A Variant of \(G_{M1}\)-Gangliosidosis Type 2 and Enzymic Differences between \(G_{M1}\)-Gangliosidosis Types 1 and 2

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\(\beta\)-Galactosidase isoenzyme pattern in three patients with \(G_{M1}\)-gangliosidosis has been studied using Sephadex G-150 column chromatography and electrofocusing procedure.

Case 1. S.H. presented at 7 months with Hurler facies, organomegaly, skeletal X-ray changes and cherry red spots. Case 2. Y.K. presented at 6 months with lumbar beaking, corneal clouding and minimal splenomegaly, but no Hurler features. Case 3. Y.Y. presented at 3 7/12 years with decerebrate rigidity, but no skeletal X-ray changes, organomegaly; development seemed normal until 17 months when she had several generalized seizures. Liver tissue (500 mg) was homogenized in a Teflon homogenizer in an aliquot of distilled water, sonicated for 3 min (Insonator model 200 M, Kubota), and centrifuged at 100,000 \(\times\) g for 60 min. The supernatant obtained was filtered through a column (1.8 \(\times\) 93 cm) of Sephadex G-150 with 0.05 M phosphate buffer, pH 7.0. Electrofocusing was carried out for 24 hr at 600 V in a small column (110 ml capacity, LKB) with a linear sucrose gradient solution (0–50%) containing 1% ampholyte, pH range 3.5 to 5. \(\beta\)-Galactosidase activity was determined with 0.8 mM 4-methylumbelliferyl-\(\beta\)-D-galactopyranoside as substrate in 0.1 M citrate-phosphate buffer containing 50 mM NaCl. Fig. 1 shows the occurrence of three distinctly separable fractions of \(\beta\)-galactosidase activity in the liver tissue from control as described by Ockerman and Hultberg (1968). In all three patients, Fr. II was not detected. Only a very small amount of Fr. I was seen in Case 1. In Case 2, a small amount of Fr. I and a decrease of Fr. III were observed. In Case 3, only Fr. III was detected. When Fr. III being obtained after gel filtration from control and Cases 2 and 3 were studied by electrofocusing, only one peak was recovered as shown in Fig. 2. Furthermore, the isoelectric points for Fr. III from Cases 2 and 3 were found to be 4.5–4.6 which corresponded to that for control. Clinically Case 1 belonged to type 1 and Case 3 belonged to type 2. However, although Case 2 belonged to type 1 as reported by the authors (1973), enzymic findings differ from those of types 1 and 2. Therefore, we would like to propose that Case 2 is a variant of type 2. A full report of Case 2's clinical course and biochemical studies is in preparation. Ho and O'Brien (1971) reported that two types of \(G_{M1}\)-gangliosidosidosis could be defined, based on the assay method described by them. Although this study was done using a different procedure, the results were the same to those reported by Ho and O'Brien (1971).
Fig. 1. Sephadex gel filtration of liver 4-methylumbelliferyl-β-galactosidase activity in GM1 gangliosidosis. β-Galactosidase activity was assayed at pH 5.0. •—•, control; o—o, Case 1; •—•—•, Case 2; ——•, Case 3.

Fig. 2. Electrofocusing of the 4-methylumbelliferyl-β-galactosidase activity in Fr. III obtained after gel filtration of supernatant from liver in GM1-gangliosidosis. •—•, control; •—•—•, Case 2; o—o, Case 3.

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References