presumed to contain the major portion of antibodies.

Summary. 1. Total protein, albumin, and 5 globulin fractions were determined by electrophoresis in the plasma of samples of cord blood and of venous blood from 11 women whose pregnancies were uncomplicated. Similar samples were obtained for electrophoretic analysis from 21 women whose pregnancies were complicated by toxemia of pregnancy and other diseases. 2. For the samples representing uncomplicated pregnancy total protein values for venous blood were higher than for cord blood. Greater average amounts of albumin and gamma globulin were found in cord blood than in the corresponding venous blood, coincident with lesser amounts of alpha, beta, and phi globulins. 3. In complicated pregnancies the ranges for total plasma protein in venous and cord blood were lower than for the normal group. Ranges of values for serum protein (calculated as plasma minus fibrinogen) fractions in cord blood following complicated pregnancies were, in general, higher for albumin and gamma globulin and lower for alpha, beta, and phi globulins than the ranges for venous blood.

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Received March 24, 1952. P.S.E.B.M., 1952, v80.

Visualization of Arterio-Venous Shunts by Cinefluorography in the Lungs of Normal Dogs.* (19581)

HERMANN RAHN,† ROBERT C. STROUD, AND CHARLES E. TOBIN.‡

From the Departments of Physiology and Anatomy, University of Rochester School of Medicine and Dentistry, Rochester, N. Y.

Catheterization of the pulmonary vessels in man and animals is currently a common procedure for experimental and diagnostic purposes. Frequently the catheters are advanced peripherally in branches of the pulmonary artery until they occlude the vessel in order to record "pulmonary capillary" pressure or to obtain arterialized blood samples by retrograde flow. In view of this technic and the many descriptions of arterio-venous shunts in

* This study was supported in part by funds from the Air Materiel Command, Wright Field,† and by a grant from the National Heart Institute of the U. S. Public Health Service.‡

the lungs of mammals it is of interest to report that following the occlusion or "jamming" of the pulmonary artery by a catheter, large A-V shunts can be visualized by cinefluorography. Since Prinzmetal *et al.*(1) have shown that glass spheres, many times the diameter of capillaries, will pass through the pulmonary vessels of the dog, cat, and rabbit, the presence of arterio-venous (A-V) shunts in mammalian lungs have received attention for their role in blood gas analyses(2), the passage of parasites through the lung(3) and the formation of arterio-venous aneurysms(4-7). Although A-V shunts were not observed in isolated human lungs by some investigators(8,9), they have more recently been demonstrated within the lobules and visceral pleura(10) by the use of the glass sphere technic of Prinzmetal *et al.*(1) followed by the injection of radiopaque media, vinyl acetate or liquid latex.

Method. Four dogs, with body weights of 40-55 lb, were anesthetized with Veterinary Nembutal (1 cc/5 lb). A Bard x-ray, whistle tip catheter, size No. 11, with openings at the tip and at 1 and 2 cm proximal to the tip, was passed into the jugular vein, right atrium and ventricle, and into the pulmonary artery. The progress and final position of the catheter were determined by fluoroscopic examination. During each cinefluorographic study, 20 cc of Thorotrast (24-26% ThO_2 by vol.) was injected in 2 to 3 seconds and 15 or 30 frames of 35 mm film per second were exposed for a period of 10 to 15 seconds.

Results. With the tip of the catheter in the pulmonary conus, the contrast medium passed into and through the pulmonary artery and veins, the left chambers of the heart and the aorta. But if the catheter was later advanced further (about 4 cm for dogs No. 1, 3, and 4) or retracted and then reinserted (No. 3) until "jammed" into the pulmonary artery of the left lower lobe, there was little filling of the branches of the pulmonary artery; most of the Thorotrast passed from one of the proximal openings in the catheter via an A-V shunt into the left chambers of the heart. In another instance (the second injection of dog No. 4) when an attempt was made to withdraw the catheter, arterial spasm held its distal end firmly but after several forceful trials, the catheter was dislodged and withdrawn until its tip was in the pulmonary conus. The injected Thorotrast in this case refluxly filled both major branches of the pulmonary artery and its smaller branches. Although the shunt could not be visualized with certainty, the left atrium contained some radiopaque medium before the remainder had traversed the pulmonary veins, indicating that the shunt must have remained open even though the catheter was removed from the pulmonary artery.

In one dog (No. 2) no evidence of A-V shunts was noted. The Thorotrast coursed normally through the pulmonary vessels of this animal both when the catheter tip was 4.5 cm out from the pulmonary conus and one-half hour later, when it was advanced about 2.2 cm still further.

Additional confirmation of the A-V shunt was obtained in dog No. 1 when one catheter was inserted into the pulmonary conus and another passed retrogradely through the femoral artery into the aorta, until the tip of the latter was just above the semilunar valves (dog No. 1). While this dog was breathing 30% O_2, several hundred glass spheres, 200 $\pm$ 25 μ in diameter, in saline were injected via the catheter into the pulmonary artery. Three seconds after introducing the spheres, 10 cc of arterial blood was withdrawn as rapidly as possible from the aortic catheter and one glass sphere was recovered. Repeating this procedure, but with the animal breathing 10% O_2, 2 spheres were recovered. This dog was killed and the heart and lungs removed as a unit. The pulmonary arteries were injected with red, and the veins, with blue vinyl acetate, respectively. The casts of the pulmonary vessels were obtained according to the technic of Tobin and Zariquiey(10) and revealed the presence of an A-V shunt in the inferior lobe of the left lung.

Discussion. In a routine study of the anatomy of pulmonary vessels of dogs by cinefluorography it was discovered that A-V shunts in the lung could be readily visualized when the catheter was advanced until it "jammed" in the pulmonary artery. In 12 dogs with the catheter tip in the right atrium,

ventricle. pulmonary conus or the proximal part of the pulmonary artery, no evidence of A-V shunts was ever seen with the injection of Thorotrast. However, with deliberate "jamming" of the catheter into a branch of the pulmonary artery, A-V shunts were seen in 3 of 4 dogs. It is suggested that the irritation produced by the catheter may cause the pulmonary vessels to constrict around the catheter as well as peripherally and thus force the injection material through A-V shunts. Another explanation is that this irritation may cause the A-V shunts to open without need of greater filling pressure.

Summary. A shunt between the pulmonary artery and vein was demonstrated in 3 of 4 dogs by injecting Thorotrast into a catheter inserted tightly into the pulmonary artery and following the circulation by cinefluorography. In one of these dogs the passage of glass spheres 200 $\pm$ 25 μ in diameter, through a cannula in the pulmonary artery, to and through a cannula in the aorta, together with the location of the shunt from plastic casts of the pulmonary vessels, help to confirm the presence of the shunt.

The authors are greatly indebted to Dr. J. S. Watson and Mr. S. A. Weinberg of the Department of Radiology, for their aid in the cinefluorography. This technic has been previously described(11).

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Received March 20, 1952. P.S.E.B.M., 1952, v80.

Absorption Rates of Colloid and Milky Suspensions of Halogenated Fats for Hepatosplenography in the Rat. (19582)

J. F. McCLENDON AND J. GERSHON-COHEN.

From the Albert Einstein Medical Center (Northern Division) Philadelphia, Pa.

Success with intravenous injections of emulsified iodized oils for hepatosplenography has not been achieved, partially because of the pyrogenic effect of the fat and toxicity of the halogens(1). This report concerns attempts to lessen these toxic effects by the use of injection methods other than by the intravenous route.

Experimental. Milky and colloid suspensions of the following halogenated fats were used in these experiments: 40% iodine in poppy seed oil (Lipiodol LaFay), 27% iodine in peanut oil (Iodochloral Searle), bromiodized linseed oil, iodized linseed oil, brominized linseed oil, bromiodized lecithin and hexabromostearic acid. Owing to the fact that the reaction between the halogen and the nonsaponifiable portion of fat seems to produce toxic substances, recrystallized hexabromostearic acid was tried. This was prepared by dissolving 2 g (M.P. 179-180°C) in 10 ml of boiling dioxane which was then injected as a capillary stream into 15 ml boiling distilled water rotated in a micro Waring blendor. The resulting sol was bluish by reflected and reddish by transmitted light. After stabilizing with 1% polyoxyethylene sorbitan-fatty esters (Tween 80), it was dialyzed free of