DIFFERENCES IN SPHINGOSINE AND FATTY ACID PATTERNS OF THE MAJOR GANGLIOSIDES OF BOVINE RETINA

M. HOLM and J.-E. MÅNSSON
Department of Neurochemistry, Psychiatric Research Centre, University of Göteborg, Göteborg, Sweden

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1. Introduction

The major ganglioside of mammalian retina is G_{D3} [1,2]. This is in contrast to other tissues of the central nervous system, in which G_{D3} constitutes only minor fractions. Furthermore, the retinal G_{D3} was found to have a fatty acid pattern different from the other major retinal gangliosides G_{D1a}, G_{D1b} and G_{T1}, typical gangliosides of nervous tissues [2]. These findings may implicate that the G_{D3} in retina has a cellular or subcellular localization which is different from that of the other gangliosides. In this study of the gangliosides of bovine retina d18:1 sphingosine constituted more than 90% of the sphingosines in G_{D3}, while a pooled sample of G_{D1a}, G_{D1b} and G_{T1} contained d18:1 and d20:1 sphingosines in approximately equal amounts.

2. Experimental

Twenty-five bovine eye bulbs were frozen immediately after slaughter. The retinae were taken out after thawing the bulbs. Total lipids were extracted with chloroform–methanol 1 : 1 (v/v) and the gangliosides were isolated as previously described [2]. The G_{D3} was isolated in one batch and the G_{D1a}, G_{D1b} and G_{T1} together in another batch. The fatty acid and sphingosine patterns of the two samples were analysed by GLC according to Vanier et al. [3].

3. Results

The fatty acid and sphingosine patterns of G_{D3} and of the pooled sample of G_{D1a}, G_{D1b} and G_{T1} are presented in table 1. The predominant fatty acid was 18:0 in both samples, but G_{D3} contained less of 18:0 and more of C_{20} and C_{22-24} than the other gangliosides. A much greater difference between the two samples was recorded in the sphingosine patterns. The pooled sample of G_{D1a}, G_{D1b} and G_{T1} contained d18:1 and d20:1 in approximately equal amounts while d18:1 constituted more than 90% of the sphingosine pattern of G_{D3}.

4. Discussion

Differences in fatty acid patterns of individual gangliosides from nervous tissues are reported with an increasing frequency [2–7]. According to Holm et al. [2] and Vanier et al. [3] the reported differences might be explained by a possible existence of separate sites for the biosynthesis of the individual gangliosides. This explanation was further supported by the analysis of the sphingosine patterns of the different cerebral gangliosides [3]. Thus those gangliosides which had different fatty acid patterns also differed in the sphingosine patterns.

The most significant differences in fatty acid patterns were previously obtained between G_{D3} and

Table 1
Fatty acid and sphingosine patterns of bovine retinal gangliosides, mol-%.

Fatty acids	G_{D3}	$G_{D1a}+G_{D1b}+G_{T1}$	Sphingosines	G_{D3}	$G_{D1a}+G_{D1b}+G_{T1}$
18:0	64	75	d18:0	4	2
18:1	1	1	d18:1	91	55
20:0	14	12	d20:0	0	2
22–24	16	10	d20:1	5	41

G_{D1a} in mammalian retina [2]. The same differences were obtained in this study of G_{D3} and a pooled sample of G_{D1a}, G_{D1b} and G_{T1} from bovine retinae. Furthermore, between these ganglioside samples we found a difference in the sphingosine patterns to an extent never reported before. The results strongly indicate that the subcellular or cellular localization of the retinal G_{D3} should be different from that of the retinal G_{D1a}, G_{D1b} and G_{T1}.

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