with such storage diseases occurs at a normal rate. The second is the development of techniques for introducing radiotracer elements into the various lipid molecules. Investigations with labelled materials provided for the identification of the nature of the enzymic defects in Gaucher's disease, metachromatic leucodystrophy, Niemann-Pick disease and Fabry's disease in the short period of time from 1965 to 1967. These findings established the still unbroken precedent that all of the lipidoses are due to attenuation of specific catabolic enzymes normally required for the metabolic disposal of the accumulating lipid. There are now nine known diseases of this nature, and the respective enzymic abnormalities are indicated in Table 1. This hard-won knowledge has recently been put to practical clinical use. We can now accurately diagnose homozygous (afflicted) individuals, we can identify heterozygous carriers of these recessive diseases and, most importantly, procedures have now been developed for the accurate prenatal monitoring of pregnancies at risk for all of the lipid-storage diseases. The second portion of the presentation will deal with the profound alterations of ganglioside pattern and synthesis in DNA- and RNA-tumorigenic-virus-transformed cell lines.

Two Cerebral Sphingolipidoses (Metachromatic Leucodystrophy and Infantile Amaurotic Idiocy) as Human Inborn Errors of Metabolism

By H. JATZKEWITZ (*Max-Planck-Institut für Psychiatrie, Neurochemische Abteilung, München, West Germany*)

Both metachromatic leucodystrophy and infantile amaurotic idiocy arise from an accumulation of sphingoglycolipids. In cases of metachromatic leucodystrophy cerebroside sulphates (i.e. sulphatides or ceramide-galactose sulphate) accumulate. In patients suffering from infantile amaurotic idiocy gangliosides (i.e. ceramide-oligosaccharides + *N*-acetylneuraminic acid residues) and to a smaller extent their neuraminic acid-free residues are stored. This takes place especially in the brain, but also in other tissues. The major monosialoganglioside in the brain contains a single *N*-acetylneuraminic acid (sialic acid) residue, derived from a tetrahexosylceramide, and has the following structure:

where NeuNAc represents *N*-acetylneuraminic acid.

Both diseases, with a recessive mode of inheritance, are caused by a disturbance in the turnover of the accumulated sphingolipids due to a genetically

induced deficiency in the catabolizing enzyme system, which resides in the lysosomes.

Cerebroside sulphates are catabolized by arylsulphatase A (i.e. cerebroside sulphatase) to give cerebroside and sulphate. The major monosialoganglioside is degraded by different glycosidases, which hydrolyse the different hexoses of the oligosaccharide chain one after the other.

Sulphatides are constituents of brain white matter including myelin. A deficient cerebroside sulphatase gives rise to the demyelinating disease metachromatic leukodystrophy. Gangliosides are constituents of the grey matter. The inability to catabolize the major monosialoganglioside or its lower homologues leads to swollen and disintegrated neurons, giving rise to infantile amaurotic idiocy. Three types of glycosidases (β -galactosidase, EC 3.2.1.23; *N*-acetyl- β -D-hexosaminidase, EC 3.2.1.30; β -glucosidase, EC 3.2.1.21) are involved in the catabolism of the major monosialoganglioside. Since each of these glycosidases can be deficient, different variants of the disease have been observed. They are characterized by more or less visceral involvement. Even the classical type of the infantile amaurotic idiocy (Tay-Sachs disease), with the accumulation of the trihexosyl ganglioside (Tay-Sachs ganglioside), caused by a deficient *N*-acetyl- β -D-hexosaminidase, shows three variations. They depend on the different patterns of two multiple forms of this enzyme that occur in humans.

Diagnostic and therapeutic possibilities of these inborn errors of metabolism will be discussed.

The Metabolism of Phosphatidylcholine in Brain Tissue

By G. B. ANSELL [*Department of Pharmacology (Preclinical), University of Birmingham Medical School, Birmingham B15 2TJ, U.K.*]

Phosphatidylcholine is found in all the subcellular components of the nervous system; small amounts of choline plasmalogen are also present. Variations in its fatty acid composition in different subcellular components, deriving from a mixture of neuronal and glial cells, are known in some detail (Kishimoto *et al.*, 1969; Sun & Horrocks, 1970). Differences in the fatty acid composition of neuronal and glial cells have also been studied (Fewster & Mead, 1968; Hamberger & Svennerholm, 1971).

Both the concentration of phosphatidylcholine and its fatty acid composition change during the development of the brain. Thus in the rat a maximum rate of deposition occurs during a short period in early life, such that the concentration in the whole brain of a 6-day-old rat is only 60% of that of a