hydrocarbons can be held in two-dimensional solution or in two-dimensional molecular association with the sterols.[1] By application of pressure to the mixed films, the hydrocarbon molecules can be displaced from their area-determining positions in the film, passing into an excess phase outside of the film, but in close proximity to it. The formation of the excess phase is characterized by the appearance of light-scattering particles which display Brownian movement; when the pressure is released, those hydrocarbons which are capable of solution type interaction with sterols can rapidly re-enter the films with the complete disappearance of the excess phase.

The present experiments show that, when in this excess phase, certain hydrocarbons are extremely sensitive to ultraviolet photodecomposition; on the other hand, when held between sterol molecules in the area-determining film phase, the same hydrocarbons are not subject to photodecomposition at the intensity of ultraviolet light employed.

A 15-watt G. E. germicidal lamp, supplied with an aluminum reflector, was mounted over the previously described[1] film tray at a vertical distance of 8 inches from the surface. The predominant radiation was at 2,537 A., but the principal mercury emission lines up to 4,338 A. were also prominent. The mixed films were put under pressures which gave the desired proportion of the hydrocarbon in the excess phase, irradiated for 15 minutes, and the force-area characteristics of the resulting film were then studied.

Typical results with 10-amyl-1,2-benzanthracene in mixed films with cholestanol may be cited as a convenient example. This hydrocarbon, when in the excess phase, was converted by irradiation into a surface active substance which was adsorbed, in addition to the sterol, at the water surface; this surface active substance could be detected and characterized by its surface film behavior. The conversion of the hydrocarbon was partially blocked by inclusion of a reducing agent, such as pyrogallol, in the water upon which the mixed film was originally spread; this indicated that the excess phase was in the water beneath the film and that the photodecomposition of the hydrocarbon took place there. This point of view was supported by two other observations: (1) when an aqueous suspension of 10-amyl-1,2-benzanthracene was introduced into the water phase immediately under a sterol film, the hydrocarbon molecules entered the film in much the same manner as hydrocarbons enter the film from the excess phase; (2) when an aqueous suspension of 10-amyl-1,2-benzanthracene was irradiated in bulk in the presence of dissolved oxygen, the substance formed had exactly the same surface properties as the material produced by irradiation of the 10-amyl-1,2-benzanthracene in the excess phase of the mixed films.

Similar experiments were performed with a number of other polycyclic hydrocarbons, including 9,10-dimethyl-1,2-benzanthracene, numerous mono-alkyl-1,2-benzanthracenes, and several mono- and di-alkyl-chrysenes. In each case where photodecomposition occurred in the film experiments, irradiation of the same hydrocarbon in bulk suspension caused loss of its characteristic ultraviolet absorption at wavelengths greater than 2500 A.

The photodecomposition product isolated after irradiation of the bulk aqueous suspension of 9,10-dimethyl-1,2-benzanthracene corresponded, in its analysis for C and H and in its lack of the characteristic absorption spectra of 1,2-benzanthracene derivatives, to the photo-oxide produced from 9,10-dimethyl-1,2-benzanthracene in CS_2 solution according to the method of Cook and Martin.[5] The relative ease of photodecomposition of the hydrocarbons in the excess phase and in bulk aqueous suspension was found to be the same as the relative photooxidizability in CS_2 as observed by Cook and Martin.

In contrast to the parent hydrocarbons, the photo-oxidation products of 10-amyl-1,2-benzanthracene and other alkyl-1,2-benzanthracenes were found to exhibit no interaction with sterols in surface films. The photo-oxides which were prepared from carcinogenic hydrocarbons by Cook and Martin[5] were found by them to be non-carcinogenic.

SUMMARY

Certain alkyl-1,2-benzanthracenes and other polycyclic hydrocarbons, when irradiated either in bulk aqueous suspensions or in the comparable excess phase under mixed surface films, were converted rapidly by ultraviolet light to photo-oxides. When held in two-dimensional solution or molecular association with sterols in mixed surface films at the air-water interface, the hydrocarbons were protected from such photodecomposition. In the one case where the comparison could be made photo-oxidation was accompanied by a loss of the ability of the hydrocarbon to interact with sterol films.

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A PHYTOPATHOGENIC BACTERIUM FATAL TO LABORATORY ANIMALS

Phytomonas polycolor (Clara) Bergey *et al.*, the causal agent of a bacterial leafspot disease of tobacco, was first isolated and described by Clara[1] in the

[5] J. W. Cook and R. H. Martin, *Jour. Chem. Soc.*, 1940, 1125.

[1] F. M. Clara, *Phytopath.*, 20: 691, 1930.

Philippines. The damage resulting from the disease to both seedling and field plants caused great concern in several tobacco-growing areas. Spraying and needle puncture inoculations recently conducted in this laboratory have shown the culture to be pathogenic for tobacco. On the basis of its disease-producing ability in plants, this organism has been placed by systematists among the phytopathogenic bacteria.

In the course of a serological study of the green fluorescent group of phytopathogenic bacteria, to which *Phytomonas polycolor* has been ascribed, it was found that this organism was extremely virulent when introduced into small laboratory animals. Rabbits, guinea pigs and mice were found to be susceptible. Intraperitoneal injections of 0.05 cc of a 24-hour broth culture proved fatal to mice in 12 hours, while 0.25 cc killed 300 g guinea pigs in the same period of time. The intravenous injection of 0.2 cc of a bacillary suspension brought about the death of 2,000 g rabbits in 24 hours. Bacterial cells which had been washed free of metabolites were found to be as lethal as were the broth cultures. In each case the organism was recovered in pure culture from the heart's blood, spleen, liver and lung. Intravenous injections into mice of 0.2 cc of the sterile filtrate of a broth culture failed to kill, whereas the same culture unfiltered was fatal. Varying amounts of washed bacterial cells which had been killed by heating at 55° C for 1 hour failed in each instance to kill mice. Sterile filtrates of lysed suspensions of the organism (lysed by alternate freezing and thawing) were apparently toxic for mice on intraperitoneal and intravenous injection but failed to cause the death of the animals. It was possible to isolate the organism from the blood stream in moderate quantities 5 or 6 hours before death, and in great numbers just previous to death. There seems no doubt, therefore, that this organism multiplies within the animal and manifests itself in a true bacteraemic fashion. That the organism is not particularly invasive is evident from the fact that very small doses were not fatal. Forced feeding of the organism produced no ill effects. Fifteen other organisms of the green fluorescent group of plant pathogens failed to produce any of the results noted above.

Although a comparative study has not yet been completed, all available evidence points to the probability of this organism being *Pseudomonas aeruginosa* (Schroeter) Migula. Whatever its true identity, the ability to multiply in both animal and plant tissues is remarkable. The fact that both animals and plants are susceptible to experimental infection makes this organism interesting from an evolutionary point of view.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

A SCALE FOR GRAPHICALLY DETERMINING THE SLOPES OF DOSE-RESPONSE CURVES

THE following device, which may have been overlooked by other workers in the field of biological assay, has been found useful in our laboratories for the routine estimation of the slopes of such dose-response curves as may be transformed into straight lines. It is based on the well-known fact that the slope is a tangent. As Fig. 1 shows

$$b = \frac{y_2 - y_1}{x_2 - x_1} = R \tan \theta \text{ or } \tan \theta = b/R.$$

In these equations b is the slope, x_2, y_2 and x_1, y_1 are the coordinates of any two points on the line, θ is the indicated angle and R is the ratio of the length of one plotted unit of dose to the length of one plotted unit of response. The dose-response curve must be plotted in such a way as to give a straight line. This usually can be done for the graded response type of data by plotting response against the log dose. And the curve for the all-or-none type of data may be made straight by converting the response into probits by means of tables developed by Bliss[1] and then plotting the probits against the log dose.

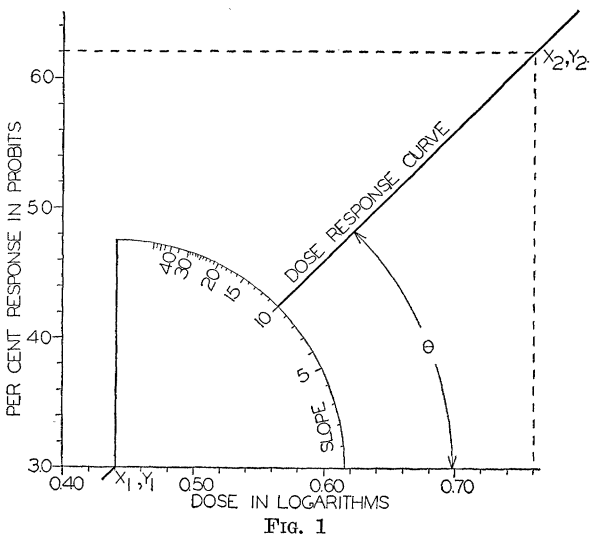

FIG. 1

[1] C. I. Bliss, *Quart. Jour. Pharm. and Pharmacol.*, 11: 192, 1938.