PROCEEDINGS OF THE BIOCHEMICAL SOCIETY

The 505th Meeting of the Society was held at University College Galway on Thursday and Friday, 25 and 26 June 1970, when the following papers were presented:

COLLOQUIUM ON 'BILIPROTEINS'

Animal Biliproteins

By W. RÜDIGER. (*Institut für Biochemie, Universität des Saarlandes, 66 Saarbrücken, Germany*)

Biliproteins are composed of bile pigments and proteins. Natural bile pigments are derived from haemoproteins. Although the protein part of haemoproteins seems to play an important role in the biosynthesis of bile pigments (Ó Carra & Colleran, 1969), there is apparently no correlation between the apoproteins of haemoproteins and biliproteins.

There are several proteins in man that can combine with bile pigments. The serum albumin complex of bilirubin is the best known and has clinical importance (see Bennhold, 1966); the possible nature of the linkage has been discussed with regard to physicochemical measurements, e.g. the optical-rotatory-dispersion spectra of the complex (Blauer & King, 1968, 1970). Other proteins binding bilirubin or biliverdin are α -globulin and elastin.

Biliverdin-protein complexes are found in fish. Among these are the only known animal biliproteins with covalent linkages between bilin and apoprotein, namely a pigment in skin and fins of *Crenilabrus* (Rüdiger & Abolinš, 1969) and a muscle pigment of *Cheilinus* (Yamaguchi & Matsuura, 1969). In some serum biliproteins of fish, however, the prosthetic groups are easily split by acidic solvents, indicating non-covalent binding (Yamaguchi, Köchiyama, Hashimoto & Matsuura, 1966; Bada, 1970).

Although bile pigments are widely distributed among invertebrates (see Rüdiger, 1970), the biliprotein nature of these pigments has been established in only a few cases.

The defence secretion of the mollusc *Aplysia* contains red and blue biliproteins. The main bilin, aplysiocyanin, is derived from algal biliproteins ingested with the food (Chapman & Fox, 1969). Comparative structural investigations lead to the suggestion that only the bile pigment, but not the apoprotein, is derived from plant biliprotein. The splitting of the algal biliprotein is a stereospecific reaction, as seen from the optical activity of aplysiocyanin. Structural relationships with secondary pigments were discussed.

Skin and eggs of the mollusc *Halotis* are coloured by blue-green biliproteins. The prosthetic group,

haliotisviolins, is also present in shells of *Halotis* species. It belongs to a new type of bile pigment. Biliproteins with new types of bilins (structure unknown) have been found in the molluscs *Diodora* and *Monodonta* (Bannister, Bannister & Micallef, 1968a,b).

The green integumental pigments of the Orthoptera *Mantis*, *Clitumnus* and *Carausius* are chromoproteins; the prosthetic group has been characterized as biliverdin IX α (Rüdiger, Klose, Vuillaume & Barbier, 1969). This is linked to the apoproteins by non-covalent linkages of various strength, as shown by splitting experiments.

The biliprotein of the integument of caterpillars of the butterfly *Pieris* is split by neutral methanol, indicating a non-covalent linkage between bilin and apoprotein. The bile pigment (pterobilin) has been characterized by oxidative degradation as biliverdin IX γ (Rüdiger, Klose, Vuillaume & Barbier, 1968). Pterobilin and similar pigments of unknown structures (neopterobilins) are widely distributed among Lepidoptera (Vuillaume & Barbier, 1969). The biosynthesis of pterobilin has been investigated by studying the incorporation of labelled precursors.

Bada, J. L. (1970). *Experientia*, **26**, 251.

Bannister, W. H., Bannister, J. V. & Micallef, H. (1968a). *Nature, Lond.*, **217**, 754.

Bannister, W. H., Bannister, J. V. & Micallef, H. (1968b). *Comp. Biochem. Physiol.*, **24**, 839.

Bennhold, H. (1966). *Acta med. scand.* Suppl. no. 445, p. 222.

Blauer, G. & King, T. E. (1968). *Biochem. biophys. Res. Commun.* **31**, 678.

Blauer, G. & King, T. E. (1970). *J. biol. Chem.* **245**, 372.

Chapman, D. J. & Fox, D. L. (1969). *J. exp. mar. Biol. Ecol.* **4**, 71.

Ó Carra, P. & Colleran, E. (1969). *FEBS Lett.* **5**, 295.

Rüdiger, W. (1970). *Naturwissenschaften* (in the Press).

Rüdiger, W. & Abolinš, L. (1969). *Experientia*, **25**, 574.

Rüdiger, W., Klose, W., Vuillaume, M. & Barbier, M. (1968). *Experientia*, **24**, 1000.

Rüdiger, W., Klose, W., Vuillaume, M. & Barbier, M. (1969). *Bull. Soc. Chim. biol.* **51**, 559.

Vuillaume, M. & Barbier, M. (1969). *C. r. hebd. Séanc. Acad. Sci., Paris*, **268**, 2286.

Yamaguchi, K., Köchiyama, Y., Hashimoto, K. & Matsuura, F. (1966). *Bull. Jap. Soc. scient. Fish.* **32**, 873.

Yamaguchi, K. & Matsuura, F. (1969). *Bull. Jap. Soc. scient. Fish.* **35**, 920.