

## BRAIN GANGLIOSIDES FROM A PATIENT WITH JAPANESE ENCEPHALITIS

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*Summary.* — The contents and composition of ganglioside (GSD) in the brain from a patient with Japanese encephalitis (JE) was studied. Changes of GSD composition, especially a remarkable increase of monosialo-GSD in the gray and white matters, were observed.

*Key words:* Japanese encephalitis; human brain; ganglioside; sialic acid; thin layer chromatography

### Introduction

GSD is a major component of neural membranes and is thought to be concerned with various neuronal functions (Norton *et al.*, 1975; Fishman and Brady, 1976). There have been several reports in which the changes of GSD composition in the brains from patients with encephalitis caused by viral infections such as herpes, measles and parainfluenza, or by the transmissible agent of kuru and Creutzfeldt-Jacob disease had been described (Norton *et al.*, 1966; Yu *et al.*, 1974, 1978; Fujiwara *et al.*, 1980). In the present report, we analyse the composition of GSD in the brain from a patient with JE.

### Materials and Methods

Brain was collected from a patient (male, 76 years old), who died 24 days after onset of illness. The patient was diagnosed as JE with increase of serum CF antibody titer. Control brain was coming from an old man who died showing no neurological disease.

Each sample was separated into gray and white matters. Total lipids were extracted by the Folch's method (Folch-Pi *et al.*, 1957). The ratios of cholesterol ester to cholesterol were analysed with thin layer chromatography. Isolation and purification of GSD from total lipids were carried out by the method of Ledeen *et al.* (1973). Distribution of GSD was determined by scanning the plates with densitometer after spraying the resorcinol-HCl reagent (Svennerholm, 1957) and heating the plates for 30 °C (Ando *et al.*, 1978). The contents of lipid-bound sialic acid (i.e. GSD) were determined by the method of Svennerholm using N-acetyl neuraminic acid (NANA) as a standard (Svennerholm, 1957).

### Results

The results of the present analysis are shown in Table 1. Water contents of the gray and white matters from the brain of the patient were similar to those of control. There were no significant differences in total lipids and GSD

**Table 1.** The contents and composition of gangliosides in the brain from a patient with Japanese encephalitis

Determination	Cerebrum					
	Gray matter			White matter		
	JE-I#	JE-II#	Control#	JE-I#	JE-II#	Control#
Water content*	85	86	86	75	74	78
Lipid content**	37	43	41	65	54	64
Ganglioside NANA***	585	1041	812	85	146	70
Distribution of gangliosides****						
G <sub>M3</sub>	10	8	1	34	21	8
G <sub>M2</sub>	3	3	0	17	20	+
G <sub>M1</sub>	22	24	15	16	18	36
G <sub>D3</sub>	8	6	3	7	12	5
G <sub>D1a</sub>	23	29	29	7	12	26
G <sub>D2</sub>	2	3	6	8	5	+
G <sub>D1b</sub>	18	15	25	7	7	16
G <sub>T1b</sub>	15	12	23	3	5	9
G <sub>Q</sub>	+	+	+	+	+	+
G <sub>M2</sub> + G <sub>M3</sub>	13	11	1	51	41	8

\*: % of tissue wet weight. \*\*: % of tissue dry weight. \*\*\*: NANA microgram/100 mg of tissue dry weight. \*\*\*\*: Gangliosides were named according to the nomenclatural system of Svennerholm (1963). #: JE-I = parieto-occipital area. JE-II = inferior area. Control = frontal area.

contents between JE samples and the control. The changes of lipid composition in the gray matter were the increase in the contents of cholesterol ester (cholesterol ester/cholesterol in JE-I, 0.19; JE-II, 0.42; control, 0.04) and the increase in lysolecithin. The quantitative distribution of the individual GSD species was included in Table 1. Remarkable increases of G<sub>M3</sub> and G<sub>M2</sub> were observed both in the gray and white matters, but G<sub>M1</sub> in the white matter decreased. Disialo-GSD in the gray matter generally decreased. In contrast, as for white matter, increases G<sub>D2</sub> and G<sub>D3</sub> were observed, but G<sub>D1a</sub> and G<sub>D1b</sub> decreased. Decreases of trisialo-GSD were observed both in the gray and white matters.

### Discussion

These results suggest that the changes of GSD composition in the brain from the patient with JE may be resulted from the alteration of the activity of beta-galactosidase or sialyl-transferase. However, we examined only one patient, therefore, further cases have to be studied to confirm these changes of GSD composition caused by JE virus infection. In addition, experimental analysis using experimental animals is necessary to clarify the influence of JE virus infection on GSD metabolism.

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