

method for testing the absorbed serum with appropriate red cells were those suitable to the individual antiserum.

The possibility of producing potent anti-P testing sera by immunizing rabbits with selected hydatid cyst fluids is being investigated.

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Hæmoglobin in the Crustacea

HÆMOGLOBIN in solution in the blood plasma is found in numerous entomostracan Crustacea. Ray Lankester first discovered it in *Chirocephalus*, observing the absorption bands of oxyhæmoglobin with a microspectroscope¹, and soon afterwards found it in *Daphnia*. The wave-length of the α -band differs among species within the genus *Daphnia*². The pigment also occurs in the blood of other Cladocera, for example: *Sida*, *Simocephalus*, *Moina*, *Bosmina*, *Ilyocryptus*, *Eurycercus*, *Leydigia*, *Chydorus*, etc., but not in *Leptodora*. The hæmoglobin of *Ceriodaphnia* has a higher oxygen affinity than that of *Daphnia*, and the former lives in fouler water³. Hæmoglobin is present, too, in Phyllozoa: it is in the blood of Conchostraca (*Lynceus*, *Leptestheria*⁴, *Limnadia*), Anostraca (*Chirocephalus*, *Artemia*^{5,6}) and Notostraca (*Triops*⁷, *Lepidurus*). It may be universal in the blood of the Phyllozoa. Among the Ostracoda, hæmoglobin occurs in *Cypria*⁸ and *Pseudocypria*.

In the Copepoda, the parasites *Lernaeocera*^{9,10} and *Mytilicola*¹⁰ have hæmoglobin in the blood, but hitherto the pigment has been unknown in free-living forms. I have not detected it in *Diaptomus* or *Cyclops*; but lately have found it in the blood of various species of Harpacticoida. The blood of these animals does not circulate, as there is no heart. Hæmoglobin was first detected in a new marine species, *Laophonte foxi* Harding¹¹, living in mud; but none could be found in the common species *Tisbe furcata* (Baird), moving freely in sea water. Hæmoglobin is present in the blood of the common freshwater species *Canthocamptus staphylinus* Jurine, found on and in mud, but it is absent from *Bryocamptus pygmaeus* (Sars), on wet moss. *Attheyella crassa* (Sars) from the bottom of the Lago Maggiore at a depth of 120 m. and from moss in a rivulet at Pallanza in Italy had hæmoglobin, but the concentration was considerably greater in the former situation. A full account of this investigation will be published elsewhere.

Among the Cirripedia, hæmoglobin is unknown in the barnacles, although it is present in the blood of some of the parasitic Rhizocephala: among these there is none in *Sacculina*, but it occurs in *Septosaccus*¹² and *Peltogaster*¹³. Not only is hæmoglobin thus found in the blood of numerous Crustacea, but it also occurs in a variety of tissues in *Daphnia*, namely, muscle, nervous system, fat cells¹⁴ and eggs. This is in contrast to the Vertebrata, where the pigment is only present in red blood cells and in muscle. In the Cladocera and Phyllozoa the concentration of

hæmoglobin in blood and tissues varies inversely as the dissolved oxygen concentration in the water, the changes being both rapid and considerable when animals pass from one water to another¹⁵.

Hæmoglobin, we have seen, is present in Branchiopoda, Ostracoda, Copepoda and Cirripodia, yet it is not known to occur in the higher Crustacea, the Malacostraca. In two malacostracan groups, the Decapoda and Stomatopoda¹⁶, the copper-containing respiratory protein hæmocyanin, blue in the oxidized state, occurs dissolved in the blood plasma. Hæmoglobin has indeed been reported in a species of the Amphipoda, *Urothoe grimaldii* Chevreux¹⁷, which burrows in sand on the sea-shore. I have, however, been unable to confirm this report, finding no hæmoglobin in animals of this species from near Plymouth: 30 individuals were examined spectroscopically on three different occasions.

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Presence of a Substance Rich in Protein-bound Cystine or Cysteine in the Neurosecretory System of an Insect

COMPARISONS have been drawn between the hypothalamo-hypophysial neurosecretory system of vertebrates and corresponding systems in invertebrates; for example, the pars intercerebralis-corpora cardiaca neurosecretory system of insects¹. Such comparisons are supported by the demonstration in both groups² of a deeply staining chrome-alum-hæmatoxyphil neurosecretory material. In the dog, this material has been described as a glycolipoprotein 'bearer-substance', soluble in lipid-solvents, and for this reason clearly to be differentiated from the posterior pituitary principles³. There is, however, an alternative view⁴, namely, that chrome-alum-hæmatoxyphil vertebrate neurosecretory material, or material in its exact distribution, is essentially a protein, which, in tissues which have not been fixed in formalin, is soluble in water rather than lipid solvents, and which for these reasons, and because of its high cystine content, could well be closely akin to the posterior pituitary principles. The present investigation is concerned with the nature of neurosecretory material in the intercerebralis-cardiacum system of the cockroach, *Leucophaea maderae*.

Prof. Berta Scharrer very kindly provided me with tissues from five adult cockroaches, fixed in Helly's fluid (formol-Zenker), embedded in paraffin wax, and serially sectioned. Representative sections, stained