu and D. Sandru, Manuscript to be submitted.
6. R. L. Sherman, S. T. Siebert and W. H. Yee, *Physiol. Chem. Phys., 5,* 49 (1973).
7. G. E. Bass and D. Crisan, *Physiol. Chem. Phys., 5,* 331 (1973).