through the filter. The latter is a clear quartz cell $2^3/_4$ inches in diameter and has a thickness of 3 mm. between the inside walls. It is filled with the liquid under examination for its ultraviolet transmission by using a pipette, filling through a small neck on the top of the cell and permitting the air to escape through a similar opening several millimeters away.

The source of light is an enclosed type carbon arc operating on 220 volt D.C. at 13 amperes. The glass globe surrounding the arc is opaque to wavelengths below 3020 Å. This indicates that none of the very short wavelengths not found in sunlight are present. The electrodes are solid carbons of 12.7-mm. diameter. The total radiation at a distance of 11 inches, center to center, at 13 amperes, was found to be 0.1431 watt per sq. cm., the spectral distribution of the light being shown on the chart.

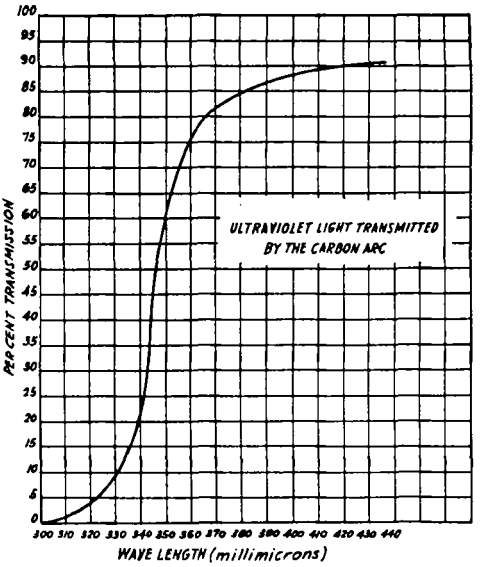

Fig. 1.—Ultraviolet light transmitted by carbon arc.

(To be continued)

A STUDY OF THE TOXIC PROPERTIES OF DIETHYLPHTHALATE.*

BY PHILIP BLICKENSDORFER AND LAWRENCE TEMPLETON.

During the past year there have been outbreaks of a peculiar form of paralysis in certain sections of the United States which have been traced directly to the drinking of a spurious form of Fluidextract of Ginger well known as "Jake" Ginger.

Various theories were at once advanced as to the cause of this paralysis. It has been blamed on diethylphthalate, iso-propyl alcohol, creosote, tri-cresyl phosphate, arsenic, vitamin deficiency and perhaps other causes.

The cause of the paralysis could be blamed on (1) the ginger, (2) the alcohol, and its denaturants or (3) a combination of the two. Diethylphthalate is one of the more common legalized denaturants for industrial alcohol and it seems probable that such a cheap form of alcohol has been used as the menstruum for the spurious "jake."

It is from this reasoning that we have studied the toxic properties of diethylphthalate.

A study of the toxic properties of diethylphthalate has been reported in this journal by Otto M. Smith (JOURNAL OF THE AMERICAN PHARMACEUTICAL ASSOCIATION, Vol. 13 (1924), page 812). In this short paper Smith reports that:

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(*a*) Per ora doses of 1/2% body weight to rats caused considerable pain, sickness and great distress for a period of 10–12 hours. After about 25 hours the behavior of the animal was normal.

(*b*) Leghorn pullets were given 1 1/2% body weight by mouth with results not so marked as with rats.

(*c*) Persons engaged in the manufacture of the chemical who have their hands and clothing saturated for days at a time have noticed no ill effects.

From his studies, Smith believes that his experiments indicate that diethylphthalate in denatured alcohol is not deleterious to health and is probably non-toxic.

Because of studies of this kind, diethylphthalate has been adopted and used as a denaturant for alcohol.

The following experiments were carried out to determine more in detail its toxicity, especially to determine if when given regularly over a period of time it might produce the paralysis caused by the "jake" ginger.

EXPERIMENTS.

(*a*) Rabbits were given 2 cc. per kilogram body weight by injection into the peritoneum for eight successive days. This would be the equivalent of about 4 oz. per day for a man of medium size (145 lbs.). No abnormal conditions were noticed, except some temporary distress, during and after the period of administration. There was no paralysis or other abnormal after effect.

(*b*) Qualitative tests taken of the urine showed marked amounts of the drug. Quantitatively we found over 50% excreted.

(*c*) Three cc. per kilo was fed to rabbits by stomach tube for eight successive days. Except for temporary distress, the rabbits appeared perfectly normal during the feedings and for the two weeks following the last administration.

(*d*) Guinea-pigs were given 1.5 cc. per kilo by injection into the peritoneum for eight successive days. They showed no permanent ill effects at any time, even after the experiment had been discontinued.

(*e*) During these experiments the drug was also applied to shaved portions of the body of a guinea-pig. The amount absorbed produced no untoward results.

(*f*) One-fourth cc. per kilo of diethylphthalate in physiological salt solution was injected, slowly into the femoral vein of a dog. The respiration was first stimulated and then paralyzed. Samples of urine were taken by catheterizing as soon as injection was begun and the first samples obtained showed traces of diethylphthalate by the recognized qualitative test.

(*g*) Five-tenth cc. was injected intravenously into the ear vein of a rabbit weighing 1800 Gm., and in a few minutes convulsions similar to those produced by strychnine were observed. These symptoms, however, soon disappeared and the rabbit again appeared normal. A slightly larger dose than this is fatal, by paralysis of respiration.

From the various experiments, especially with those on the dog, it appears that the diethylphthalate is excreted very rapidly by the kidneys.

An attempt was made to work out a quantitative test for diethylphthalate so as to measure the amount excreted during a given time as compared to the amount administered. While we have not yet developed a completely satisfactory

quantitative method, we can state definitely that over 50% and perhaps all of the diethylphthalate is excreted by the kidneys.

A fairly accurate quantitative test was perfected for alcoholic solutions but not as yet for urine containing the diethylphthalate.

DISCUSSION AND CONCLUSIONS.

Diethylphthalate may be taken in considerable quantities (over 2 cc. per kilo of body weight per day) without causing any detectable damage. When injected intravenously into animals in doses of 0.25 cc. per kilogram it may cause death by paralysis of the respiratory center. It is rapidly excreted by the kidney. Doses that are insufficient to cause paralysis may cause convulsions due to an action on the central nervous system and which resemble somewhat the convulsions produced by strychnine. It seems probable, therefore, that if the function of the kidneys is below normal, sufficient diethylphthalate could accumulate in the blood to cause damage to the nervous system. In normal health, however, this seems improbable.

THE EFFECT OF BUFFERING THE OUTER PHASE UPON THE STABILITY OF CERTAIN EMULSIONS.*

BY JOHN C. KRANTZ, JR.

INTRODUCTION.

The author with Gordon (1) studied the influence of changes of hydrogen-ion concentration upon the stability of cottonseed oil and mineral oil emulsions, when acacia and tragacanth were used as emulsifying agents. In another communication to THIS JOURNAL, the author (2) observed that acacia and tragacanth exerted a considerable amount of buffer activity upon the unbuffered outer phase of the emulsions. In this investigation, it was observed that with the emulsions in which acacia was the emulsifying agent, those emulsions having an unbuffered outer phase between p_H 2.5 and 10.13 were buffered to approximately p_H 4.3. Likewise those emulsions prepared with tragacanth, with unbuffered outer phases between these points of hydrogen-ion concentration, were buffered to approximately 5.5.

Considering thus the buffer capacities of the emulsifying agents, it becomes quite impossible to ascertain data from stability experiments for these emulsions when the outer phase was between p_H 2.5 and 10.13.

In the previous investigations, using unbuffered solutions as the outer phase of the emulsions, the range of greatest stability with the emulsions prepared with acacia was between p_H 2 and 10.5. Those prepared with tragacanth were most stable between p_H 1.9 and 2.3. In view of the observations made on the buffering action of the emulsifying agent, in the previous experiments, the stability data did not actually include those ranges of hydrogen-ion concentration over which the emulsifying agent exerted its buffer capacity.

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* Scientific Section, A. PH. A., Rapid City meeting, 1929.