This indicates that calcium and magnesium soaps had been dissolved by the methyl alcohol.

From this and other corollary information, it has been concluded that it is the formation of a water-repellent coating of metallic soaps on the soil particles (98% silica) that causes the water-repellent property found in many Florida soils. The source and identity of the particular fatty acids involved have not yet been determined.

References

1. FEIGL, F. *Qualitative analysis by spot tests.* New York: Elsevier, 1946. P. 357.
2. JACOBSON, C. A. and HOLMES, A. *J. biol. Chem.*, 1916, **25**, 29.
3. JAMISON, V. C. *Soil Sci. Soc. Amer. Proc.*, 1942, **7**, 36.
4. ———. *Soil Sci. Soc. Amer. Proc.*, 1945, **10**, 25.
5. SCHREINER, O. and SHOREY, E. C. Bul. No. 74, U. S. Dept. of Agric., Bureau of Soils, 1910, 8.
6. WAKSMAN, S. *Humus.* (1st Ed.) Baltimore: Williams and Wilkins, 1936.

Near Infrared Absorption Spectra of Uracil, 5-Chlorouracil, and Thymine[1]

J. R. Lacher, D. E. Campion, and J. D. Park

University of Colorado, Boulder

Infrared spectrometry has proved very useful in studying biologically active materials (*5*), particularly if they are soluble in solvents which are transparent in the same region of the spectrum. In proteins (*1, 4*) and the components of nucleic acids (*2, 3*), the lack of solubility in other than aqueous solvents has made it necessary to use thin films, powders, suspensions, and the like. We have found that fused antimony trichloride is a powerful solvent for some of these materials and nearly 0.2 molar solutions of uracil, 5-chlorouracil, and thymine were readily prepared at 100° C. After a vacuum distillation, the fused antimony trichloride was suitably transparent and showed only two small absorption peaks at 1.93 and 1.42 μ (believed to be an O-H stretching overtone). These peaks cause no trouble, since their effect is subtracted out with the background. We have not investigated the absorption spectra of antimony chloride beyond 2.3 μ, but one might reasonably expect it to be transparent as far out as carbon tetrachloride or perhaps silver chloride. This aspect of the problem is being studied further.

The near infrared spectra of the compounds reported in this paper were measured with a Perkin-Elmer spectrometer model 12-B. A flint glass prism and tungsten light source were used, with a constant slit width of 0.475 mm. The absorption cell was constructed of Monel metal and had a diameter of 2.5 and a length of 4.0 cm. Glass windows were used with Teflon gaskets. The cell was heated electrically to 100° C.

The results obtained are shown in Fig. 1 and tabulated in Table 1. For comparison we have included the absorption spectra of phenol and acetamide. The concentrations are about 0.2 molar. In addition, chlorouracil

[1] Supported in part by the Atomic Energy Commission and the Office of Naval Research.

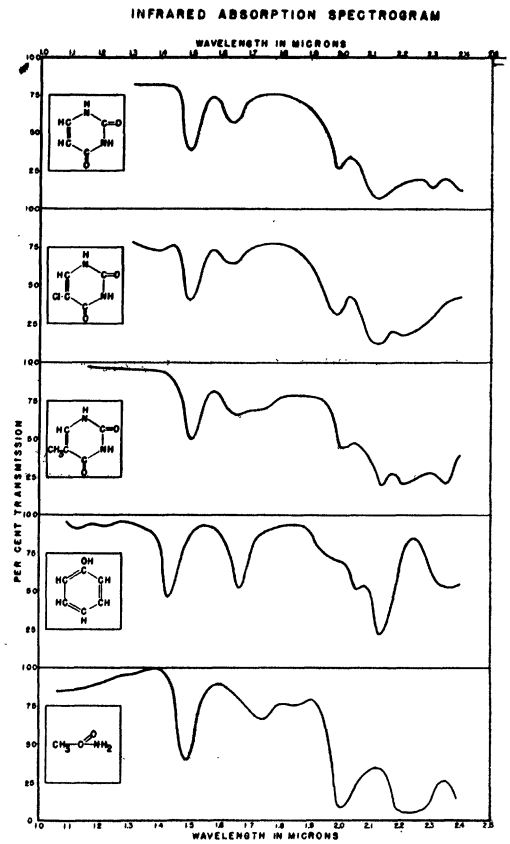

FIG. 1.

absorption curves were run at 0.18, 0.28, and 0.43 molar. The effect of increasing the concentration of chlorouracil is simply to deepen the various absorption bands. No broadening characteristic of hydrogen bonding was obtained, and we infer that in this solvent compounds are present in a monomeric form.

TABLE 1

NEAR INFRARED ABSORPTION BANDS (IN ANTIMONY TRICHLORIDE)

Uracil	5-Chloro-uracil	Thymine	Phenol	Acet-amide	Assignment
ab	ab	ab	1.43	ab	O-H
1.50	1.50	1.51	ab	1.49	N-H
1.65	1.65	1.68	1.67	ab	C-H (ring)
ab	ab	1.75	ab	1.75	C-H (aliphatic)
1.99	1.99	2.00	ab	2.00	C=O ?
2.13	2.13	2.14	2.14	ab	C-H (combination. ring)

Uracil, chlorouracil, and thymine all show sharp, deep bands at 1.50 μ. Bath and Ellis (*1*) concluded from a study of various proteins that absorption at this wavelength corresponds to the first N-H overtone. The very deep band at 1.49 μ in the spectrum of acetamide confirms

this assignment. In phenol strong absorption occurs at 1.43 μ. This corresponds to the first O-H overtone. Since uracil and its derivatives do not absorb in this region but do absorb in the region characteristic of the first N-H overtone, it is inferred that these compounds exist predominantly in the keto form when dissolved in antimony trichloride.

The absorption at 1.65 μ shown by uracil, chlorouracil, and thymine is attributed to the first C-H overtone characteristic of ring compounds. The absorption is quite strong for phenol, which has five such hydrogen atoms, and quite weak for chlorouracil, which has only one C-H bond per molecule. The broadening of the C-H band toward the infrared in the case of thymine can be attributed to the aliphatic C-H overtone of the methyl group. The second dip in this broad band is centered at 1.75 μ, which coincides nicely with the methyl type C-H band of acetamide.

Uracil, chlorouracil, thymine, and acetamide show absorption at 1.99–2 00 μ; this band is absent in phenol. It is probably due to the second carbonyl overtone vibration which is known to lie in this region (*1*). All of the compounds except acetamide absorb at 2.13 μ. This band may be due to a combination of the fundamental valence and deformation vibrations of a ring C-H group. Beyond 2.1 μ the results are uncertain because the flint glass prism begins to absorb strongly and reduces the light intensity. Complete details of the spectra will be published elsewhere.

References

1. Bath, J. D. and Ellis, J. W. *J. phys. Chem.*, 1941, **45**, 204.
2. Blout, E. R. and Fields, M. *Science*, 1948, **107**, 252.
3. Brownlie, I. A., Sutherland, G. B. B. M., and Todd, A. R. *J. chem. Soc.*, 1948, 2265.
4. Bushwell, A. M., Krebs, K. F., and Rodebush, W. H. *J. phys. Chem.*, 1940, **44**, 1126.
5. Dobriner, K., Hardy, J., and Jones, R. N. *Science*, 1949, **109**, 260.

Experimental Mixed Infection of Mice with Lansing Poliomyelitis Virus and Western Equine Encephalomyelitis Virus

Fred W. Gallagher

Department of Bacteriology and Clinical Pathology, College of Medicine, University of Vermont, Burlington

The phenomenon of interference between virus agents has been claiming increasing attention during the last decade. Interference has been demonstrated between plant viruses, between bacterial viruses (bacteriophages), and between animal viruses. In some cases when interference occurs the growth of one virus is inhibited, as evidenced by failure subsequently to demonstrate its presence (*1, 6*), while in other cases the growth of both viruses is inhibited (*3*). On the other hand, it has been shown that two viruses may grow together without apparent interference (*4, 5*).

In an attempt by the author to demonstrate interference between the viruses of equine encephalomyelitis and poliomyelitis in mice, it became apparent that such interference reported in monkeys (*2*) did not occur in mice. It was evident that both viruses grew in mice and that either or both could produce symptoms and death. If any antagonistic effect at all was manifested it consisted solely of a prolongation of life in some of the mice.

Lansing poliomyelitis and western equine encephalomyelitis viruses were chosen because their incubation periods and symptomatology made it easy to distinguish between them in mice. Because the Lansing virus has an incubation period averaging 7–9 days and the W.E.E. virus kills regularly in 48 hr, the W.E.E. virus was inoculated later so that both viruses could reach effective concentrations at about the same time. Accordingly, several preliminary experiments were run to work out the mutual relationships of dosage and time interval between administration of the viruses.

In one of these experiments using 30 mice it became apparent that LD_{50} doses of the two viruses would not give significant data without the use of extremely large groups of animals. It seemed desirable that all animals in the two control groups (Lansing virus alone and W.E.E. virus alone) should die in a reasonable period of time. Titration of the W.E.E. virus showed that 0.03 ml of a 1: 1000 dilution inoculated intracerebrally would kill all mice injected in 2–3 days. The Lansing virus, however, presented a more complex problem. A single intracerebral inoculation of the supernatant fluid (allowing suspension to stand for 10–15 min for settling of coarser tissue fragments) of a 10% suspension of mouse brain and cord never killed all of the mice injected, and even among those that did die the incubation period of some was prolonged to 2 or 3 weeks. However, killing of all mice could be achieved by two inoculations of virus spaced 48 hr apart. Further, this served to shorten the incubation period somewhat. The preliminary experiments showed also that a time interval of 3 days between the second inoculation of Lansing virus and the administration of W.E.E. virus would probably be optimal.

A group of 62 10-g white mice were used for the experiment here reported. Fifty-two of these mice received two intracerebral inoculations of Lansing virus spaced 48 hr apart. One mouse was killed by the inoculation procedure. On the morning of the third day following the second injection, 14 of these mice were either dead, moribund, or showed typical poliomyelitis paralysis. These were arbitrarily set aside to constitute a poliomyelitis virus control group. The remaining 37 Lansing mice, together with the ten uninoculated mice, were injected with W.E.E. virus. The ten W.E.E. mice all died with typical symptoms in 48 hr. Of the 37 mice receiving both viruses, 17 died in 2–17 days with typical poliomyelitis symptoms, 11 died in 2–3 days with typical W.E.E. symptoms, and eight died in 1–9 days with what were judged to be mixed symptoms. One mouse did not die.

The brains and spinal cords of five of the mice receiving both viruses and dying with typical poliomyelitis