The decomposition studies were conducted in 2-qt Mason jars. The additions were as follows: (*a*) 16.23 g protein-montmorillonite complex, containing 0.25 g carbon, plus 84 g quartz sand; (*b*) 0.58 g gelatin (0.25 g carbon), plus 15.65 g calcium bentonite and 84 g quartz sand; and (*c*) 0.58 g gelatin plus 100 g quartz sand. To each of these mixtures were added 10 ml nutrient medium, containing phosphorus, potash, and minor nutrients, and 2 ml soil infusion to supply an active soil population. Each of the first two treatments, where montmorillonite was present, received 8 ml water. Determinations of the evolved CO_2 were made daily during the first 4 days and on every third day thereafter. The data, presented graphically in Fig. 1, are typical of those being obtained.

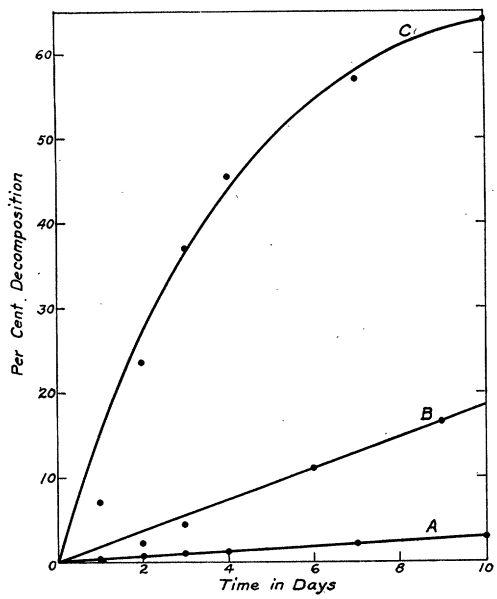

FIG. 1. Decomposition of gelatin by soil microorganisms: *A*, gelatin-bentonite complex; *B*, gelatin-bentonite mixture; *C*, gelatin alone.

The rate of decomposition of the gelatin in the gelatin-montmorillonite complex was considerably less than in the mixture of the two substances, but for a given material the rate was fairly constant during the period of the experiment. On the other hand, the gelatin in mixture with sand decomposed very rapidly at first, the rate decreasing markedly later. At the end of 10 days' incubation only 3.0% of the protein in the complex had decomposed, compared to 18.5% in mixture with bentonite, and 63.8% in the sand. These marked differences suggest that a considerable portion of the gelatin did enter into the crystal lattice where neither microorganisms nor their excreted enzymes could get to it. According to Ensminger and Gieseking (*7*), the (001) spacing of the complex containing only 3.57% protein would be < 16 A. Presumably the small amount of decomposition that takes place in the gelatin-complex preparation is limited to the protein attached to the external surfaces and edges of the montmorillonite. The low rate of decomposition in the gelatin-bentonite-sand mixture also suggests that considerable interaction between the protein and clay mineral occurred even under these conditions. The significance of these findings in connection with soil organic matter maintenance is obvious.

These researches are being extended to include other organic compounds, as well as a study of factors pertinent to complex formation and decomposition.

References

1. BRADLEY, W. F. *J. Am. Chem. Soc.*, **67**, 975 (1945).
2. MACEWAN, D. M. C. *Trans. Faraday Soc.*, **44**, 349 (1948).
3. GIESEKING, J. E. *Soil Sci.*, **47**, 1 (1939).
4. HENDRICKS, S. B. *J. Phys. Chem.*, **45**, 65 (1941).
5. ENSMINGER, L. E., and GIESEKING, J. E. *Soil Sci.*, **53**, 205 (1942).
6. ALLISON, F. E., SHERMAN, M. S., and PINCK, L. A. *Ibid.*, **68**, 463 (1949).
7. ENSMINGER, L. E., and GIESEKING, J. E. *Ibid.*, **48**, 467 (1939).

Screening Effect of Vitamin C on the Inactivation of Leaf Phosphatase by Ultraviolet Light

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It is known that enzymes are inactivated by exposure to ultraviolet light. In an earlier publication (*1*) from this laboratory it was reported that vitamin C protects the enzymes—phosphatase, amylase, and pepsin—against inactivation by ultraviolet irradiation. But the mechanism of the reaction involved in the protection of the enzymes against inactivation by the vitamin has not been elucidated. The object of the present paper is to present results which throw light on the role of vitamin C in the reaction.

Ten ml of the phosphatase solution prepared from French-bean leaves purified by fractional precipitation with alcohol (*2*) was put into two quartz tubes. The solution was adjusted to pH 7.0. Ten ml of water and 10 ml of 10 mg of vitamin C solution in another set of two quartz tubes were used as screening materials and introduced between the light source and the

TABLE 1

Time (min)	Phosphatase activity in mg phosphorus after exposure to ultraviolet light filtered through water	Inactivation (%)	Phosphatase activity in mg phosphorus after exposure to ultraviolet light filtered through vitamin C solution	Inactivation (%)	Vitamin C (mg)
0	2.58	—	2.58	—	10
30	2.42	6.2	2.54	1.5	—
60	2.40	7.0	2.54	1.5	9.1
90	2.33	9.69	2.49	3.2	—
120	2.06	20.00	2.35	8.9	—
180	1.67	35.2	2.30	10.8	6.5

experimental tubes containing the enzyme solution. The vitamin C solution thus served as filter. The enzyme solutions were exposed to ultraviolet rays from a quartz mercury vapor lamp (Hanovia, 220 v, d-c) passed through vitamin C and water solutions, and the activity was determined at known intervals of time (Table 1).

The results show that vitamin C solution serves as a filter, absorbing the rays destructive to the enzyme, thereby protecting the enzyme from inactivation by ultraviolet light.

References

1. GIRI, K. V. *J. Indian Chem. Soc.*, **18**, 141 (1940).
2. DAS, R., and GIRI, K. V. *Ann. Biochem. and Exptl. Med. (India)*, **9**, 113 (1949).

Intermittent Loud Noise and Mental Performance[1]

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In 1946 Berrien reviewed the literature dealing with the effects of intense sound upon human performance (*1*). He noted a dearth of conclusive evidence. Further studies have been reported (*2–4*), but the data are to some extent still contradictory and incomplete.

The concern of the present investigation was the effect of intermittent loud noise upon mental performance. There appears to be some agreement that intermittent sound can be expected to be more deleterious than continuous sound; furthermore, the special case of intermittent noise is one often encountered in practice, and it seemed to merit specific consideration. Also, for practical reasons the experiment was designed to motivate participants (as do industrial and military situations) toward the rapid, accurate completion of each task assigned; attempts to achieve productivity in a hit-or-miss fashion were severely penalized.

Fifty-two male and 17 female subjects were secured from among adult registrants in summer classes by announcements that emphasized the financially rewarding character of the experiment. (It is of possible interest that almost all the subjects were members of the band or glee club.)

The subjects reported to a large lecture auditorium at 8:45 P. M. The men were seated together in one section of the auditorium, the women in another. Persons occupying odd-numbered seats in odd-numbered rows, and persons occupying even-numbered seats in even-numbered rows, were then abstracted from the group and escorted to a similar room in an adjoining building. The latter subjects (26 male, 8 female) constituted the control group; those remaining in the auditorium (26 male, 9 female) constituted the experimental group.

In the central portion of each room, appropriate numbers of alternate seats were provided with packets of test equipment, and the subjects were disposed in these seats. To each group was then read the same set of directions: The subjects addressed stamped envelopes in which their "winnings would be mailed." They also signed "routine release forms" to protect the college against "irresponsible lawsuits." They were then led through the standard instructions for the Minnesota Clerical Test and for the Revised Minnesota Paper Form Board Test (Series AA), the tests to be utilized in the experiment.[2] The subjects consulted their own test booklets for this purpose but did not open them to the tests proper. Time limits of 7 min for the number-checking section of the clerical test, 7 min for the name-checking section of the same test, and 14 min for the form board test were announced and emphasized. A scoring system placing a heavy premium on accuracy (number of items correct minus twice the number incorrect or passed over) was imposed. And, finally, a first prize of $15.00, two second prizes of $10.00, three third prizes of $5.00, four prizes of $2.50, and general consolation prizes of $1.00 were established.

Only after this identical indoctrination were the members of each group informed as to whether they were to work in silence or in sound. The control group was to "work in these ordinary surroundings, with no special noise being present." In the case of the experimental group it was announced that "The noise will come from the loudspeakers in this room. It will go off and on from time to time. It will be loud [brief sample of noise stimulus], but it is not dangerous. Try to do the best you can in spite of the noise."

The experiment then proceeded for both groups. The number-checking test was administered first, the name-checking test second, and the form board last. Between the end of one test and the beginning of the next only enough time was allowed to turn pages or to change booklets. The testing was thus completed in 30 min; the subjects then reassembled and returned their test packets. The tests were corrected, and the prizes awarded by mail, within a few days.

The two randomly selected groups were treated differentially in that the noise stimulus was administered to the experimental group only. The stimulus intensity was 100 ± 2 db for each subject. The spectrum was substantially constant for all, being essentially flat between 100 cps and 3,000 cps, except for a rise of approximately 7 db in the region of 150 cps–300 cps

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[2] The Minnesota Clerical Test consists of two subtests; one of these requires the subject to discriminate between pairs of identical numbers and pairs of slightly dissimilar numbers; the other requires a similar discrimination between pairs of names. The Minnesota Paper Form Board Test calls upon the subject to identify the result of assembling a given group of isolated plane figures. Both tests as used here were answered by marking directly upon the test booklets.