The fluid, the viscosity of which is to be determined, is drawn into the pipette from a receptacle. By means of the usual method the time is recorded which elapses between the dipping of the pipette into the liquid and the moment when the fluid passes the mark above the bulb. A comparison is then made between this value and the value previously obtained for distilled water, the latter being regarded as 1. The experiments are performed at room temperature.

26 (282)

Studies in experimental arteriosclerosis.

By **ISAAC ADLER** and **O. HENSEL.**

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Some time ago we reported to this society [1] that the intravenous injection of nicotin produced in the aorta of rabbits lesions practically identical with those obtained by Josue and others with intravenous injections of adrenalin.

The following is a brief summary of our further experiments along those lines. Many observers have laid particular stress upon the fact that where macroscopic lesions are not found, minute microscopic changes, stretching of the elastica and the like, could be recognized. We have counted as positive only such where there were distinctly visible macroscopic lesions. All observers agree that the best results can be obtained with older animals weighing over 2,000 grams. It was our misfortune that the great majority of rabbits obtainable by us were young and under the weight mentioned.

Twenty-four rabbits were treated with intravenous injections of nicotin, the dose being 5 drops of a 1–200 solution of pure nicotin. 7 died before they had had a sufficient number of injections. Of the remaining 17, results were positive in 7 after 18 to 77 injections. In 10 there were no macroscopic lesions after 20 to 117 injections.

In 6 rabbits nicotin and euphthalmin were used. Five were negative but one which had received alternate nicotin and euphthalmin injections 69 times showed aneurysm and calcification.

[1] Adler and Hensel: This journal, 1905, iii, p. 36.

The euphthalmin did not alter the typical nicotin reaction, such as convulsions, etc.

Nine rabbits received intravenous injections of nicotin and subcutaneous injections of iodipin. All were negative.

Two rabbits received their nicotin subcutaneously, the dose being double that given intravenously. One died too soon; the other was killed after 25 injections. Neither showed any arterial lesions.

One rabbit was given nicotin simultaneously with 1/10 grain atropin. It died after 14 injections; negative.

One nicotin and amyl nitrite; negative. Convulsions in no way influenced by these drugs.

Four rabbits were given nicotin and sodium nitrite; 3 negative and one positive after 49 injections. Two in which nicotin was injected into the peritoneum died after a few injections from some infection.

Two were fed by mouth with nicotin solution commencing with 5 drops and gradually increasing to 60. They were killed after 68 feedings. Result was negative.

Our series comprises 52 rabbits in all with 9 positive results. Excluding the 9 rabbits treated with iodipin and not counting all those experiments in which the animals died or were killed before a sufficient number of injections could be given, 23 in all, there remain 29 negative to 9 positive results.

Eight rabbits were treated with adrenalin of which 5 died after 1 to 8 injections; the other 3 after 29, 63 and 82 injections showed aneurysms and calcifications.

Five rabbits were treated with barium chlorid, 5 to 10 minims of a 1 per cent. solution. Two of these died after 3 injections, possibly from over-dose; the other three after 40, 65 and 69 injections were negative.

Two received barium chlorid and iodipin. One died after 2 injections from over-dose. The other, after 61 injections, showed no lesion.

One rabbit received 63 injections of euphthalmin with negative result. The dose, 3 milligrams, was probably too small.

Two treated with intravenous injections of calcium chlorid after 74 injections showed no lesion.

Two which were given digalen intravenously were negative after 52 and 64 injections.

Four were given acetate of lead intravenously. In two of these, by using a very dilute solution, 1–2,000, dose 30 minims, we managed to give 26 injections. Negative. Two others received subcutaneous injections which produced abscesses.

In the whole series of over 80 rabbits there are but 12 positive results.

Fourteen rabbits weighing considerably over 2,000 grams each, not subjected to any experimentation, were examined for aortic lesions with negative results.

A close scrutiny of the reports of other observers shows that they also have had many negative results. Adrenalin seems to give the best and most uniform results, though Kayserling in eight rabbits treated with adrenalin saw no macroscopic lesions and only a few microscopic changes. On the other hand, positive results have been obtained from substances differing most widely in chemical composition and physiological action, even from normal saline solution given in large quantities. On the whole it may be said that blood-pressure-raising drugs give the best results.

The extent and gravity of the lesions do not seem to be altogether dependent upon the number of injections given — Erb saw complete calcification of the aorta after a single injection of adrenalin, while we and many other observers have found very little or nothing after a great many injections. All attempts thus far to produce similar lesions in other animals, such as dogs and monkeys, have failed. The lesions seem to occur in rabbits, though probably but rarely, spontaneously and especially in such animals debilitated by old age and disease.

Much further investigation is necessary, but the following conclusions seem to us warranted in the present state of our knowledge :

It is still very uncertain what relation the experimental results produced in the aorta of rabbits by the intravenous injection of adrenalin, nicotin and other substances, may bear to human atheroma or arteriosclerosis. In the present state of our knowledge we are not justified in identifying the two processes. It seems probable that rabbits have a special predisposition towards these lesions. Young and healthy animals seem able to resist and render

innocuous the introduction of the various toxic materials employed It is very probable that in animals debilitated by old age, malnutrition and disease, the aorta is no longer normal and is probably the seat of minute microscopic lesions such as stretching of the elastica and insufficiency of the muscular fibers. In such animals various toxins introduced into the circulation, especially those tending to raise blood-pressure, will bring out this latent disposition and cause arterial necrosis, calcification and aneurysmatic dilatation.

27 (283)

On the influence of various substances, applied directly to the medulla oblongata, upon the respiratory rhythm in frogs.

By **T. BRAILSFORD ROBERTSON.**

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Recent experiments by Maxwell[1] have shown that the nerve cells in the cerebral cortex are not stimulated by the ordinary nerve stimulants, such as oxalates, citrates, tartrates, etc. On the other hand we are in the possession of the well-known fact that an increase in the CO_2 tension of the blood supplied to the brain at first accelerates and later, if the increase in CO_2 tension be sufficiently great, inhibits the rhythmic discharge of impulses from the respiratory center or centers. It appeared possible that although the ordinary nerve stimulants do not excite nerve cells yet some other group of substances might be found which does so. Accordingly the following experiments were undertaken.

The roof of the skull, in frogs, was removed by means of a fine pair of bone forceps as far down as the tip of the fourth ventricle; in some instances the membrane covering the floor of the fourth ventricle was removed, in others not. The cerebrum was removed by cutting across the thalamencephalon just in front of the optic lobes; by this means it was found that a more regular respiratory rhythm was obtained, the frog was quieter, and the results were more uniform. The cavity left in the skull by the removal of the

[1] Maxwell: *Journ. of Biol. Chem.*, 1906, ii, p. 183.