for the shock which is associated with absence of the adrenals, but they have not reported experiments in which the effect of cortin has been assayed in traumatic shock. Always when they produced shock the adrenals were absent. Shock was never produced when the adrenals were present. They conclude, "the idea that the adrenal cortical hormone might prove of benefit in the treatment of human traumatic shock is advanced merely as a suggestion. Adequate proof can only come through clinical trial." Since it is known that deficiency of the cortico-adrenal hormone results in a lowering of the glycogen and blood glucose levels and since it is known that if the blood glucose level is reduced by insulin, there is a reduction in blood volume with blood concentration, the suggestion that the function of the adrenal cortex is the regulation of blood volume and blood dilution seems unnecessary. Although the analogy between deficiency of cortico-adrenal hormone and traumatic shock is a close one, no convincing evidence has been presented that the two conditions have a common etiology or that the cortical hormone is of benefit in the treatment of shock.

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THE ASSOCIATION OF TERMITES WITH FUNGI

A SURVEY of the fungi associated with *Kalotermes minor,* a dry-wood termite, *Reticulitermes hesperus,* the common western subterranean termite, and *Zoötermopsis angusticollis,* the large damp-wood termite, has been made.

Fungi were found to be associated with each of the fifteen colonies of *K. minor,* twelve colonies of *R. hesperus* and twelve colonies of *Z. angusticollis* studied. They were isolated (1) from the exterior of the termites, (2) from the gut of the termites, (3) from the fecal pellets of *K. minor* and *Z. angusticollis,* (4) from the "frass" with which *R. hesperus* plugs up abandoned galleries, (5) from the wood of the inner surface of the termite burrows, and (6) from the wood 1 to 2 mm below the surface of the walls of burrows. Henceforth, in speaking of the isolation of a fungus from a termite colony, this designation is used to include not only the termites themselves, but also their fecal pellets, the frass and the wood enclosing their burrows.

Representatives of thirty-three genera of fungi and twenty undetermined fungi were isolated from the colonies of the three species of termites. A somewhat smaller number of fungi was associated with *K. minor* than with *R. hesperus* or *Z. angusticollis,* seventeen genera of fungi and four undetermined fungi being isolated from twelve colonies of *K. minor* as compared to twenty-five genera and eight undetermined forms from twelve colonies of *R. hesperus* and twenty-two genera and three undetermined forms from twelve colonies of *Z. angusticollis.*

The average number of fungi isolated from ten cultures made from each of twelve colonies of each of the species of termites was 4.91 for *K. minor,* 8.75 for *R. hesperus* and 7.25 for *Z. angusticollis.*

A smaller amount of fungous growth was present in the colonies of *K. minor* than in those of *R. hesperus* or *Z. angusticollis.* Furthermore, the wood containing the *K. minor* colonies usually showed little structural injury from fungous attack, while that enclosing the *R. hesperus* and the *Z. angusticollis* burrows usually showed decay. This is undoubtedly due to the fact that the wood containing the colonies of *K. minor* was drier and, therefore, less favorable to the growth of wood-destroying fungi.

Penicillium and *Trichoderma* were the genera of fungi most frequently isolated from the colonies of each of the three species of termites. There was no evidence of any specific relation between any fungus and a given species of termite.

Termites were placed upon pure cultures of a fungus, and were found capable of transporting large numbers of fungous spores and hyphae on their legs and bodies. Subsequent dissection revealed many entire and fragmented spores and a few fragments of hyphae of the fungus in the gut of the termites.

Fungi were more abundant on the inner surface of termite galleries than in the wood below the surface of gallery walls, only four cultures out of fifteen taken from wood 1 to 10 mm from the galleries of a colony of *K. minor* being positive as compared to sixteen positive cultures out of seventeen taken from the surface of gallery walls.

Twelve cultures made from the heartwood of a pole uninfested by termites were all negative. Seventeen out of twenty-seven made from the sapwood were also negative. In a termite-infested pole, of the same kind of wood and having a similar history of use, fourteen cultures taken at intervals throughout the diameter of the pole from wood adjacent to termite galleries were all positive. The same two fungi which were isolated from the wood near the exterior of the first pole were common throughout the diameter of the second pole in and near the termite galleries. Nine other fungi were also present in the termite-infested pole.

It seems evident, then, that termites may introduce fungi which were not previously present in the wood and that they may aid in the spread through the wood of these and of those already present.

The results of this investigation indicate that con-

ditions in the burrows of *K. minor, R. hesperus* and *Z. angusticollis* are favorable to the growth of fungi and that fungi are present in the walls of the burrows and in the fecal pellets. Termites enlarge their burrows; they eat their fecal pellets. Fungi would seem, then, to be a common element in the diet of the termites. Further investigation, however, will be necessary to determine the significance of fungi as food for termites. Fungi may cause chemical changes in wood. Hence, the question whether their presence may render wood more available or more attractive to the termites also becomes a problem of interest.

A more detailed account of this investigation will appear later.

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ANTIPROTHROMBIN AND GLOBULINS

IN a recent note[1] A. Fischer called attention to his work on the effect of the addition of heparin upon precipitation of proteins, especially of blood proteins, in an acetate-acetic acid solution at pH 5.0. With small additions of heparin there is an increased precipitation of casein, blood serum protein, or a precipitation of serum albumin. With increased amounts of heparin, precipitation may be inhibited or the precipitate dissolved. The addition of heparin to dialyzed serum albumin gives a flocculation at pH 5.0. These conclusions are similar to those previously published by Fischer in the *Biochemische Zeitschrift*.[2] Fischer concludes from his experiment that euglobulin is formed from serum albumin and suggests that euglobulin is formed in the liver through the combination of serum albumin with heparin.

We were interested in these findings of Fischer in connection with the blood of new-born animals. The serum or plasma of such animals does not contain euglobulin according to the ordinary methods of detecting it, and in some animals practically no pseudoglobulin I (if one wishes to recognize two pseudoglobulins). If euglobulin is formed by combination of heparin with albumin, it seemed possible that the failure to find euglobulin might in some way be connected with the concentration of heparin in the newborn blood. Furthermore, if euglobulin is formed by a combination of heparin with albumin, such a serum offers an excellent opportunity to test the fact. It is better than a purified serum albumin, because changes in the character of the protein through the removal of euglobulin and the purification of the albumin likely to occur in any purification process would be reduced to a minimum. The only change involved is the clotting of the fibrinogen.

Heparin preparations, both purified and crude, were presented to us by Hynson, Westcott and Dunning. The addition of heparin to new-born serum or to adult serum with an acetate buffer mixture according to the procedure of Fischer confirmed his results with regard to precipitation at pH 5.0, *i.e.,* a turbidity developed with the new-born serum where no precipitate had formed without heparin and a turbidity appeared with adult serum greater than that obtained without heparin. Furthermore, the pH for maximum precipitation was found to be different for the cow and horse. Additional amounts of heparin after the maximum turbidity was reached resulted in a decreased turbidity. However, the addition of a neutral salt or mixture of salts which precipitate euglobulin, such as 1.00 volume-molar sodium sulfate solution or of 1.425 volume-molar solution of potassium phosphate at approximately pH 7[3] to untreated new-born serum and to new-born serum to which heparin had been added failed to give a precipitation. The concentration of heparin used was that which gave the maximum turbidity at pH 5.0. Furthermore, the addition of 1.50 volume-molar sodium sulfate solution or of 2.025 volume-molar potassium phosphate at approximately pH 7, which precipitate both euglobulin and pseudoglobulin, gave equal precipitations with new-born serum in the presence or absence of heparin.

After these observations were completed a communication by Fischer and Schmitz[4] appeared in which they indicate that ammonium sulfate turbidity curves are not affected by heparin. These authors also state that the addition of herparin to serum and plasma from the same animal causes a difference in the distribution of albumin and globulin of plasma such that the albumin fraction of the plasma is decreased, while the globulin fraction is increased as compared to the corresponding fraction from serum. We have fractioned the new-born serum and plasma from the same animal, with and without the addition of heparin, at 0.75 molar and at 1.50 molar sodium sulfate. These concentrations are held to precipitate fibrinogen and total globulin, respectively, at dilutions of 1:30. (No precipitate was obtained in the serum with 1.00 molar sodium sulfate, indicating an absence of euglobulin and fibrinogen.) Heparin was added in the concentration which gave the maximum turbidity at pH 5.0, in turbidity measurements such as Fischer has used, *i.e.,* 0.5 cc of a 1 per cent. solution of heparin was added to 0.5 cc of serum for each determination. No differences were obtained in the quantity of protein precipitated in serum or plasma in any concentration of salt.

[1] SCIENCE, 75: 443, 1932.
[2] A. Fischer, *Biochem. Z.,* 244: 464–485, 1932.
[3] Paul E. Howe, *Physiol. Rev.,* 5: 439–476, 1925.
[4] A. Fischer and A. Schmitz, *Naturwissenschaften,* 20: 471–2, 1932.