assembled, in recognition of the following facts:

1. The national and international need of the maximum production of all food grains for the immediate future.

2. The preventable losses resulting from smuts and other seed-borne diseases.

3. Practical and simple methods of seed treatment known to prevent such losses.

4. The Office of Cereal Investigations has already instigated a movement looking to the more universal treatment of seed for the prevention of these losses.

Resolve: (1) That it is our conviction that this work should be pushed with all possible diligence. (2) That we as representatives of these grain-growing states pledge to this work our hearty cooperation and support.

A committee consisting of Professor H. L. Bolley, Professor M. A. Carleton, and Dr. L. R. Jones, appointed to draft resolutions for the extermination of the barberry bushes, made the following report, which was accepted:

In view of the vital importance of the wheat crop, and as a national emergency measure likely to prove an effective aid in increasing and insuring a better wheat crop in 1918, be it resolved:

That we, the cereal pathologists of the American Phytopathological Society, in summer session assembled at Madison, Wisconsin, respectfully ask the President of the United States to appoint a commission to consider the relation of the barberry to outbreaks of black stem rust of wheat, barley, other cereals and grasses with a view of deciding upon the desirability of eradiction of all cereal rust-bearing strains of the barberry in the United States in order that this source of rust epidemics may be removed.

Be it further resolved that the Secretary be instructed to send a copy of this resolution to the President of the United States.

The following resolutions were also adopted by the Conference:

That the chairman of this body appoint a committee to take up with federal authorities the matter of securing some definite action to insure an adequate supply of fungicides and insecticides, particularly those containing copper, for the protection of important crops against the destruction of fungous diseases and insect pests and to insure a reasonable price for the same such as shall not be prohibitory to their use by the farmers and fruit growers of the United States.

To the Department of Plant Pathology and other Friends and Members of the University of Wisconsin:

Whereas, the cereal pathologists in meeting convened at Madison, Wisconsin, from July 9 to 11, were most hospitably entertained and assisted at their third annual meeting;

Resolved, that we extend our hearty thanks and express our due appreciation for your efforts in our behalf.

The following officers were elected for the ensuing year: Chairman, H. P. Barss. Secretary, C. W. Hungerford.

C. W. Hungerford,
Secretary

SPECIAL ARTICLES

THE POSSIBLE ORIGIN OF THE TOXICITY OF ULTRA-VIOLET LIGHT[1]

It is a general law of photochemical action that only those rays are effective which are absorbed by the system in which the reaction occurs.[2] Visible light-rays are not, as a general rule, selectively absorbed by protoplasm and hence their action is usually confined to specialized pigmented areas which constitute the receptive elements of optical sense-organs. Ultra-violet light, on the contrary, is generally highly toxic, even for colorless organisms, and since this toxicity presumably depends upon and is attributable to photochemical reactions the question presents itself to which constituent of the protoplasm are we to attribute the selective absorption of these rays which is the necessary precedent of their photochemical activity?

It was pointed out nearly forty years ago by Soret[3] that the majority of proteins exhibit a well-marked absorption-band in the ultra-violet spectrum. In seeking for the origin of this absorption-band Soret found that it is especially well exhibited by solutions of tyrosin,

[1] From the department of biochemistry and pharmacology, Rudolph Spreckels Physiological Laboratory, University of California.

[2] Eder, "Handbuch der photographie," Halle, 1884, p. 28.

[3] J. L. Soret, *Arch. d. Sc. phys. et nat. Geneva,* 1878, pp. 322, 359; 1883, pp. 194, 204. A. d'Arsonval, *Arch. de Physiol. Norm et Path. Paris,* 1890, Sér. 5, T. 2, p. 340.

and therefore referred it to the tyrosin radical in the protein molecule. These observations have recently been greatly extended by Kober,[4] who has carried out a spectrographic examination of solutions of the various amino-acids which are the end-results of protein hydrolysis and of certain polypeptids. Kober has confirmed the existence of an absorption-band in the ultra-violet in solutions of tyrosin and also finds that a similar band is exhibited by solutions of phenylalanin. The other amino-acid constituents of the protein molecule exhibit only general (*i. e.*, non-selective) absorption in the ultra-violet spectrum.

The possibility is thus indicated that the tyrosin and phenylalanin radicals of the proteins constitute the optical sensitizers which render living cells susceptible to the toxic action of ultra-violet light. If this were the case then passage of the light through solutions of proteins or the aromatic amino-acids should, by absorption of the toxic rays, to a greater or less extent deprive the light of its toxicity for protoplasm. With this possibility in view the following experiments were undertaken:

Definite volumes of a densely inhabited culture of paramecia were washed by suspending the organisms in tap-water and concentrating them by moderate centrifugalizations until a thick suspension of uninjured organisms in a colorless liquid was obtained. All of the suspensions used were prepared in exactly the same manner and were derived from the same culture.

Our first step was to determine what we have called the "normal extermination period," that is to say the duration of time in seconds of exposure to the direct rays of a Cooper-Hewitt Ultra-violet Light Type Z at a distance of 12 cm. from the quartz tube. For this purpose 0.5 c.c. of paramecium suspension was placed in a flat-bottomed (Syracuse) watch-glass and 0.5 c.c. of tap-water was added. Trials were made with varying times of exposure and the percentage of organisms killed was estimated by counting the individuals of which the cilia had ceased moving. The normal extermination-period was found, under these conditions, to be about 100 seconds. To determine whether the gases formed during the exposure to the ultra-violet light (ozone and nitric-oxide) hastened the killing of the organisms appreciably, a trial was made with a suspension protected from the ultra-violet rays by a thick glass plate, but still exposed to the gases. In this way it was determined that this factor could be overlooked, since after 900 seconds exposure no noticeable effect was observed.

After determining the normal extermination-period with the above procedure, trials were made with similar suspensions in solutios of Witte-peptone, gelatin, amino-acids, etc., the results of 160 such trials being summarized in the table below. Thus a 1 per cent. alanin suspension of paramœcia was prepared by adding 0.5 c.c. of a 2 per cent. solution of alanin to 0.5 c.c. of washed paramecium suspension.

The extermination-periods enumerated in the tables are meant to indicate that *immediately* after the stated period of exposure 100 per cent. of the organisms were dead. For it was found that even after an exposure as brief as 40 seconds in a water-suspension the organisms were affected and ultimately all died.

AVERAGE EXTERMINATION PERIODS

(*Paramecia immersed in Test Solution*)

Water suspension	100	secs.
1 per cent. cane sugar suspension	110	"
1 per cent. urea suspension	110	"
1 per cent. alanin suspension	110	"
1 per cent. leucin suspension	215	"
1 per cent. gelatin suspension	220	"
1 per cent. peptone suspension	300	"

Glutamic acid, amino-benzoic acid and aspartic acid all proved to be themselves toxic for the organisms and could not therefore be tested by this method. Tyrosin is very sparingly soluble in cold neutral water. A saturated solution, although exceedingly dilute, conferred marked protection, the extermination-period being lengthened to 180 seconds. An alkaline solution proved to be toxic and therefore could not be employed in this way.

[4] P. A. Kober, *Journ. Biol. Chem.*, 22 (1915) p. 433.

In order to rule out the possibility that the protective action might be indirect, *i. e.*, not attributable to mere absorption of the toxic rays, and also to permit the employment of toxic acids the following modified procedure was employed:

In a quartz beaker with a diameter of 32 mm. 2 c.c. of the given acid were placed, this amount being just sufficient to completely cover the bottom of the beaker. A square piece of cardboard was placed on the Syracuse dish containing the paramecium suspension. The quartz beaker was then placed over a circular opening in the cardboard, having a diameter of 25 mm. By this means the organisms were shielded from all ultra-violet rays excepting those which passed through the solution in the quartz beaker. In order to fully expose all of the organisms and to standardize the depth of suspension, a paraffine mould was made in the Syracuse dish by holding a No. 3 rubber stopper in the center of the dish and pouring melted paraffine around it. On cooling, the stopper was withdrawn, leaving a depression 20 mm. in diameter in which 0.5 c.c. of paramecium suspension was placed.

Somewhat over 100 exposures were made, using this method with the following results:

AVERAGE EXTERMINATION PERIODS

(*Paramecia not immersed in Test Solution*)

Water	130 secs.
1 per cent. alanin	130 "
1 per cent. glycocoll	130 "
1 per cent. aspartic acid	130 "
1 per cent. glutamic acid	135 "
1 per cent. leucin	250 "
0.5 per cent. tyrosin	420 "
1 per cent. amino benzoic acid	2400 "

It will be noted that the results obtained by this procedure confirm those previously obtained by the method of immersion.

In order to obtain 1 per cent. solutions of tyrosin and cystin, which are very sparingly soluble in water, slight amounts of alkali were added to the test solution in the beaker and the extermination-periods after passage of the rays through alkaline solutions of these acids and of certain of the acids enumerated above were determined, with the following results:

AVERAGE EXTERMINATION PERIODS

(*Paramecia not immersed in Test Solution*)

0.5 per cent. NaOH	150 secs.
1 per cent. NaOH	170 "
1 per cent. glutamic acid in 1 per cent. NaOH	200 "
1 per cent. cystin in 0.5 per cent. NaOH.	1200 "
1 per cent. tyrosin in 0.2 per cent. NaOH	unaffected after 40 minutes exposure.

We may infer that solutions of gelatine, peptone, amino-benzoic acid, cystin, tyrosin and leucin detoxicate ultra-violet rays which pass through them, while solutions of the other substances investigated do not appreciably do so. The protective action of tyrosin in alkaline solutions is exceptionally marked, and in this connection it is of especial interest to note that Kober has found that an alkaline reaction markedly increases the absorption of ultra-violet rays by tyrosin solutions.

The protective action of leucin, which does not exhibit a selective absorption in the ultra-violet, is at first sight somewhat puzzling. It was noticed, however, that both tyrosin and leucin solutions underwent a change of color upon continued exposure to the ultra-violet light. This change was especially marked in the leucin solutions resulting after 40 minutes exposure in closed quartz vessels in the production of a dark brown fluid having a distinctly intensified odor. This solution had a much greater protective power when tested in the above manner than leucin solutions which had not been previously exposed to the light. We may infer that ultra-violet light induces chemical changes in a leucin solution resulting in the production of substances having an enhanced power of absorbing ultra-violet rays.

Our results are therefore decidedly in harmony with the view that the susceptibility of protoplasm to ultra-violet light is conditioned by the selective absorption of the toxic rays by the aromatic amino-acid radicals of the proteins.

F. I. HARRIS,
H. S. HOYT
UNIVERSITY OF CALIFORNIA