

Fourteen were given ethylene gas, 2 ether, and 1 nitrous oxide and oxygen. The tables will show the CO₂ combining power taken before the administration of the anesthetic and at various times subsequent to its cessation, usually from one hour to 2 hours after completion of the operation. The patients were prepared for the operation wherever possible by appropriate diet and insulin so that they would come to the operation approximately as normal individuals without ketosis and hyperglycemia. This was not in every case possible and it will be observed that in a number of instances the blood sugar was abnormally high at the time of the operation. The method used included the administration of an extra carbohydrate feeding and insulin dose about 6 or 8 hours before the operation and during the course of the anesthetic the administration of 20 cc. of 50% glucose intravenously with from one to 2 units of insulin per gram of glucose. The insulin was given hypodermatically. It will be observed that usually the general anesthetic caused no change in the level of the CO₂ combining power. This corresponded to the clinical picture for there was no evidence of acidosis. It will be observed also that the level of the blood sugar at the time of the anesthesia was immaterial. Equally good results were obtained with high blood sugar levels as with low. The pH was not determined.

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Experiments on the Effect of Di-hydranol on Intestinal Protozoa of Man and Laboratory Mammals.

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Leonard and his associates (Leonard,¹ Leonard and Frobisher,² Hampil³) have demonstrated the bactericidal properties of the acyl and alkyl derivatives of resorcinol and Ratcliffe⁴ has shown that the administration of certain of these derivatives to rats not only changes the intestinal flora from a Gram-positive to a Gram-negative type but also is effective in reducing the protozoa in the cecum

¹ Leonard, V., *J. Urol.*, 1924, xii, 585.

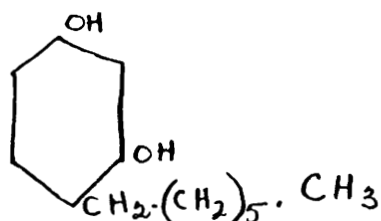
² Leonard, V., and Frobisher, M., *J. Urol.*, 1926, xv, 1.

³ Hampil, B., *J. Inf. Dis.*, 1928, xliii, 25.

⁴ Ratcliffe, Herbert L., *Am. J. Hyg.*, 1929, x, 643.

(*Trichomonas* spp., *Endamoeba muris*). Trichomonads in young chicks were also killed on a one per cent N-heptyl resorcinol diet fed for 5 days (Ratcliffe, l. c.). At the suggestion of Dr. Veader Leonard the writer has made a study of the effect of di-hydranol, a homolog of hexyl resorcinol, on certain intestinal protozoa of man and mammals in New Orleans. The drug has been prepared by Sharp and Dohme of Baltimore and been placed at the writer's disposal through the courtesy of Dr. Leonard.

Structure and properties of di-hydranol. Di-hydranol (2,4-dihydroxy-phenyl n-heptane) is a yellowish crystalline product with the structural formula:



Its taste is at first slightly sweetish, but soon there develops a definite mild acrid pungency, very similar to that of the root of the Indian turnip, *Arisaema atrorubens*, to be followed later by a mild numbness of the tongue. The drug is only slightly soluble in water. Hampil (l. c.) found the series to which this group belongs to be more bactericidal in alkaline solutions, presumably due to their greater solubility in this medium. In concentrated crystalline form it is too irritating for the human stomach but in olive oil, in which it is highly soluble, this difficulty is entirely obviated. Almost all of the drug is excreted by the bowel; its presence in the urine of a patient taking the drug in olive oil can be detected only by the most delicate technic. Its toxicity is clinically negligible.

Clinical material for study. Through the cooperation of several physicians 21 patients harboring intestinal protozoa have been available for study of the protozoacidal properties of the drug. These have consisted of 8 children from 2 to 9 years of age, 10 adolescent boys and 3 men. The protozoa which they harbored before treatment, together with the number of cases, are respectively as follows: *Endamoeba histolytica*, 14; *E. coli*, 9; *Iodamoeba buetschlii*, 2; *Endolimax nana*, 2; *Giardia lamblia*, 11. In addition, *Endamoeba histolytica* and *Giardia* have been treated in 2 dogs and 3 rhesus monkeys, *Giardia* in 3 rats, *Trichomonas* in 2 monkeys, and *Chilomastix* in 3 monkeys.

The dosage. One teaspoonful of olive oil, containing 0.2 gm. of di-hydranol, has been given to children 3 times a day after meals for a period of 7 days or more. Two capsules (1.2 cc.), containing 0.3 gm., have been administered to adolescents and adults 2 or 3 times a day after meals. In dogs and monkeys the compound (10 cc.) has been given once a day by duodenal tube; in rats one per cent of the crystalline drug was added to a balanced diet. In no instance except in the rats was it possible to have complete control of the diet. A total of from 4 to 10 gm. was given to each host studied. In every case the drug was well tolerated and there were no symptoms except in the case of 2 children, to which it had been administered before meals, when slight gastric pain was noted, and in 2 cases (adults) in which a slight diarrhea developed for 2 days.

Results of treatment. Follow-up microscopic examinations together with case histories provide the following data. In a total of 19 cases of *E. histolytica*, including 2 acute infections (dogs), one chronic case of 5 years' standing and refractory to other drugs (adult), 2 chronic (children), and 14 carrier cases, all except one carrier case have been freed of the infection with a single treatment series (4 to 10 gm.). Two of the 12 *E. coli* infections have been eliminated. The 2 *Iodamoeba* and 2 *E. nana* infections have been removed. The 2 *Trichomonas* infections (monkeys) have been eliminated. One of the 3 *Chilomastix* and 4 of the 14 *Giardia* cases (2 human, 2 canine) have been eliminated. The rats were completely freed of their *Giardia* infection on the third day of treatment, but gradually showed *Giardia* cysts in their stools. The question of reinfection from their cages is a possible explanation for this recurrence.

On the whole there are ample data to support the view that di-hydranol has a specific action on *Endamoeba histolytica*, *Iodamoeba*, *E. nana* and *Trichomonas*. On the other hand, those intestinal protozoa with very resistant cyst capsules, *i. e.*, *E. coli*, *Chilomastix* and *Giardia*, are less amenable to the action of this drug. These observations parallel those of various workers on the *in vivo* and *in vitro* action of emetin hydrochloride and yatren (iodoxyquinolin sulphonic acid) on these several intestinal protozoa.

The results obtained from this preliminary series of cases indicate the valuable place which di-hydranol may attain as an amebicidal therapeutic, particularly in view of the ease with which it may be administered and the essentially negligible toxic effects which it produces. It appears to be a particularly satisfactory therapeutic for chronic and carrier cases in children as well as in adults, and for those patients where hospitalization is impracticable.