Lipid

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Introduction to Lipid

- ลักษณะทั่วไปของลิพิด (lipid)

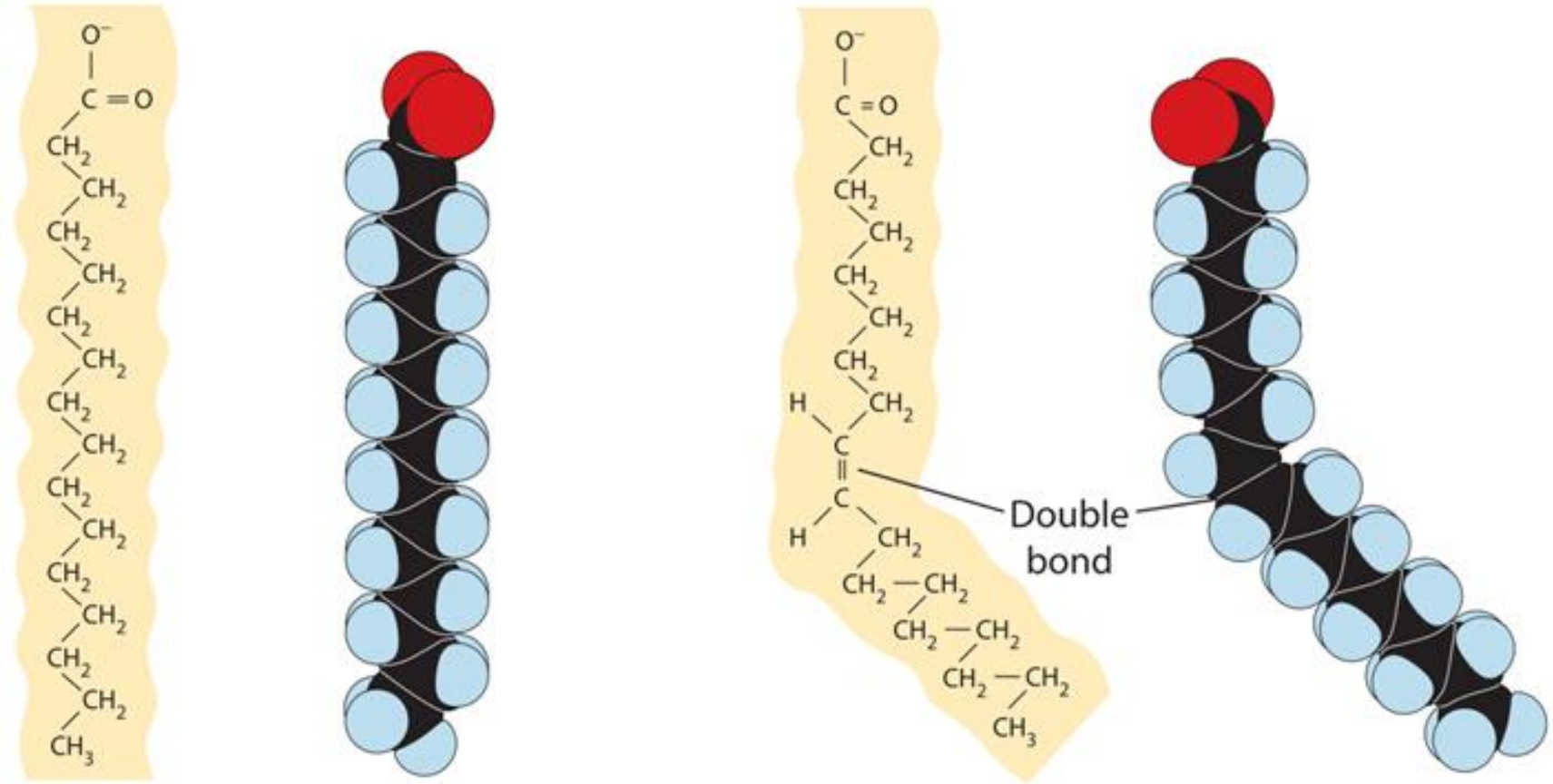
Fatty Acids

- กรดไขมัน (fatty acid)

Fatty Acids

- ประเภทของกรดไขมัน (types of fatty acid)

Fatty Acids



(a) Palmitate (saturated)

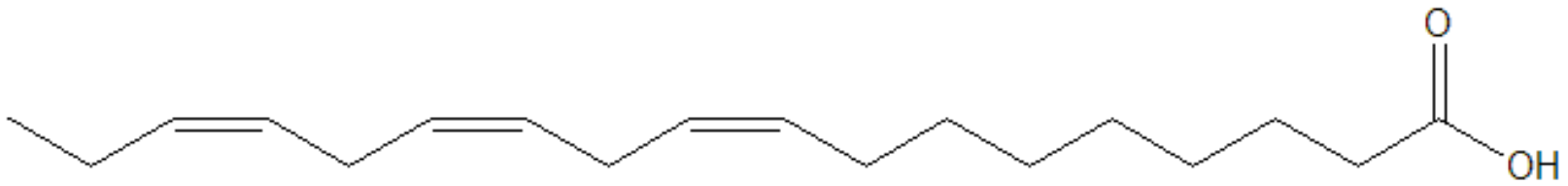
(b) Oleate (unsaturated)

Fatty Acids

- การเรียกชื่อกรดไขมัน (fatty acid nomenclature)

Fatty Acids

- กรดไขมันชนิด α-linolenic acid (ALA) มีสูตรโครงสร้างดังต่อไปนี้



  - ระบุชื่อ IUPAC ของกรดไขมันชนิดนี้และเขียนโครงสร้างแบบย่อ (Δ-system)
  - กรดไขมันชนิดนี้จัดเป็น ω-3 หรือ ω -6 เพราะเหตุใด
  - จุดหลอมเหลวของกรดไขมัน ALA เทียบกับ stearic acid เป็นอย่างไร เพราะเหตุใด

Fatty Acids

TABLE 9-1 The Common Biological Fatty Acids

Symbol[a]	Common Name	Systematic Name	Structure	mp (°C)
Saturated fatty acids				
12:0	Lauric acid	Dodecanoic acid	$CH_3(CH_2)_{10}COOH$	44.2
14:0	Myristic acid	Tetradecanoic acid	$CH_3(CH_2)_{12}COOH$	53.9
16:0	Palmitic acid	Hexadecanoic acid	$CH_3(CH_2)_{14}COOH$	63.1
18:0	Stearic acid	Octadecanoic acid	$CH_3(CH_2)_{16}COOH$	69.6
20:0	Arachidic acid	Eicosanoic acid	$CH_3(CH_2)_{18}COOH$	77
22:0	Behenic acid	Docosanoic acid	$CH_3(CH_2)_{20}COOH$	81.5
24:0	Lignoceric acid	Tetracosanoic acid	$CH_3(CH_2)_{22}COOH$	88
Unsaturated fatty acids (all double bonds are cis)				
16:1*n*–7	Palmitoleic acid	9-Hexadecanoic acid	$CH_3(CH_2)_5CH{=}CH(CH_2)_7COOH$	−0.5
18:1*n*–9	Oleic acid	9-Octadecanoic acid	$CH_3(CH_2)_7CH{=}CH(CH_2)_7COOH$	12
18:2*n*–6	Linoleic acid	9,12-Octadecadienoic acid	$CH_3(CH_2)_4(CH{=}CHCH_2)_2(CH_2)_6COOH$	−5
18:3*n*–3	α-Linolenic acid	9,12,15-Octadecatrienoic acid	$CH_3CH_2(CH{=}CHCH_2)_3(CH_2)_6COOH$	−11
18:3*n*–6	γ-Linolenic acid	6,9,12-Octadecatrienoic acid	$CH_3(CH_2)_4(CH{=}CHCH_2)_3(CH_2)_3COOH$	−11
20:4*n*–6	Arachidonic acid	5,8,11,14-Eicosatetraenoic acid	$CH_3(CH_2)_4(CH{=}CHCH_2)_4(CH_2)_2COOH$	−49.5
20:5*n*–3	EPA	5,8,11,14,17-Eicosapentaenoic acid	$CH_3CH_2(CH{=}CHCH_2)_5(CH_2)_2COOH$	−54
22:6*n*–3	DHA	4,7,10,13,16,19-Docosohexenoic acid	$CH_3CH_2(CH{=}CHCH_2)_6CH_2COOH$	−44
24:1*n*–9	Nervonic acid	15-Tetracosenoic acid	$CH_3(CH_2)_7CH{=}CH(CH_2)_{13}COOH$	39

[a]Number of carbon atoms: Number of double bonds. For unsaturated fatty acids, the quantity "*n*–*x*" indicates the position of the last double bond in the fatty acid, where *n* is its number of C atoms, and *x* is the position of the last double-bonded C atom counting from the methyl-terminal (ω) end.
Source: LipidBank (http://www.lipidbank.jp).

? **How do chain length and the presence of double bonds affect the melting point?**

Triacylglycerols

- ลักษณะและโครงสร้างของ triacylglycerol: TAG (1)

Triacylglycerols

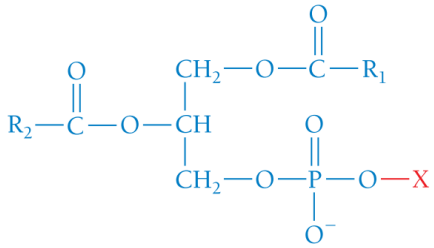
- ลักษณะและโครงสร้างของ triacylglycerol: TAG (2)

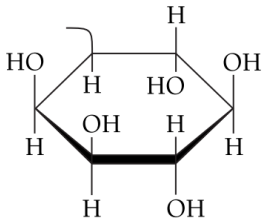
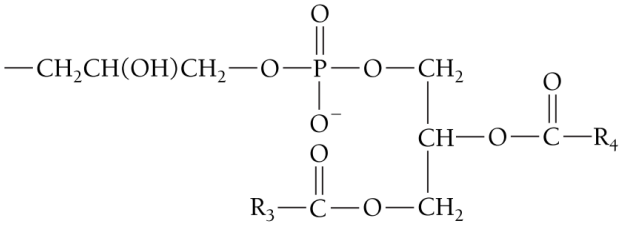
Glycerophospholipid

- ลักษณะและโครงสร้างของ glycerophospholipid

Glycerophospholipid

TABLE 9-2 The Common Classes of Glycerophospholipids

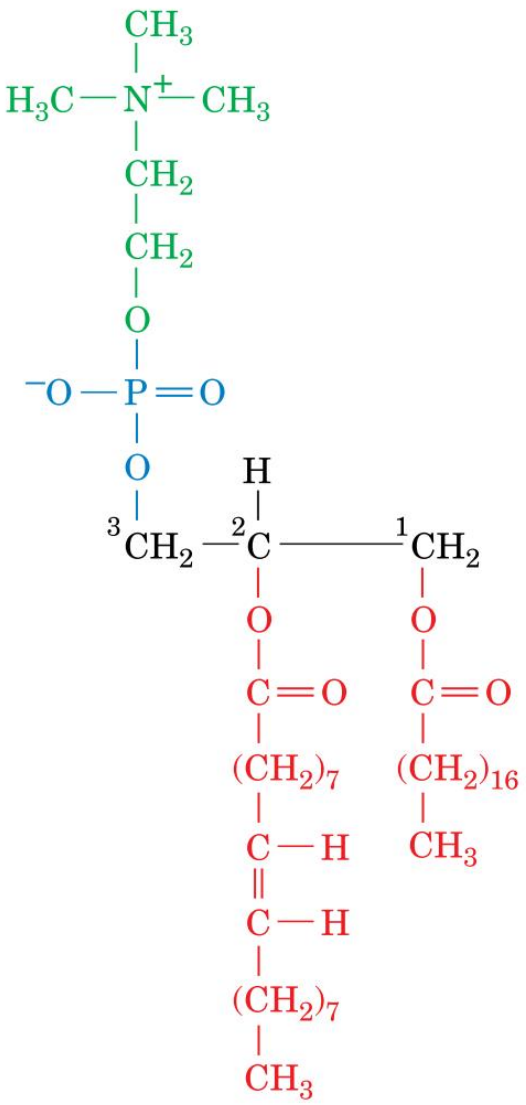


Name of X—OH	Formula of —X	Name of Phospholipid
Water	—H	Phosphatidic acid
Ethanolamine	$-CH_2CH_2NH_3^+$	Phosphatidylethanolamine
Choline	$-CH_2CH_2N(CH_3)_3^+$	Phosphatidylcholine (lecithin)
Serine	$-CH_2CH(NH_3^+)COO^-$	Phosphatidylserine
myo-Inositol		Phosphatidylinositol
Glycerol	$-CH_2CH(OH)CH_2OH$	Phosphatidylglycerol
Phosphatidylglycerol		Diphosphatidylglycerol (cardiolipin)

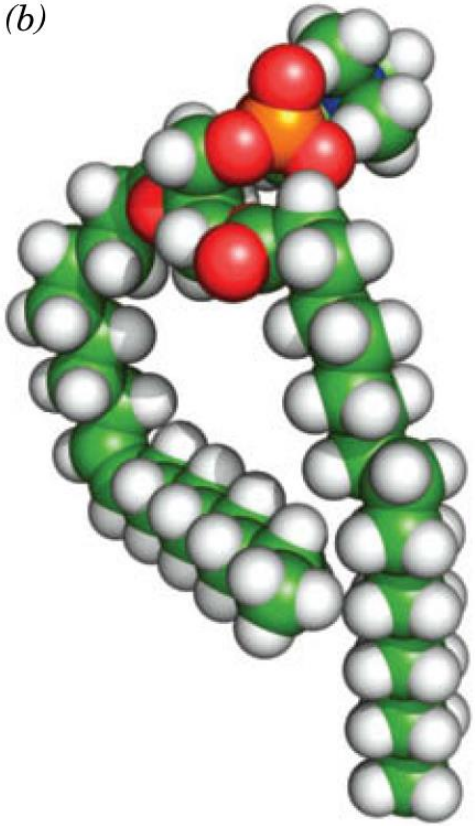
? **Identify the functional groups in the glycerophospholipids.**

Glycerophospholipid

(a)



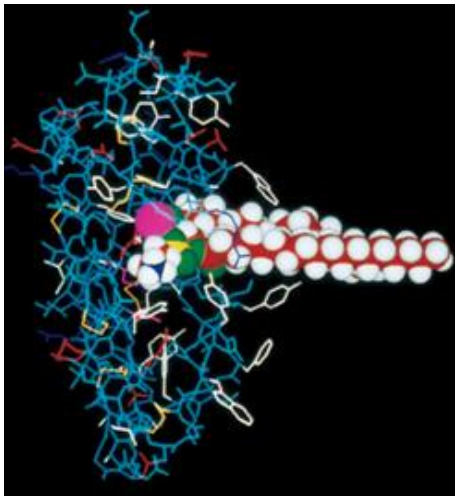
(b)

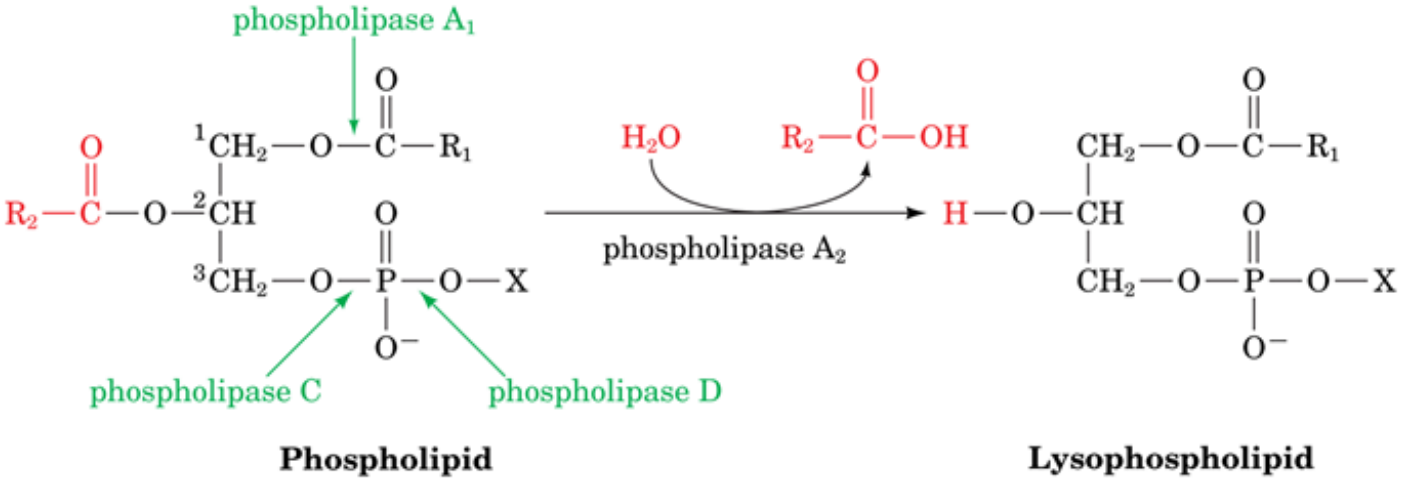


1-Stearoyl-2-oleoyl-3-phosphatidylcholine

Glycerophospholipid

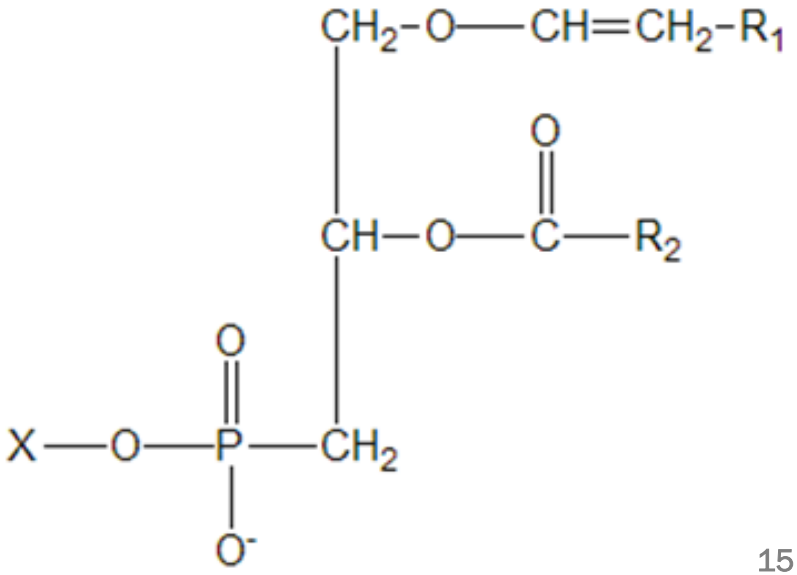
- Phospholipase





Glycerophospholipid

- Plasmalogen



Sphingolipid

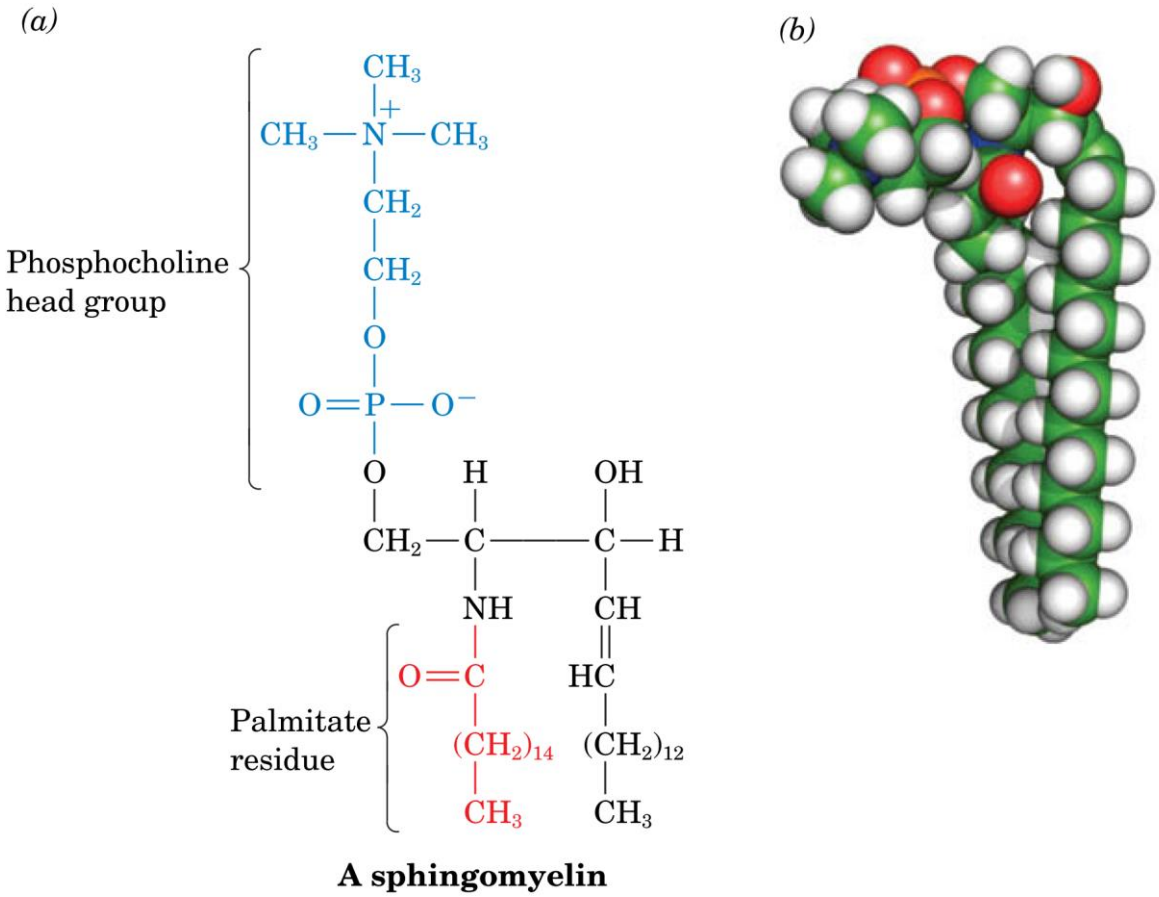
- ลักษณะทั่วไปของ sphingolipid

Sphingolipid

- Sphingomyelin

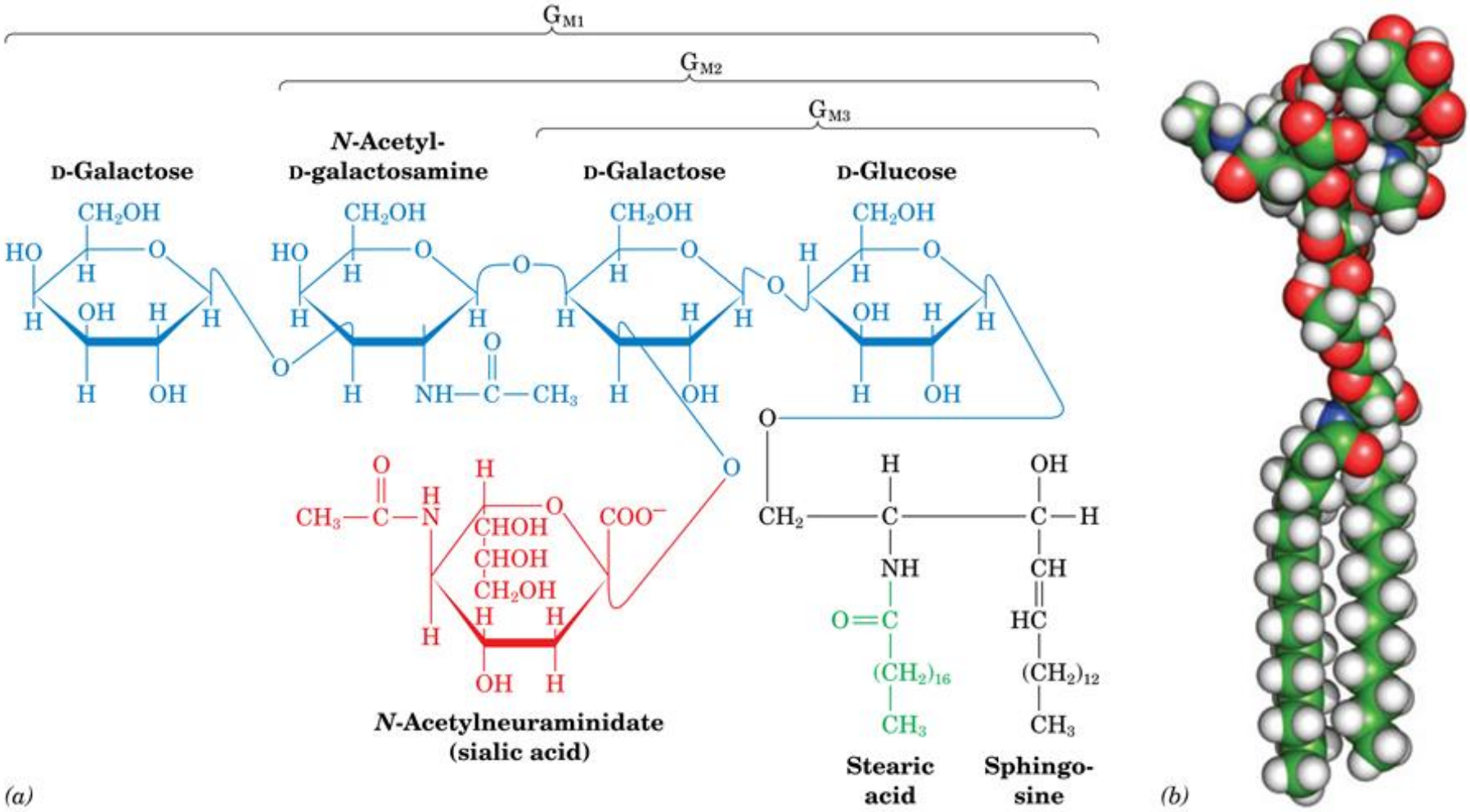
Sphingolipid

- Sphingomyelin



Sphingolipid

- Cerebroside

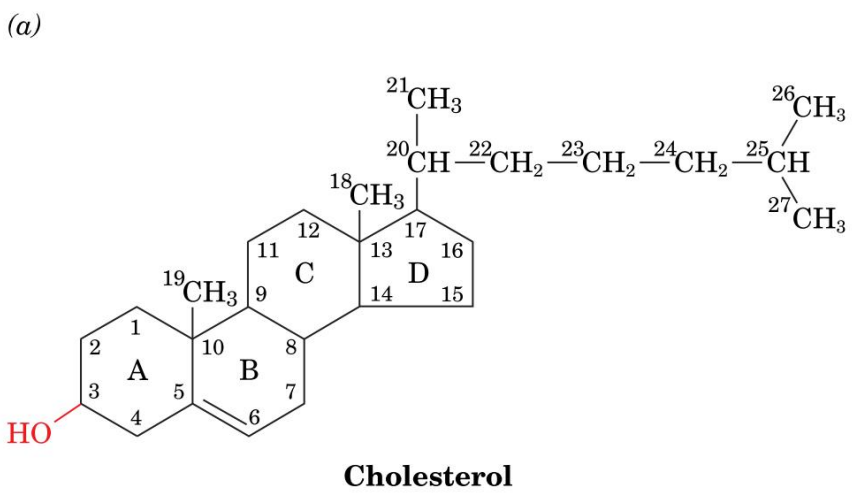


Steroid

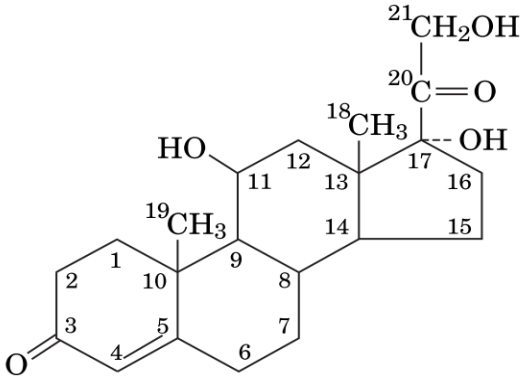
- ลักษณะทั่วไปของ sphingolipid

Steroid

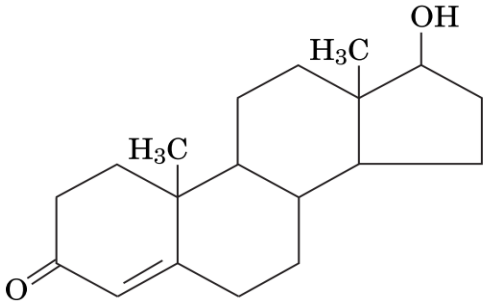
- Cholesterol and cholesteryl ester



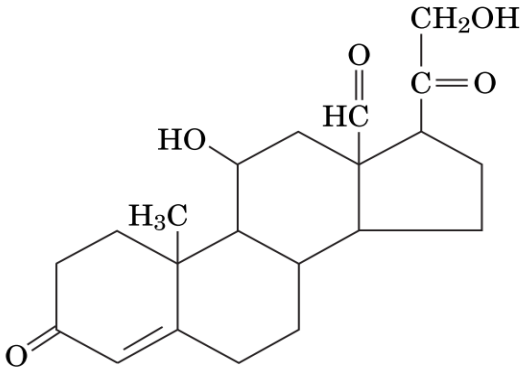
Steroid



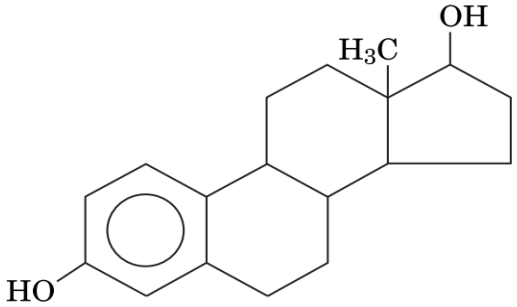
Cortisol (hydrocortisone)
(a glucocorticoid)



Testosterone
(an androgen)



Aldosterone
(a mineralocorticoid)



β-Estradiol
(an estrogen)

Other Lipids

- ลิพิดชนิดอื่นที่เกี่ยวกับเมแทบอลิซึม (1)

Other Lipids

- ลิพิดชนิดอื่นที่เกี่ยวกับเมแทบอลิซึม (2)