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NEUROCHEMICAL GROUP COLLOQUIUM ON 'PROTEIN SYNTHESIS IN THE CENTRAL NERVOUS SYSTEM'

Mechanisms of Protein Synthesis in the Central Nervous System

By SIDNEY ROBERTS (*Department of Biological Chemistry, University of California at Los Angeles School of Medicine, Los Angeles, Calif.* 90024, *U.S.A.*)

The functional significance of protein-synthesizing systems localized in different cellular and subcellular regions of the central nervous system will be outlined. Physical, chemical and metabolic properties of cytoplasmic ribosomal systems of cerebral origin will be described, with emphasis on characteristics that appear to be unique compared with those of corresponding preparations from other mammalian tissues. These include mechanisms that regulate gene expression, turnover of mRNA, RNA components of polyribosomes, stability of mRNA–ribosome complexes and ribosomal state *in vivo*. Alterations that occur in these properties during cerebral maturation will be indicated. The relationship of these phenomena to specialized function in the central nervous system will be discussed.

Membrane-Bound and Free Ribosomes in Brain and other Tissues

By T. M. ANDREWS and J. R. TATA (*National Institute for Medical Research, Mill Hill, London NW7 1AA, U.K.*)

Membrane-bound and free ribosomes can be isolated from rat cerebral cortex, as from many other tissues. A rapid age-dependent decline in protein-synthetic activity in rat brain during the first 3 weeks of life is more markedly reflected in the membrane-bound fraction than in free ribosomes. This appears to involve some functional alteration in the ribosomes themselves rather than any change in soluble factors or endogenous mRNA content.

The role of membrane-bound ribosomes in brain will be discussed in relation to the known importance of ribosome–membrane attachment for secretion of newly synthesized protein in liver and other secretory tissues.

Polyamines and the Regulation of Protein Synthesis in Brain

By P. P. GIORGI (*Medical Research Council Demyelinating Diseases Unit, Newcastle General Hospital, Newcastle upon Tyne NE4 6BE, U.K.*)

Analytical and experimental studies *in vivo* and *in vitro* show that spermine and spermidine are structural components of brain ribosomes and contribute to enhance their stability, aggregation and protein-synthetic activity.

Developmental changes of brain polyamines are well correlated with the corresponding changes in protein-synthetic activity, and both are typical of the brain.

About 50% of brain polyamines are associated with the microsomal fraction, and their half-life is similar to that of rRNA.

Some characteristics of the enzymes responsible for polyamine biosynthesis and their relationship to trophic hormones are such that changes in the concentration of brain polyamines could represent an effective mechanism for the regulation of protein synthesis in this organ.

Protein Synthesis by the Mitochondria of Neurons

By A. HERNANDEZ and T. S. WORK (*National Institute for Medical Research, Mill Hill, London NW7 1AA, U.K.*)

Brain-cortex cells are readily homogenized by standard techniques. Mitochondria of these cells purified by application of standard techniques of differential sedimentation in sucrose synthesize protein by two routes, one inhibited by cycloheximide and one inhibited by chloramphenicol. The cycloheximide-sensitive synthesis is due to 80S ribosomes enclosed in semipermeable vesicles, and the chloramphenicol-sensitive synthesis proceeds on the 55S mitoribosomes. The brain mitoribosomes synthesize ten or more proteins, and these are indistinguishable, in rate of migration on polyacrylamide, from the protein synthesized by isolated liver mitochondria.