Triacylglycerol Biosynthesis

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- **Biosynthesis Triacylglyserol is a metabolic process that very active in animal**

- **In human there is only several hundred of glycogen that can storage in liver and muscle**

Tricylglycerol Biosynthesis

- If we consume carbohydrate in hyper amount, that our body can store the glycogen, so the carbohydrate will be change to triacylglyserol and storage in large amount as fat cell in several different part of our body as specially in under skin and stomach

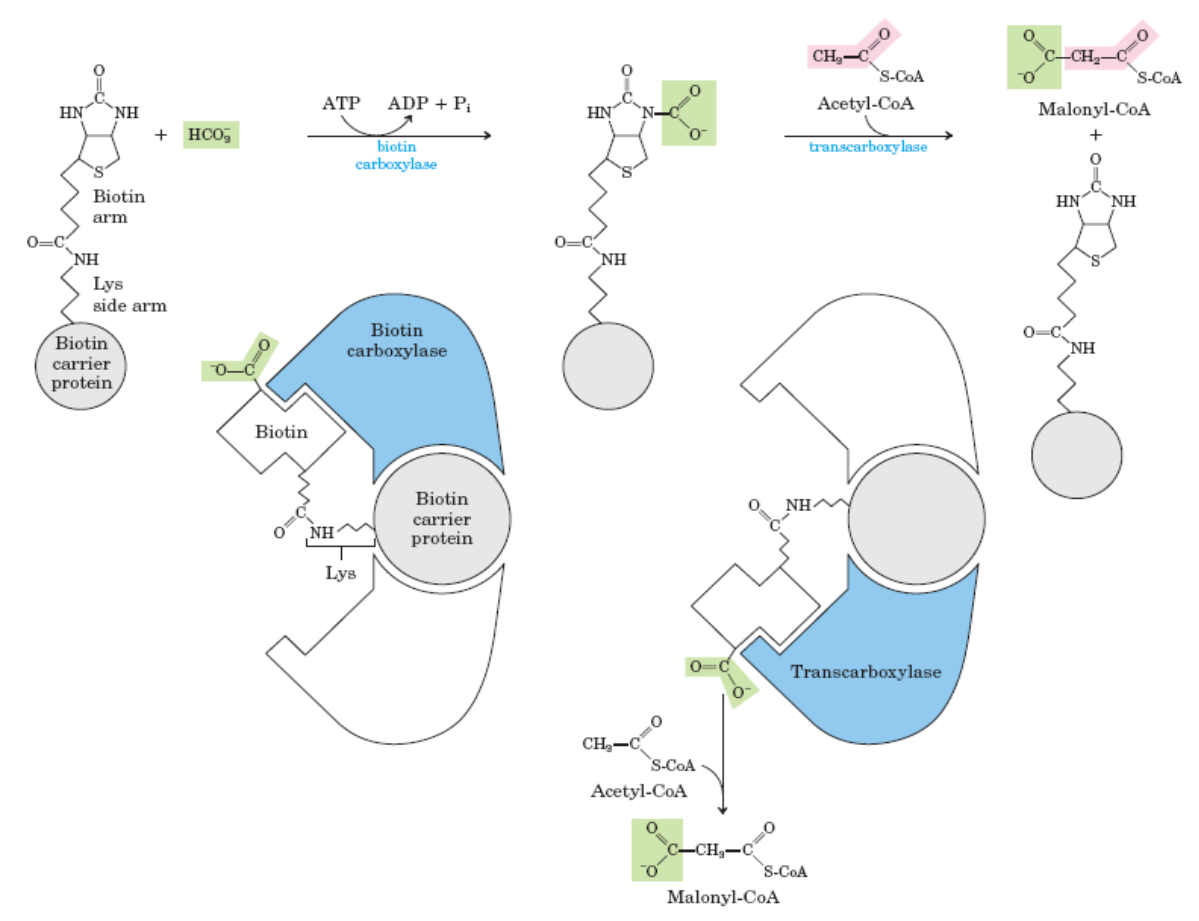
Biosynthesis palmitic from acetyl CoA

- The overall reaction for the synthesis of palmitate from acetyl CoA in two parts :

first, the formation of seven malonyl CoA molecules :

7 Acetyl-CoA + 7 CO_2 + 7 ATP ⇒ 7 malonyl – CoA + 7 ADP + 7Pi

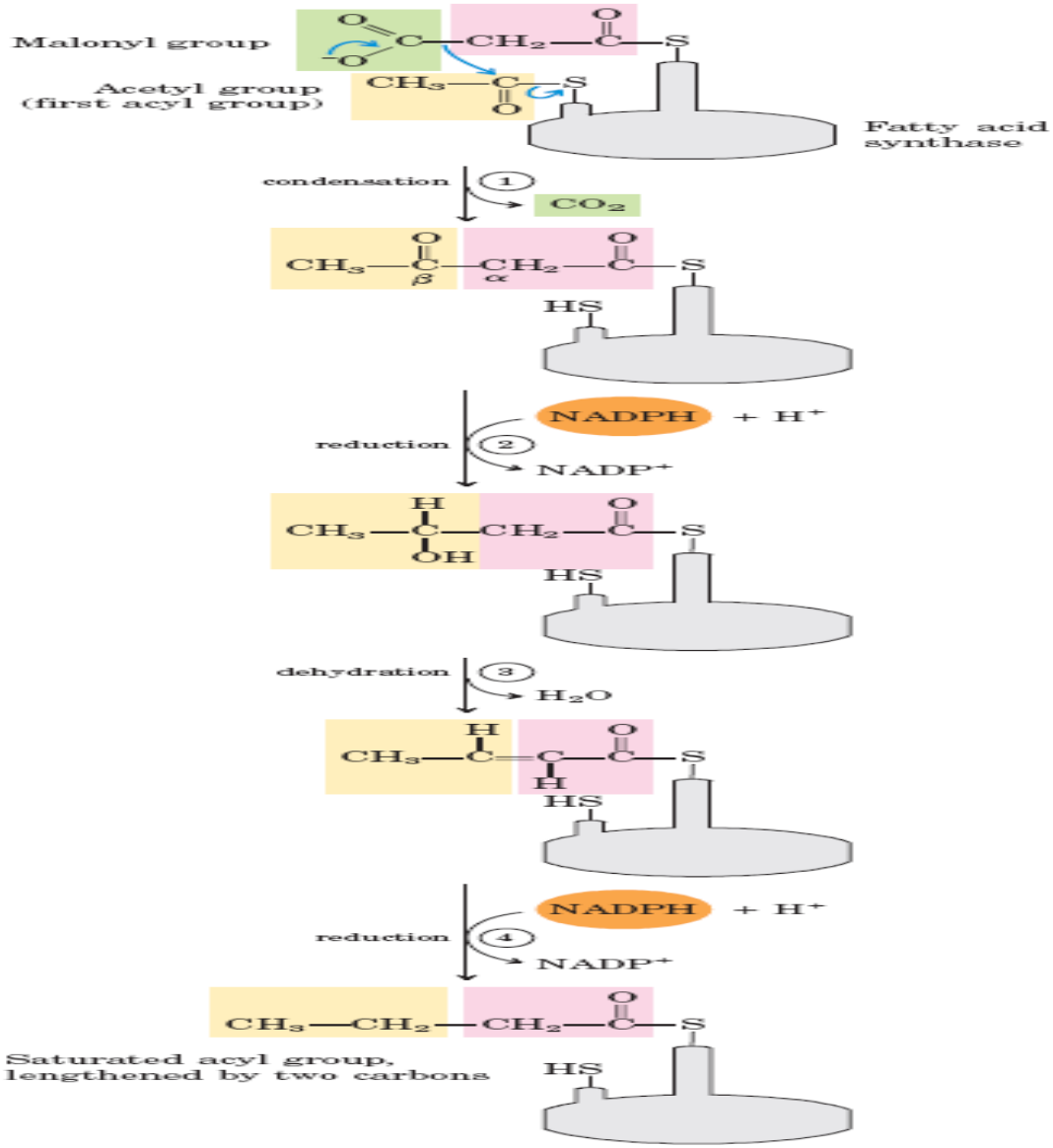
The acetyl CoA carboxylase reaction



second,, seven cycle of condensation and reduction :

Acetyl-CoA + 7 malonyl-CoA + 14NADPH + $14H^+$ → palmitate + $7CO_2$ + 8 CoA + $14NADP^+$ + $6H_2O$

- **Addition of two carbons to a growing fatty acyl chain : a four – step sequence**


Malonyl group
Acetyl group
(first acyl group)
Fatty acid
synthase
condensation
1
CO_2
HS
NADPH
+ H^+
reduction
2
$NADP^+$
dehydration
3
H_2O
NADPH
+ H^+
reduction
4
$NADP^+$
Saturated acyl group,
lengthened by two carbons
HS

1. Condesation of an activated acyl group
2. The β- keto group is reduced to an alcohol
3. Elimination of H_2O created a double bond
4. The double bond is reduced to the coressponding saturated fatty acyl group

The Overall process is :

8 Acetyl-CoA + 7ATP + 14NADPH + $14H^+$ → Palmitate + 8 CoA + 7ADP + 7Pi + 14$NADP^+$ + 6H_2O

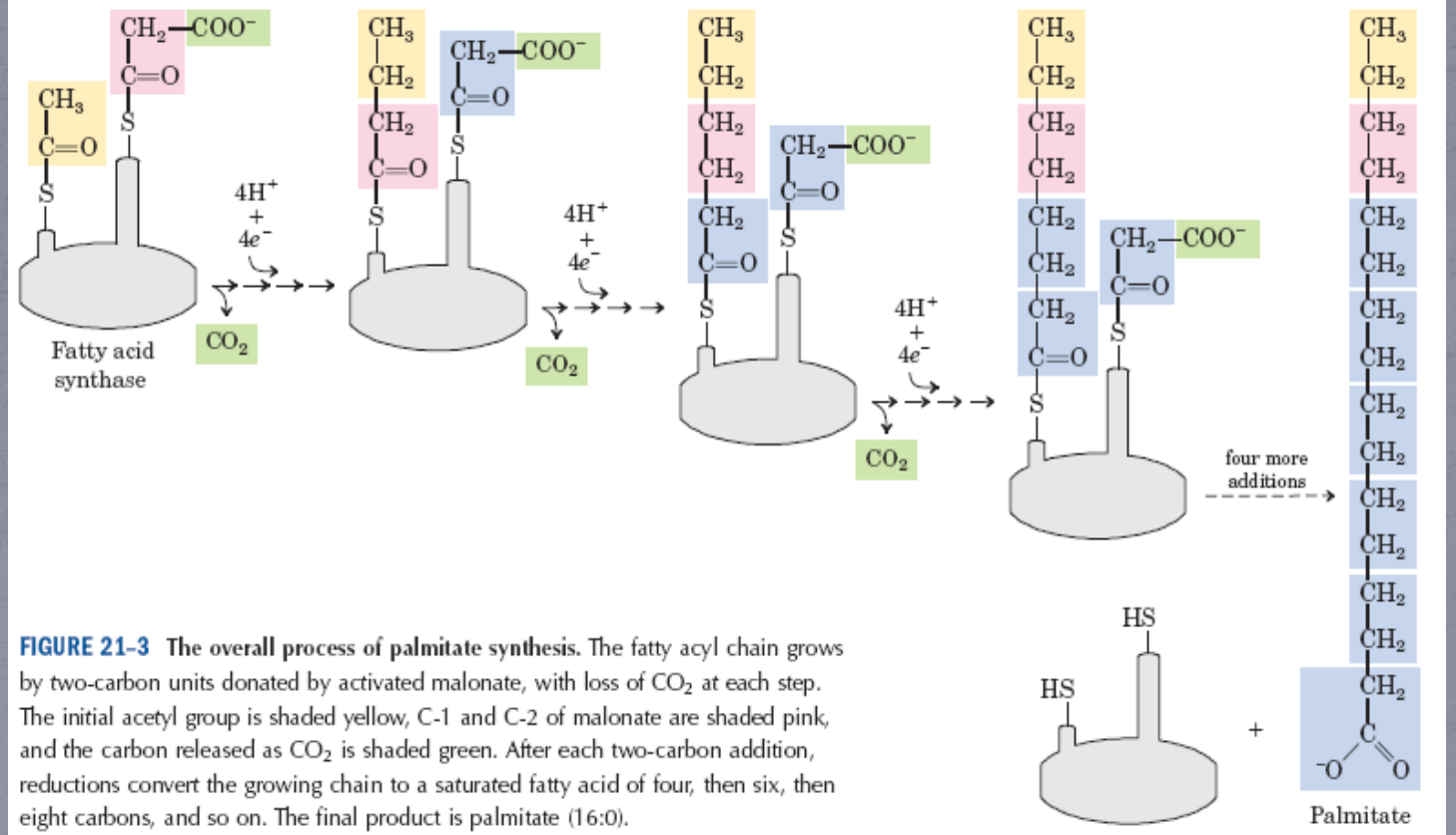
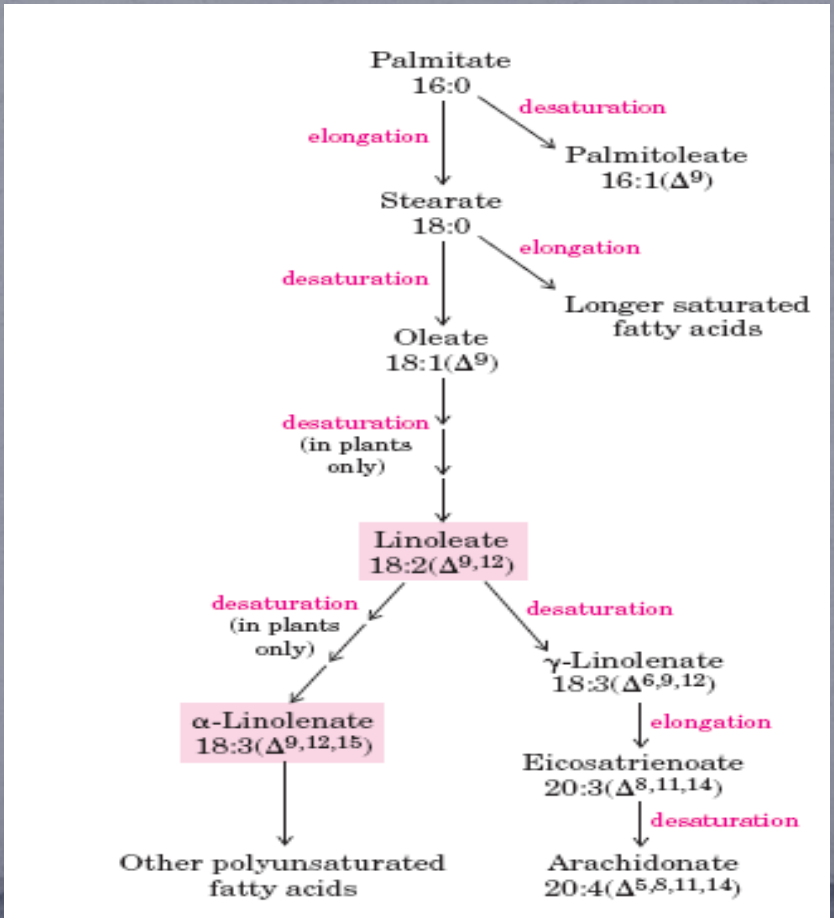


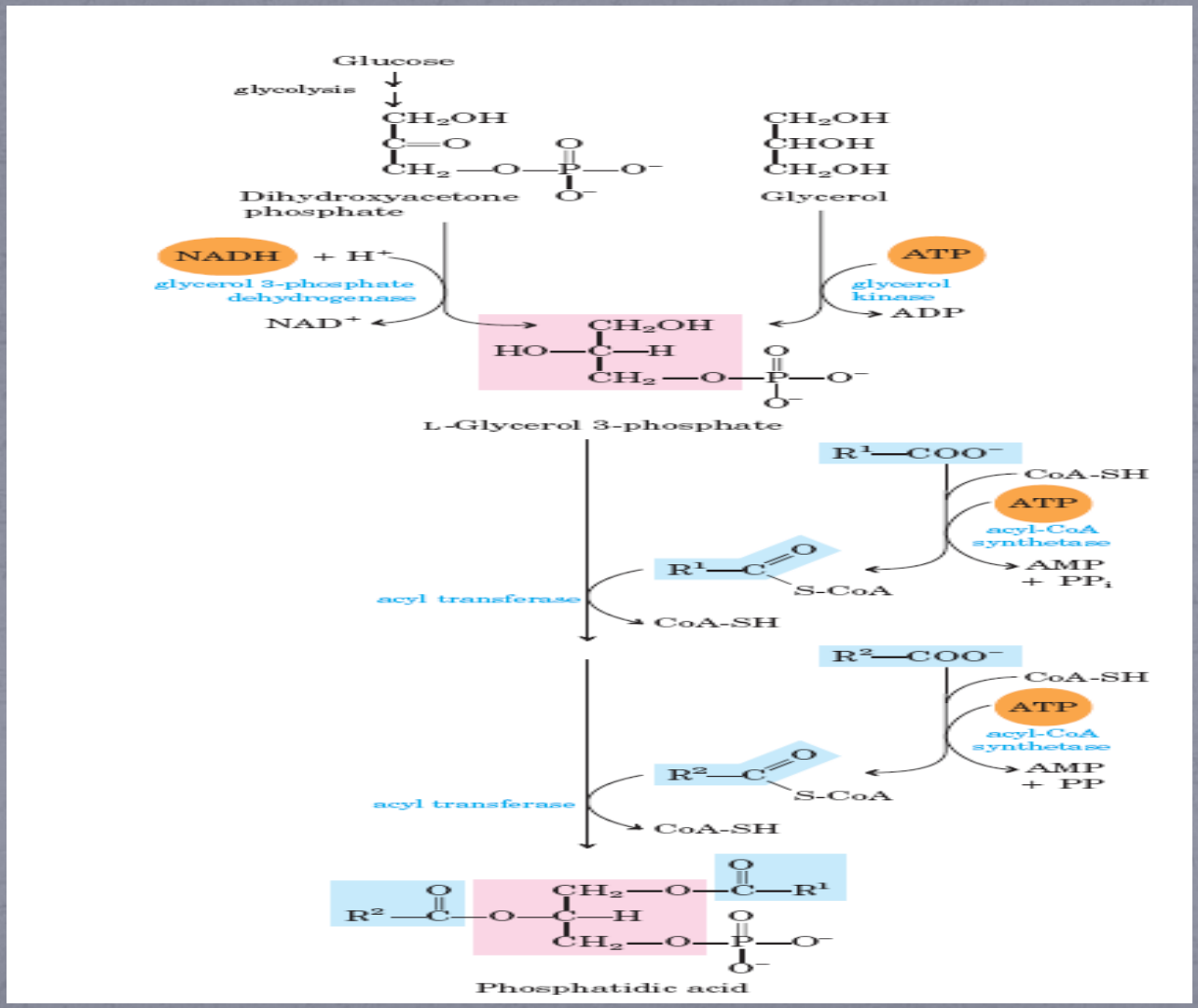
FIGURE 21–3 **The overall process of palmitate synthesis.** The fatty acyl chain grows by two-carbon units donated by activated malonate, with loss of CO_2 at each step. The initial acetyl group is shaded yellow, C-1 and C-2 of malonate are shaded pink, and the carbon released as CO_2 is shaded green. After each two-carbon addition, reductions convert the growing chain to a saturated fatty acid of four, then six, then eight carbons, and so on. The final product is palmitate (16:0).

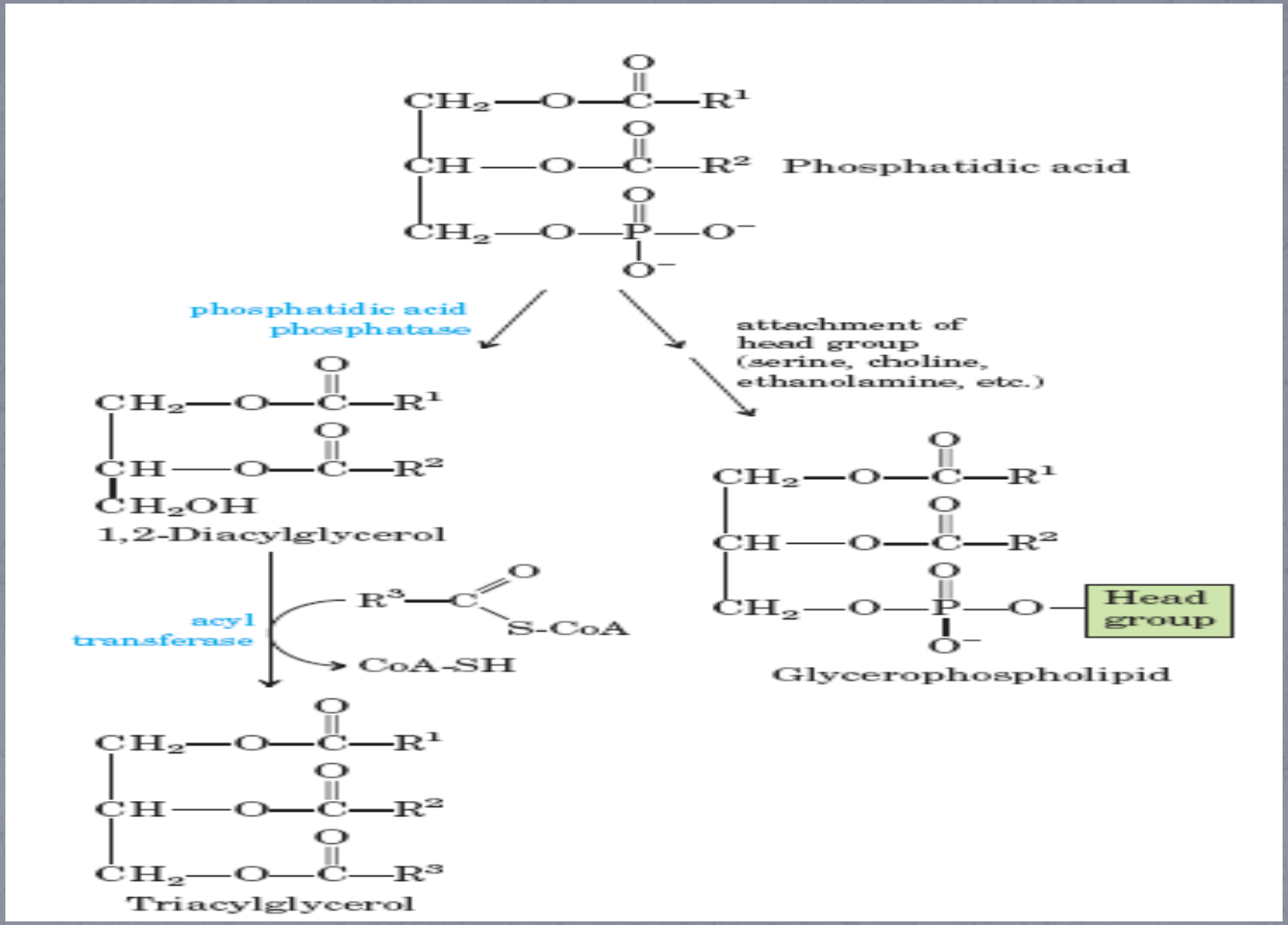
Long – chain saturated fatty acids are synthesized from palmitate

- Palmitat is precursor of other long – chain fatty acid

Route of synthesis of other fatty acids




Glucose
glycolysis
Dihydroxyacetone phosphate
Glycerol
NADH
+ H+
glycerol 3-phosphate dehydrogenase
NAD+
ATP
glycerol kinase
ADP
L-Glycerol 3-phosphate
R1—COO−
CoA-SH
ATP
acyl-CoA synthetase
AMP + PPi
S-CoA
acyl transferase
CoA-SH
R2—COO−
CoA-SH
ATP
acyl-CoA synthetase
AMP + PP
S-CoA
acyl transferase
CoA-SH
Phosphatidic acid


Phosphatidic acid
phosphatidic acid phosphatase
attachment of head group (serine, choline, ethanolamine, etc.)
1,2-Diacylglycerol
acyl transferase
S-CoA
CoA-SH
Head group
Glycerophospholipid
Triacylglycerol

References

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Thank you and let's move to the other topic presentation