

the vas deferens and the spermatic artery is cut so as to leave the blood supply to the vas deferens intact. The vas deferens is hemi-sectioned at a high level. A small silver cannula about the size of a No. 22 hypodermic needle is inserted into the duct with the aid of a stilet and tied in place with a silk suture. The vas deferens is then severed from the epididymis and the testicle is removed. The vas deferens can now be made to extend well towards the liver. The bile duct is doubly ligated at a level above the point of entrance of the major pancreatic ducts and semi-sectioned just above the ligature. The remaining end of the cannula is inserted into the bile duct. The end of the vas deferens and the bile duct are brought together and the cannula is tied in position. The bile duct is sectioned between the ligatures, and the abdomen is closed surgically.

The success of the operation can be demonstrated by injecting a saline solution of rose bengal into the jugular vein. This dye is normally excreted through the bile and in this case should appear in the urine.

It has been possible to keep rats operated by this technique in apparent health for a period of 3 to 4 months. With cannulas of the size given above it is possible to carry out the operation on rats as small as 150 gm. body weight. Rats as small as 60 to 70 gm. may likewise be operated upon provided smaller cannulas are used. The operation eliminates the danger of infection which is present in the 2 other techniques. It permits the complete exclusion of bile from the intestinal tract. However, the technique is applicable only to male rats.

8722 P

Spectral Region of Photosensitivity in *Hydroa Aestivale* Seu *Vacciniforme* with Porphyrinuria.

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Many attempts have been made to produce typical lesions in *Hydroa* patients by exposure to light, but few, if any, have succeeded in demonstrating a definitely increased sensitivity to light. Nevertheless, it has been very generally assumed that such patients

are abnormally photosensitive and that porphyrins, which are found in the urine of many of these cases, are the photosensitizing substances. The present experiments would seem to demonstrate the truth of both these assumptions, and also to explain the discrepancies in the findings of others.

A boy of 7 years, suffering from Hydroa and displaying marked porphyrinuria, was subjected to exposure of small areas of the back to bright sunlight for 30 minutes, certain of the areas being covered with glass color filters to delimit various spectral regions. At the end of this time, a distinct erythema was observed on those areas which had received any considerable amount of radiation of wave lengths between approximately 3200 Å and 4500 Å, but not on the areas from which this portion of the sunlight had been excluded by the filters. The response occurred when the radiation shorter than 3200 Å, to which normal skin is sensitive, was excluded. Thus the skin of this patient is shown to be abnormally sensitive to light, responding to the spectral region between 3200 Å and 4500 Å, to which normal skin is not sensitive.

If we examine the absorption spectrum of porphyrins, we find a nice correspondence with the region of sensitivity of our patient, which may be taken as reasonable proof that porphyrins are the photosensitizing substance. Their most characteristic absorption lies between 3200 Å and 4300 Å,¹ and this absorption is much greater than that which occurs in the visible spectrum. This accounts for the fact that longer wave lengths did not produce any response in the patient, although it is quite certain that prolonged exposure would have demonstrated some sensitivity in the visible portion of the spectrum.

The patient has been receiving bi-weekly exposures to quartz-mercury arc for many months, which have never produced any abnormal reaction, and he has responded with a healthy, normal coat of tan; no immediate erythema such as we obtained with sunlight follows these regular quartz-mercury arc treatments. This is quite readily explainable since the arc produces much greater intensities of radiation shorter than 3200 Å than reach us from the sun, whereas sunlight contains much greater intensity than the arc in the region between 3200 Å and 4500 Å. Thus the quartz-mercury arc elicits only the normal delayed erythema and pigmentation, which are produced by wave lengths shorter than 3200 Å, without producing a detectable amount of the abnormal immediate erythema. Sunlight, on the other hand, elicits the abnormal response. Most

¹ Clar, E., and Hauowitz, F., *Ber. deutsch. chem. Gesell.*, 1933, **66**, 331.

of the attempts to demonstrate abnormal sensitization in Hydroa have employed the quartz-mercury arc as a source, and the results have been very conflicting, some claiming to have shown an enhanced and some a diminished sensitivity. It is probable that exposure to such a source would produce a very severe sunburn of the normal type before the abnormal hematoporphyrin response would appear, so that the latter would be masked. A few cases in which sunlight or carbon arc have been used as a source have shown results in apparent agreement with ours.

A more complete description of the experiments together with an account of artificial photosensitization with porphyrins will be given elsewhere in the near future.

8723 C

Hemolytic Phage-Bacterium Conjugates.

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The production of hemolytic bacteriophage-bacterium conjugates was reported by Friedberger and Vallen.¹ Apparently identical aggressive conjugates were afterwards isolated from clinical material.² The non-hemolytic microorganisms which can be transformed into erythrolytic variants by phage-"hybridization" include *B. typhosus*, *B. dysenteriae*, *B. paratyphosus*, *B. suipestifer*, *S. cholerae*, and *B. coli*. In order to obtain material for an immunochemic and genetic study of such "hybrids," we have tested the erythrolytic powers of 75 conjugates, formed by combining 11 local typhoid strains with 7 demonstrably active antityphoid bacteriophages. Each bacteriophage was first grown for 3 to 6 test-tube generations on each of the 11 typhoid strains. In 67 of the 77 combinations powerful lysis was noted. The 67 resulting apparently completely lysed typhoid cultures were incubated for an additional period of 48 to 72 hours. In 65 of the tubes an overgrowth with phage-resistant

¹ Friedberger, E., and Vallen, J., *Klin. Wochenschr.*, 1923, **22**, 1649.

² van Loghem, J., *Centralbl. Bakt.*, 1926, **100**, 19; Sonnenschein, C., *Ibid.*, 1929, **111**, 177; 1930, **117**, 58; Kleineberger, E., *Ibid.*, 1930, **117**, 344; Bechtel, E., *Ibid.*, 1930-31, **119**; Bianchi, L., and Callerio, C., *Z. Immunitätsf.*, 1931, **72**, 155; Zimmerman, E., *Ibid.*, 1934, **82**, 495.