

completely masked. The extent of contamination was found by separately diluting the hemolyzed blood and measuring the optical density at 505 $m\mu$ (12). The hemoglobin concentration of the dye-tinged dog plasma was 0.76 g% and that of the human was 0.73 g%. The most striking thing is not so much the recovery of dye (Fig. 2, triangles) as the removal of the hemoglobin. A sharp blue band about 1 mm thick is revealed at the top of the column within a few seconds after rinsing begins. From this band some 96.8% of the dye is recovered.

Extent of separation from plasma constituents. The spectral curves of the dye in effluent obtained from the 3 types of plasma were compared with that of dye in effluent obtained by sorbing dye out of saline solution. The maximum optical density always occurred at 620 $m\mu$. The measurements at each indicated wave length from 475 $m\mu$ to 700 $m\mu$ are in excellent agreement. Between 400 $m\mu$ and 475 $m\mu$ the dye from plasma has a somewhat greater absorption of light than the dye which was extracted from saline solution. The spectral data from human plasma, which are identical with those of dog plasma, are shown in Fig. 3. These results indicate that the extent of separation is quite remarkable. In fact this procedure can even be employed in the recovery of T-1824 from other biological fluids, such as liver and gall bladder bile.

12. Drabkin, D. L., p. 40 in *Haemoglobin*, Interscience Publ. Inc., New York, 1949.

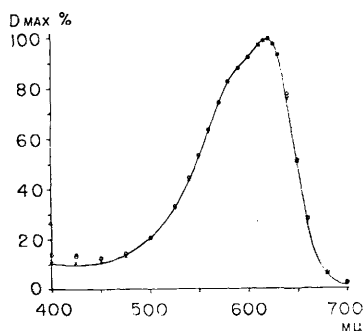


FIG. 3.

Spectral curves: relative absorption of light by T-1824 extracted from saline compared to that by T-1824 extracted from types of plasma denoted by symbols as in Fig. 2.

Summary. Consistent mean recoveries of 97% are obtained by use of a simple procedure for the stable extraction of T-1824. Dye-tinged plasma is treated with a modern soap and then quantitatively transferred to a column of paper fiber. Dye is sorbed on the paper, rinsed with saline solution and eluted with acetone:water. The various steps including the spectrophotometric measurement can be finished in one hour. Spectral curves of eluted dye show that interference from hemolysis and lipemia is removed in the rinse. This procedure improves the versatility and certainty of the dye-hematocrit method for estimation of blood volume.

The helpful advice of Professor Magnus I. Gregersen is gratefully acknowledged.

Received December 7, 1950. P.S.E.B.M., 1951. v76.

Constriction of Thoracic Inferior Vena Cava in Rabbits Following Two-Stage Portal Ligation.* (18418)

ROGER F. MILNES.† (Introduced by George H. Stueck, Jr.)

From the Surgical Service, Veterans Administration Hospital, White River Junction, Vt., and Dartmouth Medical School, Hanover, N. H.

Rapid or gradual constriction of the thor-

acic inferior vena cava in animals generally produces ascites. The fluid formed by such a procedure is believed to be the result of

* Published with the permission of the Chief Medical Director, Department of Medicine and Surgery, Veterans Administration, who assumes no responsibility for the opinions expressed or the conclusions drawn by the author.

† Veterans Administration Hospital, White River Junction, Vt., Mary Hitchcock Memorial Hospital, and Hitchcock Clinic, Hanover, N. H.

venous congestion in the liver. The purpose of the following experiment was to observe the effect of a previous 2-stage portal ligation on ascites produced in rabbits by thoracic inferior vena cava constriction. McKee(1,2) produced ascites in dogs within a few days by means of an adjustable aluminum band placed on the thoracic inferior vena cava midway between the heart and diaphragm. Volwiller (3) and Volwiller and co-workers(4), working with dogs, used a cellophane band placed around the thoracic segment of the inferior vena cava; the fibrous reaction of the cellophane would cause a progressive constriction of the vessel lumen to approximately one quarter of its original diameter within 3 to 4 weeks. This resulted in marked ascites. Both in animals and in man, gradual occlusion of the portal vein does not produce ascites. In monkeys, as shown recently by Milnes and Child(5), acute portal occlusion does not produce ascites. It is suggested that acute portal occlusion is tolerated by man as shown by Child(6) in his work on several patients with carcinoma of the stomach.

In the present experiment, rabbits weighing 2 to 4 kg were used. The diet consisted of stock rabbit pellets, containing 17% protein, oats and water. All surgical procedures were carried out under aseptic conditions. Postoperatively the animals were not maintained on antibiotics and no measure of intake or output was made.

Method and results. A control series of 8 rabbits was operated upon with positive endotracheal oxygen pressure and thoracotomy performed under local anesthesia. Each rabbit was subjected to constriction of the thoracic inferior vena cava, midway between the heart and diaphragm, with a polyethylene band measuring 0.5 cm in width. The vein

TABLE I. Ascitic Fluid in Rabbits with Thoracic Caval Constriction.

Exp.	Onset of ascites (days)	S.G.	T.P. (g/100 cc)	A/G
1	4	1.014	3.8	0.9
2	3	1.012	3.6	1.1
3	4	1.016	4.4	1.1
4	3	1.018	4.3	1.0
5	3	1.014	4.2	0.9
6	3	1.012	4.0	1.0
7	4	1.018	3.6	1.0
8	4	1.017	4.3	0.9
Avg			4.0	1.0

was measured carefully with calipers so that the vessel could be reduced as nearly as possible to 60% of its normal diameter. Closure of the chest was accomplished with interrupted silk, and the lungs re-expanded by means of positive endotracheal pressure. Following operation, the presence of ascites was determined by daily paracentesis. Ascites was found to occur in 3 to 4 days. Samples of fluid were removed every 7 days for a period of 3 months and analyzed for total protein and A/G ratio. The volume that could be removed at each sampling varied from 20 cc to 40 cc, with a specific gravity range of 1.012 to 1.018. The values for total protein averaged 4.0 g per 100 cc, and the A/G ratio averaged 1.0. Over the period of 3 months, the values for total protein did not vary appreciably from the average. Interestingly, some of the animals developed edema of the posterior extremities after 4 months. No jaundice was apparent clinically in any of the rabbits. Table I outlines the 8 control experiments.

Another group of 8 rabbits was operated upon and 2-stage ligation of the portal vein was performed. The procedure used to ligate the portal vein was carried out under local anesthesia in the following manner. At the first stage, the portal vein was carefully dissected free, just distal to its entrance into the liver, and a constricting band of polyethylene placed about it, causing not more than 50% constriction of the vessel's diameter. The abdomen was then closed in layers, and a period of 20 days elapsed before a secondary laparotomy was performed, at which time total ligation of the vessel was completed

1. McKee, F. W., *J. Exp. Med.*, 1948, v87, 457.
2. McKee, F. W., *Surg., Gynecol. and Obstet.*, 1950, v89, 529.
3. Volwiller, W., *Proc. Staff Meetings, Mayo Clinic*, 1950, v25, 31.
4. Volwiller, Grindley, Bollman, *Gastroenterology*, 1950, v14, 40.
5. Milnes, R. F., *Proc. Soc. Exp. Biol. and Med.*, 1949, v70, 332.
6. Child, C. G., *Ann. Surg.*, 1950, v132, 475.

TABLE II. Ascitic Fluid in Rabbits with Thoracic Caval Constriction Following Two-Stage Portal Ligation.

Exp.	Onset of ascites (days)	S.G.	T.P. (g/100 cc)	A/G
1	3	1.012	3.6	0.9
2	4	1.013	3.5	0.8
3	4	1.016	4.2	1.0
4	4	1.016	4.0	1.1
5	3	1.015	4.4	1.0
6	4	1.015	3.9	0.9
7	4	1.013	4.1	0.9
8	3	1.014	4.0	0.9
			Avg 3.9	0.9

with silk. In none of these animals was ascites demonstrable by frequent paracentesis.

One week following the second-stage portal ligation, thoracic inferior caval constriction was performed on these rabbits, using the same technic as was used in the control series. The formation of ascites was usually demonstrated by paracentesis within 4 days. This

fluid was examined for total protein and A/G ratio every 7 days for a period of 3 months. No appreciable change in average total protein or A/G ratio was noted in comparison with the animals with thoracic inferior caval constriction alone. Total protein averaged 3.9 g per 100 cc, A/G ratio 0.9, and the specific gravity varied from 1.012 to 0.016. Table II outlines the results obtained in this group of animals. These rabbits did not show clinical jaundice. There was no evidence that 2-stage ligation decreased the total volume of ascitic fluid.

Conclusion. 1. Constriction of the thoracic vena cava in rabbits produces ascites. 2. 2-stage portal ligation in rabbits does not cause demonstrable ascites. 3. In rabbits, the ascitic fluid formed by caval constriction in the chest is not affected by previous 2-stage portal ligation.

Received December 8, 1950. P.S.E.B.M., 1951, v76.

Effects of Administration of Gonadotropic Hormone on Vitamin A Deficient Rats. (18419)

JEAN MAYER AND J. W. GODDARD.

(Introduced by F. J. Stare.)

From the Department of Nutrition, Harvard School of Public Health, Boston, Mass.

It had been shown by Mason(1), in particular, that the effect of vit. A deficiency on the male rat amounted to a virtual castration as far as secondary sexual characters are concerned. This could be interpreted as meaning that in vit. A deficiency target organs did not respond to circulating androgens or it could mean that androgens were not synthesized or released. To answer this point, Mayer and Truant(2) administered testosterone to vit. A deficient castrates and non-castrates and to their controls. It was found that the response of target organs of the deficient animals to injected androgens was essentially normal. In particular, the secondary sex organs became extremely hyper-

trophied even while severe losses of weight due to the deficiency were taking place. It was concluded that in vit. A deficiency, synthesis or release of androgens was interfered with. In order to find out whether this was due primarily to a testicular lesion or to a pituitary hypofunction, it was decided to study the effects of administration of gonadotropic preparations on vit. A deficient animals and their controls.

Method. The animals used were male Wistar albino weanlings, of the Harvard-Hisaw colony, 22 days of age. Their average weight was 50.75 g. These animals were kept in an air-conditioned room (about 26°C) at constant humidity and were alternately 12 hours in darkness and 12 hours in artificial light. The diet used had the following composition: Casein 25%, "Salt IV" mixture 4%, Corn

1. Mason, K. E., *Am. J. Anat.*, 1933, v52, 153.

2. Mayer, J., and Truant, A. P., *Proc. Soc. Exp. Biol. and Med.*, 1949, v72, 436.