Sphingolipids at a glance

A sphingoid base defines the family. Ceramide adds an amide-linked fatty acyl group; substitutions at C1 distinguish many complex classes.

Class	Head group	Example	Where found	Selected storage disorder
Ceramide	Free C1 hydroxyl	Cer(d18:1/16:0)	Membranes; specialized skin-barrier ceramides	Farber disease
Sphingomyelin	Usually phosphocholine	SM(d18:1/16:0)	Animal plasma membranes; myelin	Acid sphingomyelinase deficiency
Cerebrosides	One hexose	Glucosylceramide; galactosylceramide	Cell membranes; galactosylceramide in myelin	Gaucher; Krabbe
Globosides	Neutral oligosaccharide	Gb3	Cell surfaces in multiple tissues	Fabry disease
Gangliosides	Sialylated glycan	GM1; GM2; GM3	Cell surfaces; prominent in nervous tissue	GM1 gangliosidosis; Tay-Sachs; Sandhoff
Sulfatides	Sulfated sugar	3-O-sulfogalactosylceramide	Myelin and other tissues	Metachromatic leukodystrophy
Sphingoid bases	No complex head group	Sphingosine; sphinganine	Intermediates in synthesis and turnover	Varies with the affected pathway

Read the associations carefully. Cerebrosides, globosides, gangliosides, and sulfatides are glycosphingolipid groups. Each named disorder affects particular substrates, not every species in a class. Sulfatide charge comes from sulfate; ganglioside charge includes sialic acid.

Key distinction: Sphingomyelin is both a sphingolipid and a phospholipid. Most familiar glycerophospholipids instead have a glycerol backbone.

Sources: Berg et al., Biochemistry, 5th ed., chapters 12 and 26; Schnaar et al., Essentials of Glycobiology, 4th ed., chapter 11; Hannun & Obeid, Nature Reviews Molecular Cell Biology (2018), doi:10.1038/nrm.2017.107; GeneReviews: Sandhoff Disease and GLB1-Related Disorders. Full linked references: sphingolipid.com.

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