

# W W Nawar: Lipids

- “Lipids consist of a broad group of compounds that are generally soluble in organic solvents but only sparingly soluble in water....” “...Glycerol esters of fatty acids, which make up 99% of the lipids of plant and animal origin have traditionally been called fats and oils. This distinction, based solely on whether the material is solid or liquid at room temperature, is of little practical importance and the two terms are often used interchangeably.”

## FAT CONTENTS OF SOME FOODS

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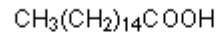
Product	Fat (%)
Asparagus	0.25
Oats	4.4
Barley	1.9
Rice	1.4
Walnut	58
Coconut	34
Peanut	49
Soybean	17
Sunflower	28
Milk	3.5
Butter	80
Cheese	34
Hamburger	30
Beef cuts	10-30
Chicken	7
Ham	31
Cod	0.4
Haddock	0.1
Herring	12.5

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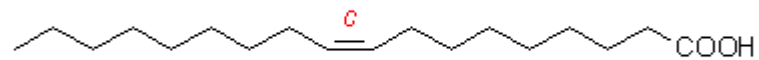
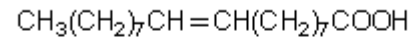
# Fatty Acids

- Straight chain
- Even numbers
- Mainly c12-c20
- Double bonds usually *cis* (note – hydrogenation)
- Polyunsaturated, methylene interrupted, Rarely other functional groups

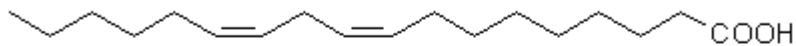
# Λιπαρά οξέα



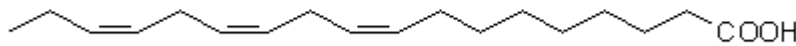
hexadecanoic (palmitic) acid



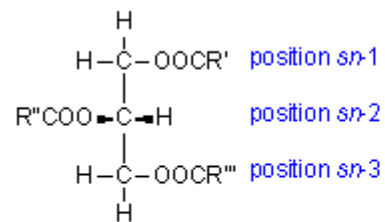
*cis*-9-octadecenoic (oleic) acid



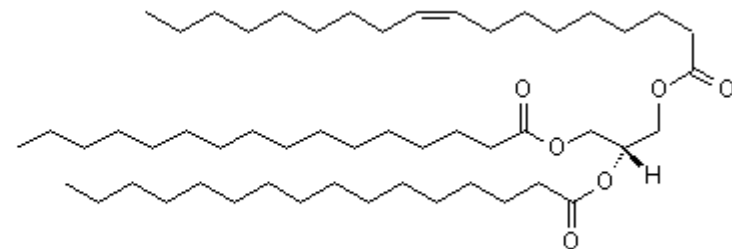
linoleic acid



$\alpha$ -linolenic acid



Fischer projection of a triacyl-*sn*-glycerol



1,2-dihexadecanoyl-3-(9*Z*-octadeceryl)-*sn*-glycerol

# Glycerol esters

- Glycerol (viscous, polar polyol)
- Monoglyceride and Diglyceride (surface active)
- Triglyceride (non polar oil)

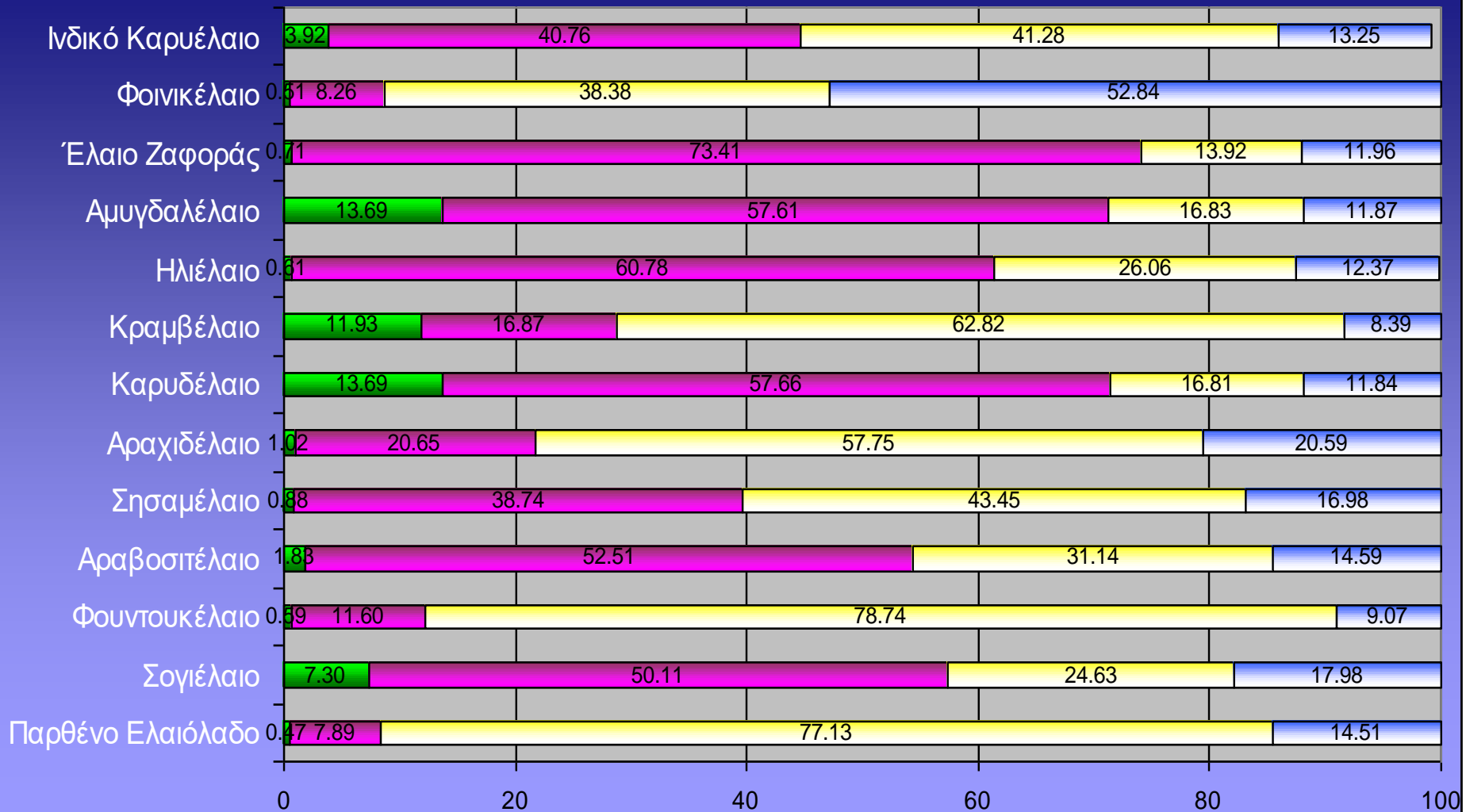
*Most food oils are a very diverse group of triglycerides*

# Lipid Classification

- **Milk fats.** Relatively high proportion of short chain fatty acids
- **Vegetable butters.** Unsaturated, narrow melting range
- **Oleic-Linoleic.** Most vegetable oils,
- **Linolenic.** Soybean oil
- **Animal fats.** Long chain fatty acids
- **Marine oils.** Long chain PUFAs (up to 6 unsaturations)

# Λιπιδική σύσταση εδώδιμων ελαίων

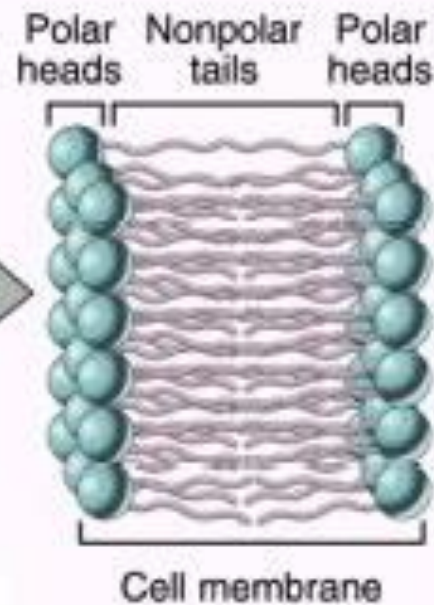
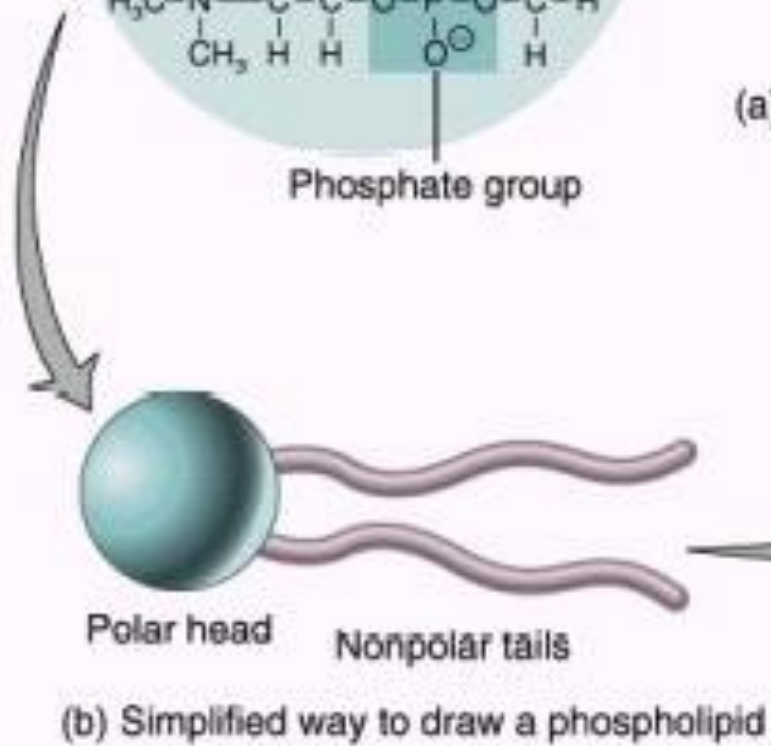
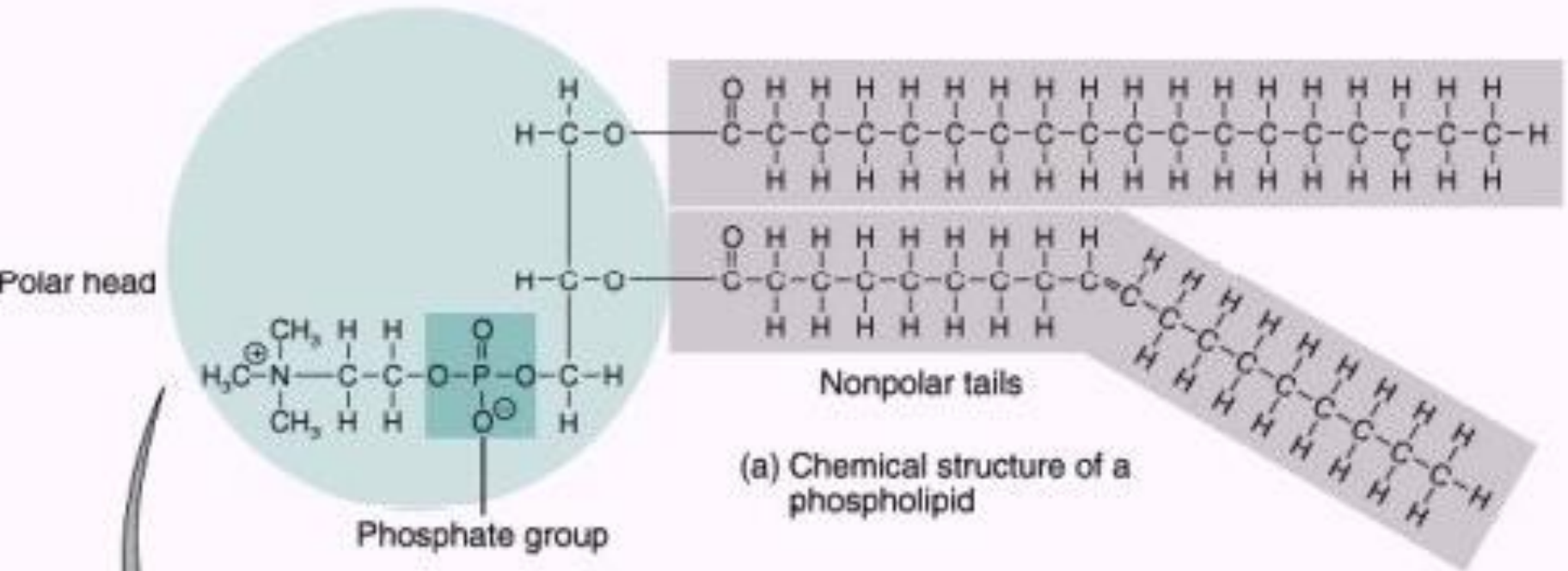
■ Λινολενικό οξύ 
 ■ Λινελαϊκό οξύ 
 ■ Ελαϊκό οξύ 
 ■ Κορεσμένα οξέα



**TABLE 4** Positional Distribution of Individual Fatty Acids in Triacylglycerols of Some Natural Fats

Source	Position	Fatty acid (mol%)														
		4:0	6:0	8:0	10:0	12:0	14:0	16:0	18:0	18:1	18:2	18:3	20:0	20:1	22:0	24:0
Cow's milk	1	5	3	1	3	3	11	36	15	21	1					
	2	3	5	2	6	6	20	33	6	14	3					
	3	43	11	2	4	3	7	10	4	15	0.5					
Coconut	1		1	4	4	39	29	16	3	4						
	2		0.3	2	5	78	8	1	0.5	3	2					
	3		3	32	13	38	8	1	0.5	3	2					
Cocoa butter	1							34	50	12	1					
	2							2	2	87	9					
	3							37	53	9						
Com	1							18	3	28	50					
	2							2		27	70					
	3							14	31	52	1					
Soybean	1							14	6	23	48	9				
	2							1		22	70	7				
	3							13	6	28	45	8				
Olive	1							13	3	72	10	0.6				
	2							1		83	14	0.8				
	3							17	4	74	5	1				
Peanut	1							14	5	59	19		1	1		1
	2							2		59	39					0.5
	3							11	5	57	10		4	3	6	3
Beef (depot)	1						4	41	17	20	4	1				
	2						9	17	9	41	5	1				
	3						1	22	24	37	5	1				
Pig (outer back)	1						1	10	30	51	6					
	2						4	72	2	13	3					
	3								7	73	18					

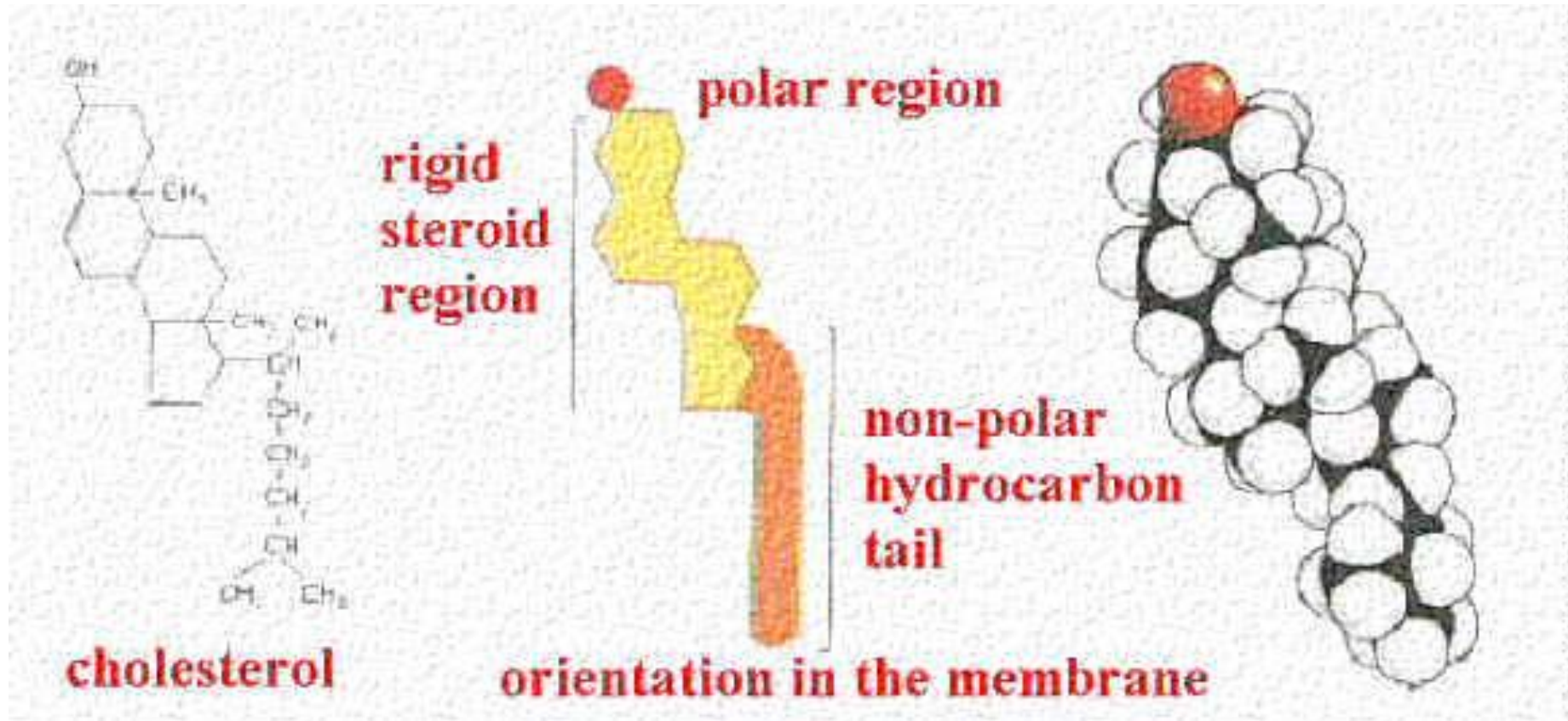
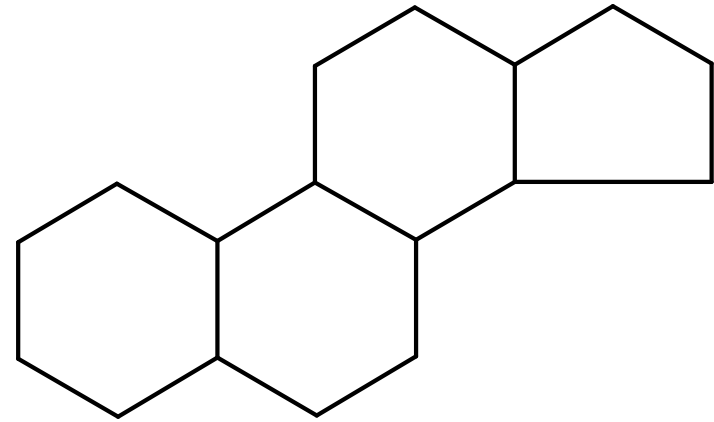




(c) Arrangement of phospholipids in a portion of a cell membrane

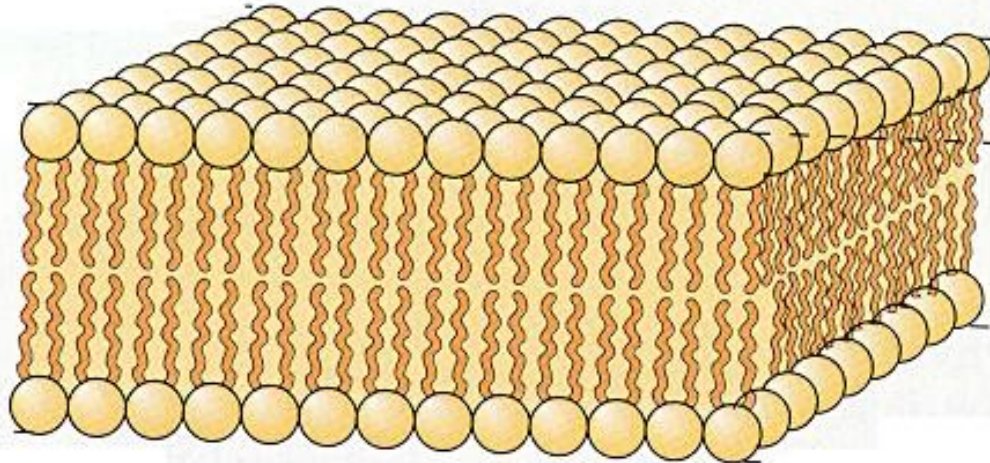
Amphiphilic

# Cholesterol

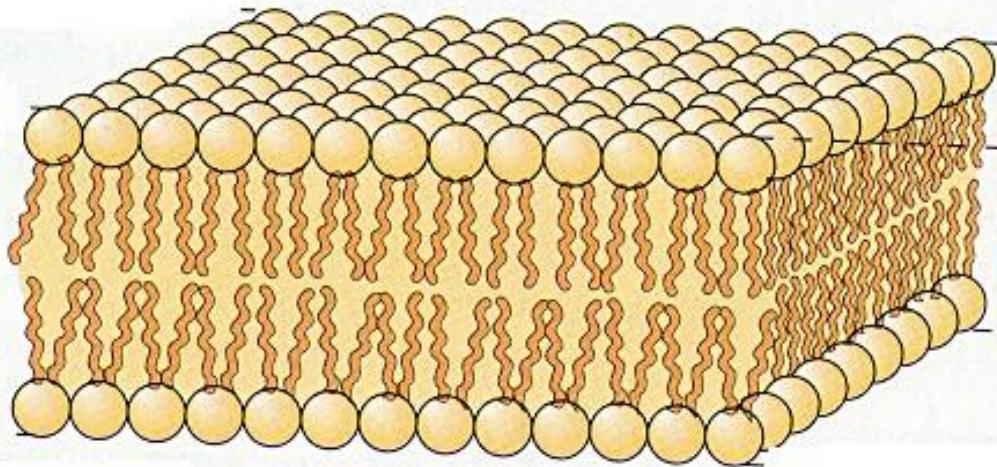


**gel phase--low temperatures**

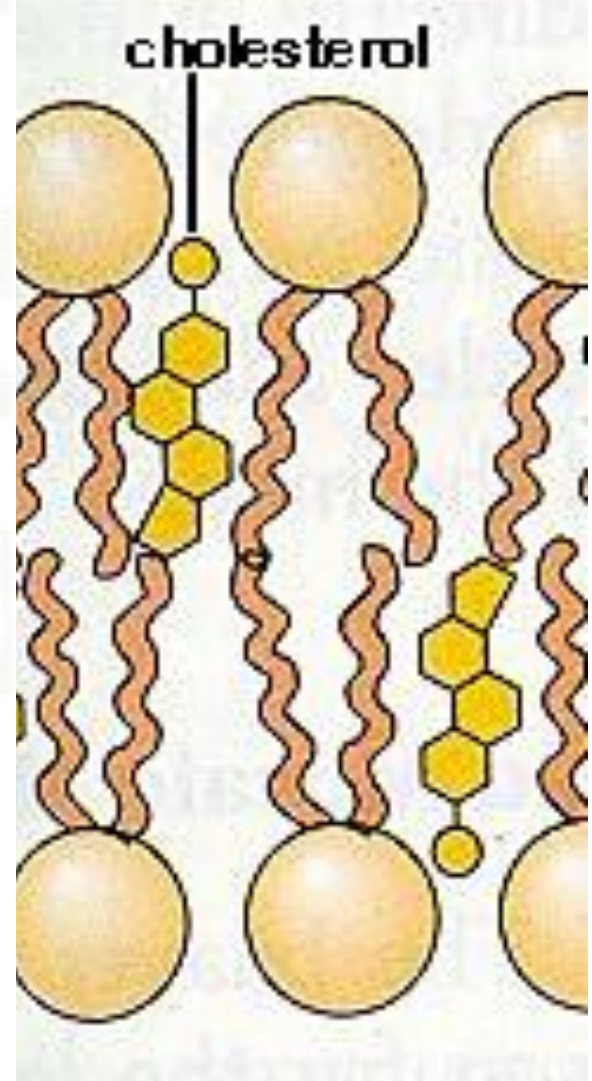
**hydrocarbons are tightly packed**



**at higher temperatures--moves to fluid phase**



**bilayer "melts", movement is allowed**



# Frito Lay's

- Potatoes
- Corn and/or cottonseed oil
- Sea salt



28g serving contains 8g of fat (2.5g saturated fat)

# Beef Jerky

- Beef
- Corn syrup solids
- Hydrolyzed corn and soy protein
- Salt
- Smoke flavor
- Flavorings
- Water
- Vinegar
- Sugar
- Molasses
- (Sodium erythorbate)
- Caramel color
- Citric acid
- (Sodium nitrite)



28g serving contains 1g of fat (0g saturated fat)

# Oven Baked Combos Snacks

## COMBOS® SNACKS NACHO CHEESE PRETZEL:

1.80 oz Single Bag

### Nutrition Facts

Serving Size 1 bag

Calories 240

Fat Calories 80

\*\* Percent Daily Values (DV) are based on a 2,000 calorie diet.

Amount/Serving	%DV**	Amount/Serving	%DV**
<b>Total Fat</b> 8g	<b>12%</b>	<b>Total Carb.</b> 34g	<b>11%</b>
Saturated Fat 2g	10%	Fiber 1g	4%
<b>Cholesterol</b> 0mg	<b>0%</b>	<b>Sugars</b> 8g	
<b>Sodium</b> 580mg	<b>24%</b>	<b>Protein</b> 5g	
<b>Vitamin A *</b> • <b>Vitamin C *</b> • <b>Calcium 8 %</b> • <b>Iron 2%</b>			
* Contains less than 2 percent of the Daily Value of these nutrients.			



**INGREDIENTS: FLOUR, WHEY, PARTIALLY HYDROGENATED VEGETABLE OIL (SOYBEAN AND COTTONSEED), FOOD STARCH-MODIFIED, SALT, CHEESE BLEND (ROMANO, CHEDDAR AND PARMESAN [MILK, CHEESE CULTURES, SALT, ENZYMES]), CORN FLOUR, LEAVENING (SODIUM BICARBONATE, SODIUM ACID PYROPHOSPHATE), DEXTROSE, LESS THAN 0.5% - CULTURED NONFAT MILK, CORN SYRUP, PAPRIKA, SOY LECITHIN, NONFAT MILK, TOMATO, NATURAL FLAVOR, AUTOLYZED YEAST EXTRACT, CITRIC ACID, GARLIC, HYDROLYZED WHEAT AND CORN PROTEIN, LACTIC ACID, MALTODEXTRIN, ONION, SPICES, TORULA YEAST, COLORING (YELLOW 6 LAKE), SPICE EXTRACT.**