D.PHARM • SECOND YEAR

जैव रसायन एवं नैदानिक विकृति विज्ञान

अध्याय 4

लिपिड

हिंदी अध्याय नोट्स



DIPLOMA IN PHARMACY

LIPIDS: DEFINITION & FUNCTIONS

DEFINITION

Lipids naturally occurring organic compounds का diverse group हैं। ये water में insoluble, पर chloroform, ether और benzene जैसे organic solvents में soluble होते हैं।



COMPOSITION

मुख्यत: carbon, hydrogen और oxygen; कुछ lipids में phosphorus, nitrogen या sulfur भी होता है।

MAIN FUNCTIONS

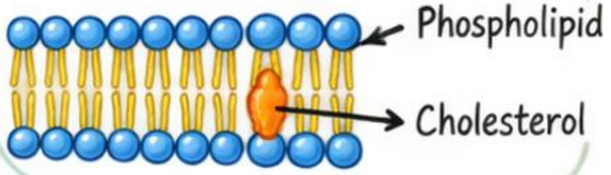
1 Energy reserve

9 kcal/g।



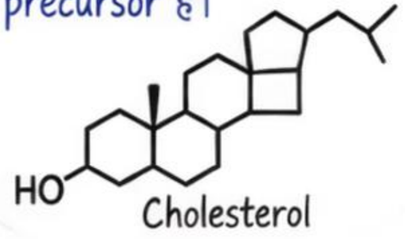
2 Cell membranes

phospholipids और cholesterol।



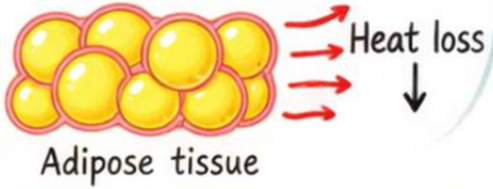
3 Hormone formation

cholesterol steroid-hormone precursor हैं।



4 Insulation और protection

adipose tissue heat loss बदाता और organs को cushion करता हैं।



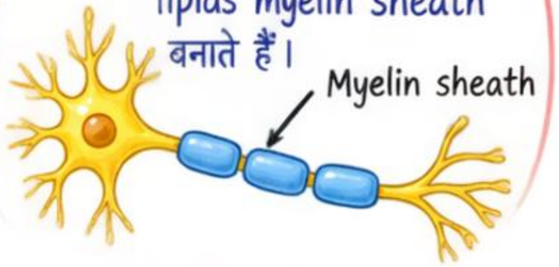
5 Vitamin absorption

vitamins A, D, E और K को carry करता हैं।

A D E K

6 Nerve function

lipids myelin sheath बनाते हैं।



KEY IDEA

Lipids hydrophobic या amphipathic molecules हैं, जिनके structural, storage और signalling roles हैं।

CLASSIFICATION OF LIPIDS

SIMPLE LIPIDS

Fatty acids और alcohols के esters।

- Fats और oils: fatty acids + glycerol — tripalmitin, triolein।


Oils


Fats


Beeswax

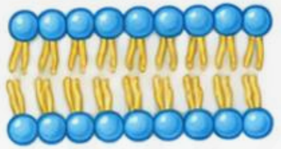
- Waxes: long-chain fatty acid + long-chain alcohol — beeswax में myricyl palmitate।

LIPIDS

COMPOUND / COMPLEX LIPIDS

Fatty acids और alcohol के साथ एक अतिरिक्त group।

- Phospholipids — phosphate; lecithin, cephalin।
- Glycolipids — carbohydrate; cerebrosides, gangliosides।
- Lipoproteins — protein; HDL, LDL।


Phospholipids (in cell membrane)


Glycolipids (in brain)

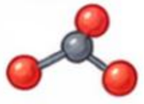

Lipoproteins (HDL, LDL)

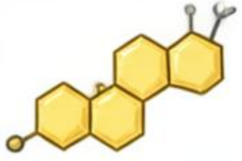
DERIVED LIPIDS

Simple और complex lipids से derived products या components।

Fatty acids, glycerol, cholesterol और fat-soluble vitamins।


Fatty acids


Glycerol


Cholesterol



Fat-soluble vitamins

REMEMBER

Simple = fatty acid + alcohol; complex = एक additional fanctional group present।

MISCELLANEOUS LIPIDS

Lipid-like compounds: squalene, carotenoids और hydrocarbons।


Squalene (in olive oil)


Carotenoids (in carrots)


Hydrocarbons (in natural sources)

TRIGLYCERIDES: STRUCTURE & PROPERTIES

DEFINITION

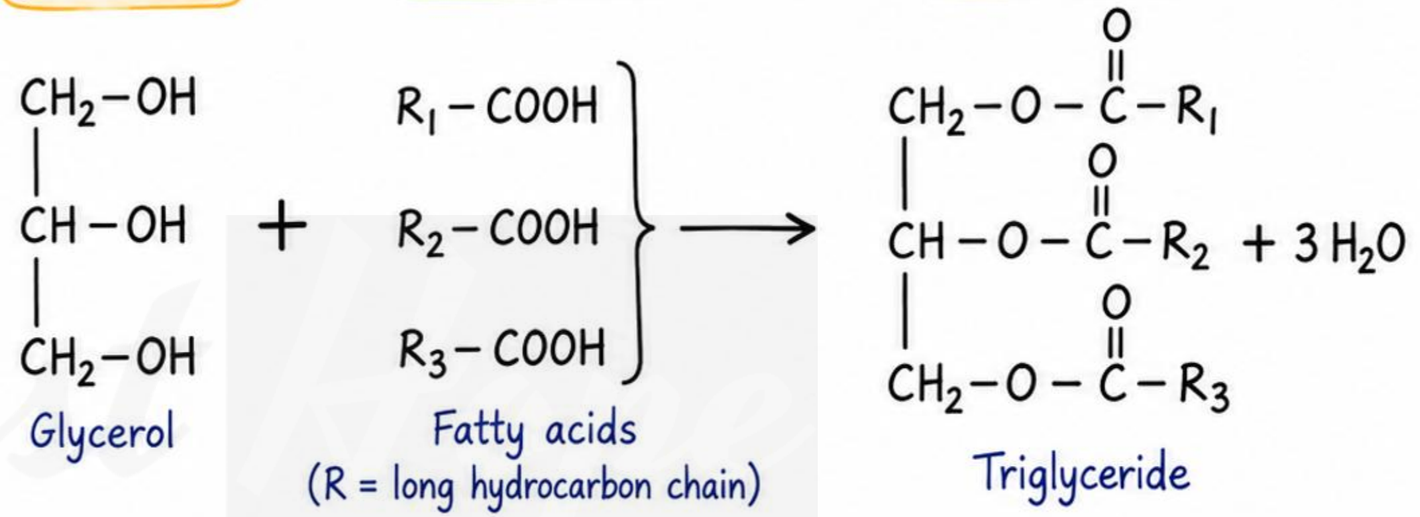
Triglycerides या triacylglycerols, one glycerol और three fatty acids से बने esters हैं।
ये food और body के common storage lipids हैं।

ESTERIFICATION

Glycerol + 3 fatty acids → triglyceride + 3 H_2O

Glycerol का प्रत्येक –OH, fatty acid के –COOH से react करके ester bond, –COO– बनाता हैं।

Glycerol (1 molecule) | 3 Fatty acids (3 molecules) | Triglyceride (1 molecule)

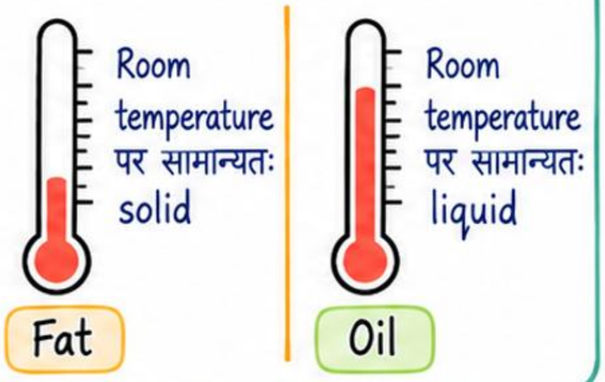


Glycerol | Fatty acids (R = long hydrocarbon chain) | Triglyceride

TYPES

- Simple triglyceride — तीनों fatty acids same।
- Mixed triglyceride — दो या तीन different fatty acids।
- Fat — room temperature पर सामान्यतः solid; saturated fatty acids अधिक।
- Oil — room temperature पर सामान्यतः liquid; unsaturated fatty acids अधिक।

FAT vs OIL



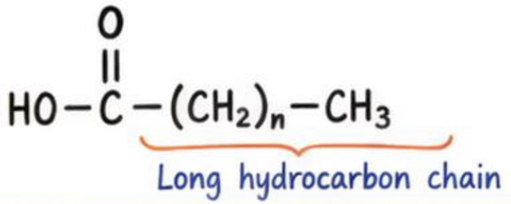
PROPERTIES

- Lipase से hydrolysis पर glycerol और fatty acids।
- NaOH या KOH से saponification पर glycerol और soap।
- Oxidation से rancidity: unpleasant smell और taste।
- Energy value = 9 kcal/g।

SATURATED & UNSATURATED FATTY ACIDS

FATTY ACID

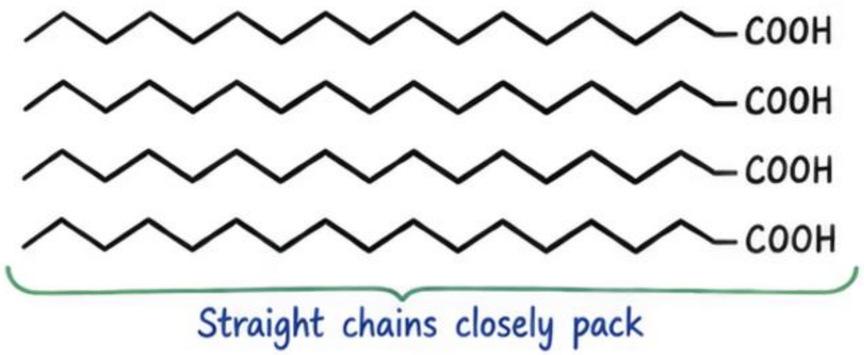
Terminal carboxyl group, –COOH बाला long hydrocarbon chain।
Natural fatty acids में सामान्यत: even number carbon atoms होते हैं।



SATURATED FATTY ACIDS — SFA

- Carbon–carbon double bond नहीं।
- Straight chains closely pack करते हैं।
- Melting point सामान्यत: अधिक; कई room temperature पर solid।
- Animal fats और कुछ tropical oils में common।

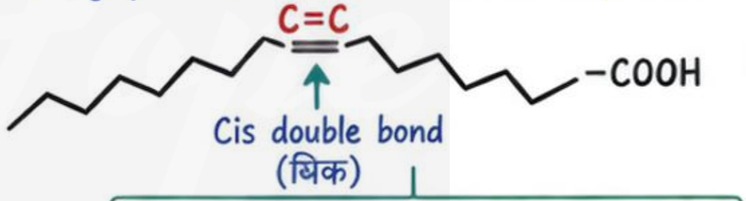
उदाहरण: palmitic acid, $C_{16:0}$; stearic acid, $C_{18:0}$।





UNSATURATED FATTY ACIDS — UFA

- एक या अधिक C=C double bonds।
- Cis double bonds bends बनाते हैं, इसलिए chains कम closely pack करते हैं।
- Melting point सामान्यत: कम; कई liquid oils।



MUFA
one double bond — oleic acid, $C_{18:1}$।

PUFA
two या अधिक double bonds — linoleic acid, α-linolenic acid, arachidonic acid।

Food Sources





KEY POINT Unsaturation की degree melting point और membrane fluidity को प्रभावित करती हैं।

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