terone(25) will prolong the life of certain adrenalectomized mammals including the ferret and the cat. Regardless of what prolongs the life of adrenalectomized pregnant females, it has been shown that adrenalectomizing the mother results in hypertrophy of the adrenals of fetuses(5,6). It has also been found that the injection of adrenal cortical extracts into the mother will prevent these effects(6). These observations raise a question as to whether the same factors responsible for hypertrophy of fetal adrenals after adrenalectomizing the mother play a part in the compensatory hypertrophy noted in the unilaterally adrenalectomized fetuses of this present series. It is reasonable to assume that one factor in both these instances is the action of an adrenocorticotrophin. A number of recent observations point to the view that adrenocorticotrophin is produced by the hypophysis of the mammalian fetus(7-12). Against this view is a recent report that in immature rats subjected to injections of epinephrine or to cold the hypophysis does not release ACTH until the 8th day and 16th day, respectively, after birth(26). This report poses a question as to whether the effective adrenocorticotrophin might have come from the maternal hypophysis, the fetal hypophysis or, conceivably, the placenta. Also one has to consider the possibility of the direct effect of reduced quantities of adrenal cortical hormones upon the fetal adrenal. From the observations noted in this series, it is not possible to settle the matter.

Conclusion. Subjection of the fetal rat to unilateral adrenalectomy causes a compensatory hypertrophy of the intact adrenal. Manifestations of this include an increased volume of the gland and an increased size of cells of all cortical zones. Those cells at both borders of the intermediate zone show an increased vacuolation, suggesting that the zone had been widened by the metamorphosis of cells at these borders.

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Arteriovenous Shunts in the Human Lung.* (18360)

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The presence of arteriovenous (A-V) shunts bypassing the capillary circulation in the human lung has been suspected from studies on blood gas analyses(1), the passage of certain parasites through the lung(2), and the formation of telangectasis(2) and arteriovenous aneurysms(3-6) within the lung.

Although these shunts have not been observed in the human lung(7,8), Prinzmetal *et al.*(9) have shown that glass spheres many

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times the accepted diameter of capillaries in all species will pass through the pulmonary vessels of the dog and rabbit. Experiments were therefore undertaken, utilizing the glass sphere technic followed by injection media, to ascertain the presence and anatomical location of A-V shunts in the human lung.

Material and methods. Fresh human lungs (obtained at autopsy from 20 adults, 17-91 years of age, and 3 newborn infants) showing little or no evidence of respiratory pathology, were used. The lungs were gradually inflated, via the bronchus, with compressed air (5-10 mm Hg pressure) to approximately normal size and then allowed to deflate by their inherent elasticity. Glass cannulae were ligated in the hilar ends of the pulmonary artery and veins, and normal saline solution perfused (30-40 mm Hg pressure) into the pulmonary artery to wash out the residual blood. Perfusion was continued until a relatively clear perfusate returned from the pulmonary veins. Several hundred small glass spheres (10-750 μ in diameter)† were then poured into a small glass funnel, connected by rubber tubing to the cannula in the pulmonary artery, and washed into the artery with 50-100 cc of saline solution. The rubber tubing was clamped with a hemostat, the funnel removed, and the outer surface of the lung washed thoroughly to remove any spheres that might possibly have fallen there. The cannulated specimen was placed in a clean white-enameled basin, the hemostat removed, and 500 cc of saline perfused through the pulmonary artery at 50-300 mm Hg pressure. The outer surface of the lung was again washed with saline to collect any spheres that might have adhered to the lung after leaving the cannulated pulmonary veins. The perfusate returning from the venous cannulae and the washings collected in the basin were decanted and filtered. Recovery of the spheres could be enhanced by examining the basin or filter paper under ultraviolet light, since the spheres fluoresce with a different color from that of the enameled basin or the filter paper. The spheres recovered were counted, and their sizes measured on a stage micrometer. Solutions of liquid latex or vinyl acetate‡ were injected into the pulmonary vessels at an initial pressure of 60-100 mm Hg, which was increased to 200-250 mm Hg as peripheral resistance to the injection masses was encountered. Acetone perfusion preceded the vinyl acetate injection. The pulmonary arteries were injected with red, and the pulmonary veins with blue colors of these solutions. Radiopaque media§ were added to the injection mass used in 6 adult lungs, to permit radiographic visualization of the pulmonary vessels and localization of the spheres. The lungs injected with liquid latex were embalmed by perfusing 10% formalin into the bronchi; those injected with vinyl acetate were macerated in concentrated hydrochloric acid to obtain casts of the vessels.

Observations. Spheres up to 500 μ in diameter were washed through the pulmonary veins from 9 of the adult and 2 of the neonatal lungs by the saline perfusion, with an average of 37.5 spheres recovered from each lung. No spheres were recovered in the perfusate from the other 12 lungs. However, when the pulmonary veins of these lungs were dissected (if injected with latex) or dissolved in acetone (if filled with vinyl acetate) they were

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† Some of the glass spheres were obtained through the kindness of Dr. Myron Prinzmetal, Institute for Medical Research, Cedars of Lebanon Hospital, Los Angeles, Calif., others were purchased from B. F. Drakenfeld, 45-47 Park Place, N. Y. City.

‡ Stock solutions of the liquid latex and vinyl acetate, in various colors, were purchased from Ward's Natural Science Establishment, Rochester, N. Y. The injection syringe consisted of a glass cylinder and a metal piston with a rubber washer at the end of the piston, such as the Janet-Frank Bladder Syringe or the B-D Champion Veterinary Syringe. This type of syringe is necessary, because latex or vinyl acetate will cause metal to adhere to metal or glass to glass.

§ The radiopaque injection media consisted of: vinyl acetate 90% and 10% iodoform; liquid latex 75% and 25% of a saturated solution of barium sulphate in a 25% ammonium hydroxide; or the liquid latex and 25% stabilized colloidal thorium dioxide contrast medium (Thorotrast, manufactured by the Heyden Chemical Corporation, New York City); or liquid latex and 25% ethyl iodophenylundecylic acid (Pantopaque).

found to contain spheres up to 500 μ in diameter. Spheres larger than 500 μ were lodged in the arteries and did not pass to the veins.

The anatomical location of the A-V shunts was ascertained from radiographs of the lungs injected with radiopaque media, in which the course of the vessels and the spheres themselves could be visualized; from dissections of the latex-injected lungs; and from the casts of the specimens injected with vinyl acetate. No A-V shunts were present in the hilar region nor along the course of the larger branches of the pulmonary artery and vein. At the apex of the lobular subdivision of the bronchopulmonary segments, however, shunts up to 500 μ in diameter were found. Smaller shunts (50-100 μ) were located at the level of the smaller bronchi and respiratory bronchioles, and the smallest, (20-25 μ) near the alveolar sacs and the alveoli. Shunts up to 200 μ in diameter also occurred in the pleura.

Comment. Perhaps a larger number of spheres and a higher percentage of successful passages of spheres through the pulmonary veins might have been found if gelatin, or some other solution of greater viscosity than the saline perfusate, had been used, since many of the spheres settled in the more dependent parts of the arteries and veins. Such viscous solutions, however, would have interfered with the subsequent injection of latex or vinyl acetate. Unless the A-V shunts were relatively large, they could not be demonstrated by the vinyl acetate technic, apparently due to the shrinkage and fixation of the vessels by the pre-injection acetone perfusion or the acetone content (approximately 80%) of the vinyl acetate and the small percentage (less than 20) of vinyl resin remaining after the specimen was macerated.

Summary. Arteriovenous shunts, many times the accepted diameter of capillaries, were demonstrated in isolated human lungs with little or no pulmonary pathology, by the passage of glass spheres from the pulmonary artery to or through the pulmonary veins. Injection of these vessels with liquid latex or vinyl acetate indicates that the shunts are located at the apex of and within the lobular divisions of the lungs.

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Antigenic Pattern of Strains of Influenza A and B. (18361)

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Studies on the antigenic pattern of influenza A and B viruses have revealed heterogeneity in each of these groups(1-5). The significance of this multiformity as it relates to the occurrence and recurrence of strains of a particular antigenic composition in the human population and to the selection of viruses for use in the vaccine has not been fully evaluated. The present communication presents data on the antigenic patterns of a number of strains of influenza A and B which have been recovered since 1933.

Materials and methods. Virus strains. Certain pertinent information about the viruses used in the present work is summarized in Table I. Additional data are given in Table II on the strains designated CAW-1, CAW-2, CAW-3, CAW-4A, CAW-5, Canadian Arctic 1A and Canadian Arctic 12A which were recovered from specimens collected from Es-

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