

The ears are normal in many individuals but not infrequently both are poorly developed and often one is scarcely formed. When one eye is large and the other small or absent the well formed ear is usually on the side with the more perfect eye. The general growth rate is retarded and spina-bifida sometimes occurs.

Chloroform, chloroform and ether are more general in their anesthetic effects, the entire embryo being unusually depressed. In all of these substances, however, if the concentration be delicately regulated the eye defects so common in alcohol and magnesium may be produced.

Cyclopia and other eye defects, in fish embryos at least, are produced by lessening the developmental energy at certain critical stages. This is readily accomplished by treating the developing embryo with anesthetics.

2 (412)

On the variation in the resistance of human erythrocytes in disease to hemolysins, with especial reference to syphilis.

By **RICHARD WEIL.**

[From the Department of Experimental Therapeutics, Cornell University Medical School.]

The observations herein presented have to do with the alterations in the reaction of the red blood cells to the action of certain hemolytic agents. This alteration in the resisting power of the red cells may be either in the direction of a diminution or an increase in their resistance; increased resistance, however, is apparently a much more striking and demonstrable feature than is the reverse, and seems to me, furthermore, to be of considerable importance from the standpoint of immunity. My observations comprise a study of almost five hundred human cases, normal and diseased, in which the red cells were subjected to the action of various lytic agents. Among the agents so studied were various acids and alkalies; certain metallic salts, such as bichloride of mercury, which possesses a well-known hemolytic power; certain vegetable hemolysins, such as saponin, digitonin and cyclamin, and certain animal venoms, such as rattlesnake and cobra venom. The results obtained from the study of the inorganic lysins have not been such that they could be reduced to a definite correlation with any given

class of corpuscles studied. The results with the organic lysins were of greater interest, the most marked feature being the striking resistance offered by the corpuscles derived from certain cases of syphilis to the action of saponin and allied poisons. On the other hand, not all of the cases with syphilis manifested this result; indeed some of them seemed among the least resistant of the bloods which were studied. Further analysis revealed the fact that some cases of advanced tuberculosis of the lungs also possessed corpuscles marked by resistance to these poisons, although their resistance did not equal that of the cases of syphilis. Added to these unsatisfactory conditions was the fact that the technique, unless most rigidly observed, failed to demonstrate these differences satisfactorily.

Digitonin proved a far more satisfactory glucoside than saponin, inasmuch as it separated far more cases of lues from the non-luetic than did saponin, but it shared the disadvantages already outlined, namely, the extreme delicacy of the reaction, which left too little margin of difference between the luetic and the non-luetic cases and the extreme care necessary in the technique, inasmuch as the slightest difference in the handling of the various specimens of erythrocytes sufficed to invalidate the result.

In looking for some other hemolysin of the same nature, I was guided by the fact that the sapotoxins previously investigated act upon the red cells through their content in cholesterin and in lecithin. H. Sachs states that cobra venom is an indicator of the lecithin content of red cells; I therefore made a further study of snake venom, using rattlesnake venom and cobra venom. Of the rattlesnake venom I had two specimens, one of which I owe to the kindness of Professor McFarland, of Philadelphia; neither has given me satisfaction, although I am not ready to make a final report on the subject. I have also had two samples of cobra venom for one of which I am indebted to Dr. Flexner. Cobra venom has fulfilled my expectations even more completely than I had hoped. I have tested approximately 150 cases of human blood, of which 50 were from syphilitics, and I believe that it is justifiable to make a preliminary statement of the results of these tests. To summarize the results in brief: luetic conditions are characterized by their resistance to cobra venom. This group comprises also some

fairly early cases of lues. The reaction does not invariably determine luetic conditions, but is marked in about 90 per cent. of the cases. I have had my reactions controlled in every case, not only by the clinical history and findings, but by the results of a Wasserman test done in every case on the serum either by Dr. Kaplan, of the Montefiore Home Laboratory, or by Dr. Warren, of the Cornell Laboratory — to whom I am indebted for these data. In comparing our results, it is a very striking fact that I have obtained fewer positive reactions in the case of the so-called parasymphilitic diseases — namely, tabes dorsalis and general paresis. The cause of this discrepancy I am unable to determine. It is possible that it might disappear in a larger series of cases; it is possible that when lues attacks the lipoids of the central nervous system, it spares those of the red cells; finally, it is possible that tabes and general paresis give a greater number of positive Wasserman reactions than corresponds to the proportion of luetic infection among these cases. I have also failed to get a positive reaction in three cases of scarlet fever, and in two cases of polycythemia, and in one case of scleroderma, in all of which the Wasserman reaction was positive, but inasmuch as the positive Wasserman reaction in these cases is to be regarded as probably due to a source of unavoidable error resident in the nature of the reaction, I believe that the cobra venom has proven a superior reagent in these cases. In certain types of cases, the method which I have described has a distinct advantage over the Wasserman reaction. In the first place, it is applicable to cases with jaundice; in the second, it is positive for some time after mercurial treatment has abolished the Wasserman reaction; and finally, it is positive in a very large percentage of very old, quiescent cases in which Wasserman reaction is negative. The cases which most closely approach the luetics in point of resistance are some cases of tuberculosis, but they have not as yet proven a source of confusion. In the very early florid cases of lues, with chancre and the first rash, the resistance of the corpuscles to cobra venom is regularly diminished considerably below the normal.

As regards the theory involved in this reaction, I am unable to advance a very satisfactory explanation. I presume that the well-known relationship of lecithin to the Wasserman reaction,

and to the action of cobra venom will play a rôle in the final solution, but my own experiments have not hitherto thrown any light on the subject.

As regards the method, the blood is to be drawn into 2 per cent. sodium citrate, thoroughly washed, and made up into a 4 per cent. suspension in 0.9 per cent. common salt. The suspensions may be tested at once, or may be kept in the ice box until the following day and then tested. Equal quantities of a 1 : 8,000, and of a 1 : 15,000 dilution of cobra venom are then added, and after one hour incubation the results may be read. If still higher dilutions, as from 10,000 to 60,000 are used, the cells must be incubated for one hour and observed the next morning, but nothing is gained by this except more delicate gradations. Syphilitic cells should resist a solution twice as strong (1 : 8,000) as that which is sufficient to destroy all the control (1 : 15,000). If intermediate solutions are also used, it is possible to trace the gradual loss of the reaction in treated cases. It is probable that each specimen of cobra venom would have to be independently standardized, but one gram would then suffice for about 5,000 tests.

3 (413)

The distribution of sulphur compounds in brain tissue.

By **W. KOCH** and **F. W. UPSON**.

[*From the Hull Physiological Laboratory of the University of Chicago.*]

The distribution of sulphur expressed in per cent. of total among the various chemical groups of the whole brain is approximately as follows: (1) Proteins, 60 per cent.; (2) lipoids, 26 per cent.; (3) water, soluble extractions or neutral sulphur compounds, 9 per cent.; (4) sulphates, 5 per cent. (Total sulphur in per cent. of dry matter is from 0.45 to 0.5.)

Sulphur occurs in the following five stages of oxydation: (1) Cystein $R-S-H$, (2) cystin $R-S-S-R$, (3) sulphonate or taurin-like $R-SO_2-OH$, (4) ethereal $(RO)_2SO_2$, (5) sulphates.

Taking the various groups of chemical constituents, the following stages of oxydation of sulphur have been found in each: Protein — (1) cystein, (2) cystin, (3) ethereal; lipoids — (4) ethereal. Water soluble extractives (1 or 2 or both) most likely cystein, (3) sulphonate or taurin-like.