Desulfovibrio vulgaris strain Hildenborough (N.C.I.B. 8303) has been investigated, and the structure shown below deduced from peptides isolated from trypsin, chymotrypsin and thermolysin digests:

Ala-Pro-Lys-Ala-Pro-Ala-Asp-Gly-Leu-Lys-Met-Glu-Ala-Thr-Lys-Gln-Pro-Val-Val-Phe-Asn-His-Ser-Thr-His-Lys-Ser-Val-Lys-Cys-Gly-Asp-Cys-His-His-Pro-Val-Asn-Gly-Lys-Glu-Asp-Tyr-Arg-Lys-Cys-Gly-Thr-Ala-Gly-Cys-His-Asp-Ser-Met-Asp-Lys-Lys-Asp-Lys-Ser-Ala-Lys-Gly-Tyr-Tyr-His-Val-Met-His-Asp-Lys-Asn-Thr-Lys-Phe-Lys-Ser-Cys-Val-Gly-Cys-His-Val-Glu-Val-Ala-Gly-Ala-Asp-Ala-Ala-Lys-Lys-Lys-Asp-Leu-Thr-Gly-Cys-Lys-Lys-Ser-Lys-Cys-His-Glu.

The native protein is very resistant to proteolysis, but if the haem is first removed (by reduction with HgCl_2 in 0.1N-HCl-8M-urea) and the apoprotein then oxidized with performic acid, digestion is satisfactory.

The structure contains two sequences of the type -Cys-X-Y-Cys-His-, typical of the haem attachment sites of other cytochromes *c*, but it also contains two sequences of the type -Cys-A-B-C-D-Cys-His-. It has not been possible to react any of the eight cyst(e)ine groups of the protein with alkylating agents when the haem is present, even after reduction with thioglycolic acid in 8M-urea. The relative positions of the cyst(e)ine and histidine residues suggest that the protein consists of two half-sections, each of which binds a haem group. There is little evidence for direct sequence homology between these halves.

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Bruschi-Heriaud, M. & Le Gall, J. (1967). *Bull. Soc. Chim. biol., Paris*, **49**, 753.

Coval, M. L., Horio, T. & Kamen, M. D. (1961). *Biochim. biophys. Acta*, **51**, 246.

Postgate, J. R. (1958). *J. gen. Microbiol.* **14**, 545.

Postgate, J. R. & Campbell, L. L. (1966). *Bact. Rev.* **30**, 732.

Enzyme Changes in Mice under Hypoxic Conditions

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Hypoxia is one of the natural differences in the environment to which the animal must adapt and there is evidence that under hypoxic conditions oxygen utilization by the tissues is increased (Valdivia, 1956). The $p\text{O}_2$ of venous blood is lower in acclimatized humans at high altitude than at sea

level (Hurtado, 1964) and Hurtado *et al.* (1956) found that acclimatized Amerindians had a lower than normal blood lactate and pyruvate after exercise. Increased muscle myoglobin and increased NADH oxidase activity has been found in man at high altitudes (Reynafarje, 1962). Increases in muscle myoglobin and cytochrome, haemoglobin, heart weight and succinate oxidase have been described in guinea pigs kept at high altitudes (Tappan & Reynafarje, 1957; Tappan, Reynafarje, Potter & Hurtado, 1957). There is, however, little work on the enzyme patterns of the tissues of animals kept under controlled conditions of oxygen tension. The animals used in this study were adult male C57 B1 mice. The experimental animals, six in a cage, were maintained in a decompression chamber at 390mm. Hg pressure for up to 1 week. Litter mates were used as controls. Groups of six pairs of animals were killed at 24hr., 48hr. and 1 week. At the end of the experimental period the following enzymes were estimated in the heart, liver, kidney and skeletal muscle: cytochrome oxidase, NADH-cytochrome *c* reductase, succinate dehydrogenase, malate dehydrogenase, α -glycerol phosphate dehydrogenase, lactate dehydrogenase, glucose 6-phosphate dehydrogenase, pyruvate kinase, glutamate-oxaloacetate transaminase and glucose 6-phosphatase. The enzymes of the heart showed no progressive change, but NADH-cytochrome *c* reductase, succinate dehydrogenase, pyruvate kinase and lactate dehydrogenase were all significantly decreased at some stage of the exposure to hypoxia. The enzyme pattern of the liver became less oxidative, but there was no corresponding increase in the activity of the glycolytic enzymes. Glucose 6-phosphatase had only one-tenth of the activity of the controls. It is suggested that the loss of mitochondrial and microsomal enzymes reflects a diminished phospholipid synthesis for membrane formation. In the kidneys there was no loss of oxidative capacity but a slight increase in glucose 6-phosphatase and lactate dehydrogenase activity. There was a marked increase in the glycolytic enzymes of the muscle after 48hr. of hypoxia.

Hurtado, A. (1964). In *Handbook of Physiology, Section 4: Adaptation to the Environment*, chapter 54. Washington, D.C.: American Physiological Society.

Hurtado, A., Velásquez, T., Reynafarje, C., Lozano, R., Chavez, R., Aste-Salazar, H., Reynafarje, B., Sanchez, C. & Muñoz, J. (1956). *Rep. 56-1, School of Aviation Medicine, U.S.A.F., Randolph Field, Texas.*

Reynafarje, B. (1962). *J. appl. Physiol.* **17**, 301.

Tappan, D. V. & Reynafarje, B. (1957). *Amer. J. Physiol.* **190**, 99.

Tappan, D. V., Reynafarje, B., Potter, V. R. & Hurtado, A. (1957). *Amer. J. Physiol.* **190**, 93.

Valdivia, E. (1956). *Rep. 55-100, School of Aviation Medicine, U.S.A.F., Randolph Field, Texas.*