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Abstract Paper

PRACTICAL SIGNIFICANCE OF THE RESULTS

The resistance to winter damage and the ability to recover from it shown by planted red and Scotch pines of several seed sources emphasizes the desirability of planting pines of local or climatically similar origins in northeastern Minnesota. This agrees with previous findings for red pine based on survival, growth, vigor, form, and soundness (1). However, it modifies previous findings for Scotch pine. Prior to the present winter-damage the more rapid growth of central European Scotch pines had given them an apparent advantage over those of northern European origin. This advantage has now been wiped out.

The results of this study add another shred of evidence to the general case in favor of selecting the right seed sources as well as proper species in forest planting. By such means severe winter damage and other ill effects of poorly adapted tree races may be avoided.

REFERENCES CITED

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OBSERVATIONS ON THE ACTION OF THE CARDIAC, PULMONIC, AND AORTIC VALVES IN THE BEATING HEART

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ABSTRACT

The perfusion of the isolated heart of the rabbit or dog is a well-known laboratory procedure. In its simplest form it consists of cannulating the aorta and connecting it to a reservoir of oxygenated Ringer-Locke Solution which is placed at a sufficient height above the heart to provide a pressure of about 100 mm. Hg.

In order to observe the mitral and tricuspid valves the atrial walls are incised and retracted sufficiently to permit direct observation of the opening and closing of the cardiac valves. The ventricles are usually kept supplied by the flow of fluid from the Thebesian vessels and other vessels from which fluid finds its way into the opened chamber. If the fluid thus supplied is insufficient, a tube can be run from the reservoir of Ringer-Locke solution to one or both ventricles and additional fluid can thus be provided for keep-

ing the cardiac valves in operation. With proper illumination the pulmonic valves can be observed quite effectively by opening and retracting the walls of the common pulmonary artery.

The direct observation of the aortic valves requires a special cannula and an apparatus for providing peripheral resistance to the flow from the left ventricle. Obviously, if the aortic valves are to be observed in operation, fluid must be pumped out of the left ventricle by the beating heart. To accomplish this purpose a peripheral resistance is effected in the same manner as in a heart-lung preparation. In brief, a rubber sleeve is placed within a large glass tube (20 mm. in diameter) and each end of the rubber sleeve is reflected over the ends of the glass tube and tied in place. The glass tube has side arms to which a pressure bulb and a mercury manometer can be connected. The desired pressure can be exerted on the sleeve and the proper peripheral resistance can thus be obtained.

The first steps in the procedure are the same as for perfusing the heart in the usual manner. When the heart has established a regular rhythm, the tube supplying the aorta with Ringer-Locke's solution is clamped and the tube which connects the aorta with the peripheral resistance is opened. The heart is in this way required to furnish its coronary vessels with fluid by action of the left ventricle. The necessary fluid for the left ventricle, as already described, is provided by a tube connected directly to the reservoir of Ringer-Locke's solution.

In order to observe the aortic valves in operation a cannula must have been made with a broad flat top through which it is possible to look directly down on the valves. Such a cannula has been developed making one arm of a T-tube funnel-shaped and about 15-20 mm. in diameter. This was then covered by a thin glass disc which was glued in place. When completely filled with fluid, the aortic valves can be seen opening and closing with each pulsation of the heart.

With this preparation it is possible to perform a variety of experiments. We have listened to the heart sounds and have noted their absence when the cardiac valves have been excised. We have also observed the contraction of the atrio-ventricular ring and have noted the action of the papillary muscles. Additional experiments with this preparation are now in progress. It provides an ideal classroom demonstration of the action of the cardiac, aortic, and pulmonic valves.