Brunet, P. C. J. (1963). *Ann. N.Y. Acad. Sci.* **100**, 1020.
 Shambough, G. F. (1969). *Bull. ent. Soc. Am.* **15**, 210.
 Whitehead, D. L. (1969). *Nature, Lond.*, **224**, 721.
 Willis, J. H. & Brunet, P. C. J. (1966). *J. exp. Biol.* **44**, 363.

A Possible New Sclerotization Agent in the Cockroach Cuticle

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A variety of sclerotization agents exist in insects (Brunet, 1967). Among these are *N*-acetyldopamine (Karlson & Sekeris, 1962) which has been shown to play an important role in the 'tanning' of the cockroach cuticle (Mills, Lake & Alworth, 1967). Further investigation has shown that [*carbinol*-¹⁴C]-noradrenaline [2-amino-1-(3,4-dihydroxyphenyl)-ethanol] is also incorporated into the cuticle of the American cockroach, *Periplaneta americana* L.

By using conditions both *in vivo* and *in vitro*, it has been found that a number of acidic, basic and neutral compounds arise from noradrenaline. These substances have been separated by high-voltage electrophoresis and paper chromatography. Co-chromatography and comparison with known metabolites has led to their identification, which suggests *N*-acetylation may be an important step.

I propose that β -hydroxylation of dopamine followed by *N*-acetylation may be involved in the synthesis of a previously unreported sclerotizing substance.

Brunet, P. C. J. (1967). *Endeavour*, **26**, 68.
 Karlson, P. & Sekeris, C. E. (1962). *Nature, Lond.*, **196**, 183.
 Mills, R. R., Lake, C. R. & Alworth, W. L. (1967). *J. Insect Physiol.* **13**, 1539.

Synthesis of Unstable Haemoglobins

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In subjects heterozygous for Hb-A* and a β -chain-variant unstable haemoglobin, the proportion of the unstable haemoglobin usually comprises 25–35% of the total haemoglobin. In three such cases the synthesis rates of the unstable β -chain and the β^A -chain have been shown to be equal (White & Dacie, 1970; Steadman, Yates & Huehns, 1970). The observation that the unstable haemoglobin

* Abbreviation: Hb, haemoglobin.

comprises less than 50% of the total haemoglobin in these cases suggests that a proportion of this haemoglobin is being removed as insoluble inclusion (Heinz bodies).

There are four unstable haemoglobins, however, present in smaller amounts, 15% or less of the total haemoglobin: Hb-Borås, F4 Leu $\rightarrow$ Arg (Hollender, Lorkin, Lehmann & Svensson, 1969); Hb-Santa Ana, F4 Leu $\rightarrow$ Pro (Opfell, Lorkin & Lehmann, 1968); Hb-Sabine, F7 Leu $\rightarrow$ Pro (Schneider, Veda, Alperin, Brimhall & Jones, 1969); Hb-Köln, FG5 Val $\rightarrow$ Met (Carrell, Lehmann & Hutchinson, 1966). In two patients heterozygous for Hb-Köln the relative rates of synthesis of the $\beta^{Köln}$ -chain and β^A -chain have been measured by incubation of their reticulocytes with [³H]leucine and measurement of the total incorporation of [³H]leucine into the two chains. The ratio of β^A - to $\beta^{Köln}$ -chain synthesized was found to be approx. 4:1 (White & Brain, 1970). The low proportion of Hb-Köln found in heterozygotes is therefore due to defective synthesis of the $\beta^{Köln}$ -chain as well as to its denaturation. This explanation may also be valid for the other three haemoglobins.

In all of these four haemoglobins the region of the amino acid substitutions are close to each other and near the haem-like histidine residue, F8. It is postulated that if an amino acid substitution in this region of the β -chain disrupts the normal structure then it may impede assembly of that chain.

Carrell, R. N., Lehmann, H. & Hutchinson, H. E. (1966). *Nature, Lond.*, **210**, 915.
 Hollender, A., Lorkin, P. A., Lehmann, H. & Svensson, B. (1969). *Nature, Lond.*, **222**, 953.
 Opfell, R. N., Lorkin, P. A. & Lehmann, H. (1968). *J. med. Genet.* **5**, 292.
 Schnieder, R. G., Veda, S., Alperin, J. B., Brimhall, B. & Jones, R. T. (1969). *New Engl. J. Med.* **280**, 739.
 Steadman, J. H., Yates, A. & Huehns, E. R. (1970). *Br. J. Haemat.* **18**, 435.
 White, J. M. & Brain, M. C. (1970). *Br. J. Haemat.* **18**, 195.
 White, J. M. & Dacie, J. V. (1970). *Nature, Lond.*, **225**, 860.

Thermal Denaturation of Human Haemoglobins

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The thermal denaturation of dilute solutions of various human haemoglobins has been studied by following fluorescence changes at 45°C, and from 'melting' curves by using the percentage change in optical rotation at 233nm with temperature.