

# VITAMINS-4

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# Plan for today

- Review last lecture
- Summarize what's done

# Pop Quiz !!

- Which vitamin has a major role in clotting

A

K

B

I Don't know,  
Too busy with  
periodic exams!

# Pop Quiz !!

- Beriberi is due to deficiency of vitamin

B2

B12

B1

Sorry forgot,  
too many B's

# Pop Quiz !!

- Vitamin K is involved in formation of ?? That is important for clotting

Thiamine

Glutamine

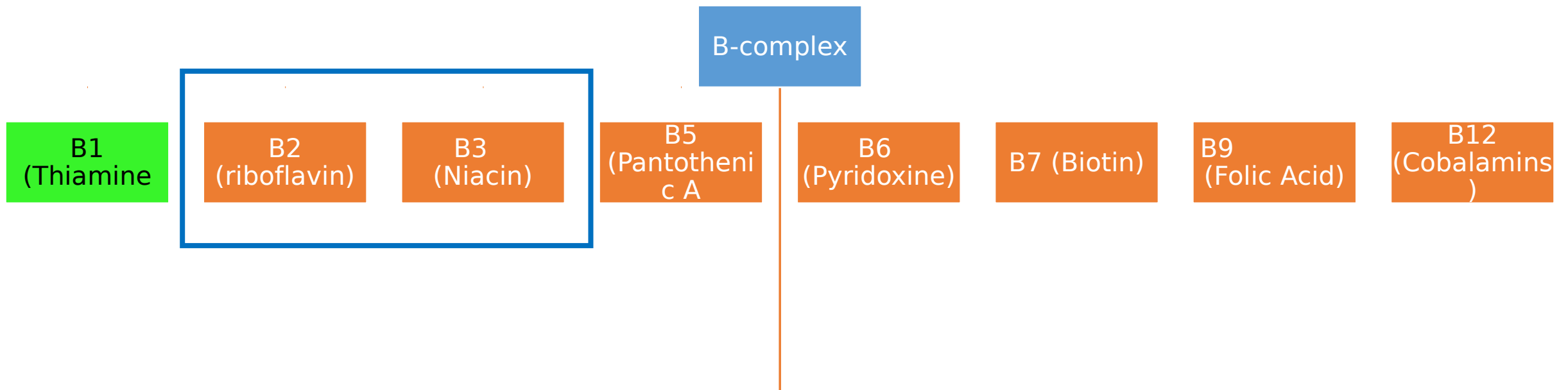
Carboxyglutam  
ate

Sorry , Don't  
know

# Vitamin B Complex

- Group of water soluble vitamins, chemically distinct
- Play an important role in metabolism

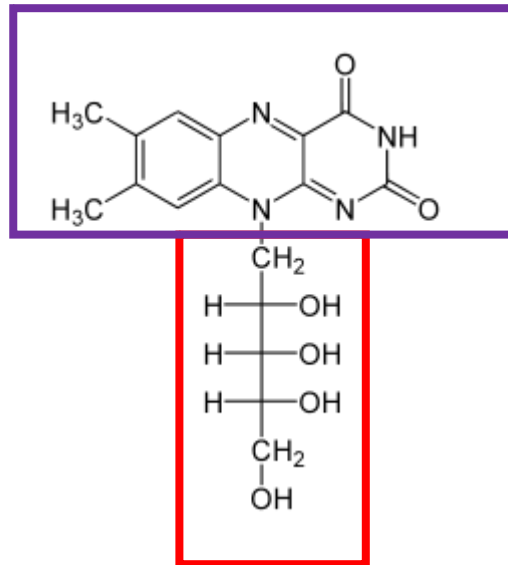
B-complex (Thiamine)



# Vitamin B2 (Riboflavin)

- Vitamin B2 also known as Riboflavin
- Ribo (Ribose) + flavin (yellow colored oxidized form)
- In body, exists as part of flavin adenine dinucleotide (FAD) and flavin mononucleotide (FMN) cofactors
- Cofactors derived from riboflavin are termed flavo-coenzymes, and enzymes that use a flavo-coenzyme are called flavo-proteins

# Vitamin B2 (Riboflavin) Structure



Riboflavin



# Vitamin B2 : What's the role

- Redox reactions
- Living organisms derive most of their energy from redox reactions
- Flavo-coenzymes participate in redox reactions in numerous metabolic pathways
- Flavo-coenzymes are critical for the metabolism of carbohydrates, lipids, and proteins
- FAD is part of the electron transport (respiratory) chain, which is central to energy production
- In conjunction with cytochrome P-450, flavo-coenzymes also participate in the metabolism of drugs and toxins

# Vitamin B2 : What's the role

- Anti-oxidant functions
- Glutathione reductase is an FAD-dependent enzyme that participates in the redox cycle of glutathione
- The glutathione redox cycle plays a major role in protecting organisms from reactive oxygen species
- Xanthine oxidase, another FAD-dependent enzyme, catalyzes the oxidation of hypoxanthine and xanthine to uric acid
- Vitamin metabolism
- Involved in metabolism of several other vitamins (B6, Niacin Folate)

# Vitamin B2 : Deficiency (Ariboflavinosis)

- Riboflavin deficiency is rarely found in isolation; it occurs frequently in combination with deficiencies of other water-soluble vitamins
- Body has an efficient mechanism for conserving of vitamin B2
- B2 released due to catabolism, rapidly incorporated back in enzymes
- Deficiency symptoms
  - sore throat, redness and swelling of the lining of the mouth
  - cracks or sores on the outsides of the lips
  - inflammation and redness of the tongue
  - moist, scaly skin inflammation

# Vitamin B1 : How much do we need ?

1. Infants :  
0.3 - 0.4 mg/day
2. Children:  
0.5 - 0.9 mg/day
3. Adults:  
1.3 mg/day

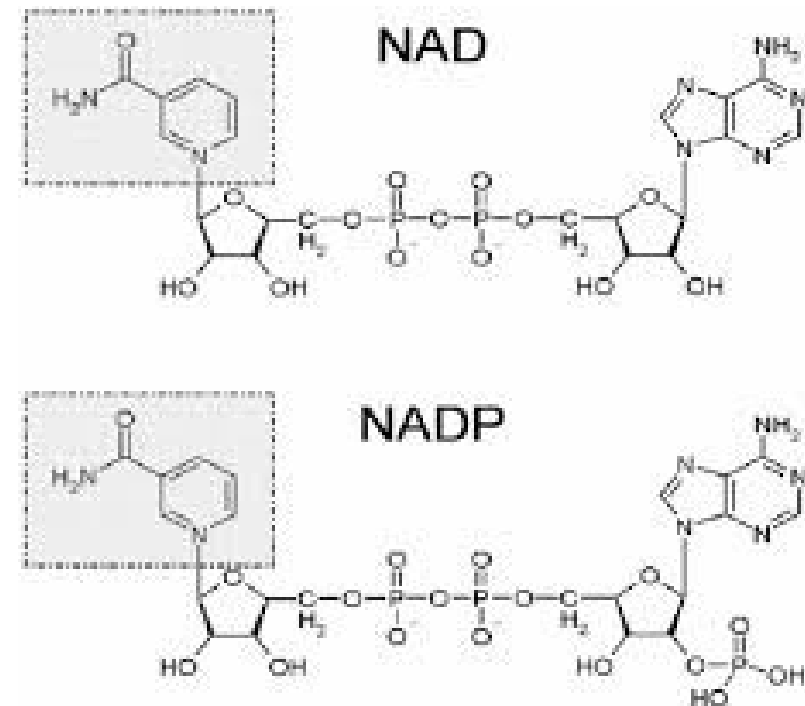
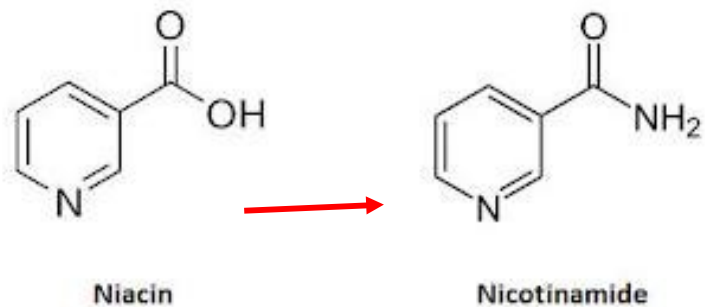
# Vitamin B2 : Food Source



# Vitamin B3 (Niacin)

- Known as B3, Niacin, Nicotinic acid
- Nicotinic acid & its amide (Nicotinamide) are active forms of vitamin B3
- Dietary tryptophan can be converted to niacin, although the efficiency of conversion is low in humans
- Niacin and nicotinamide are dietary precursors of nicotinamide adenine dinucleotide (NAD)

# Vitamin B3 (Niacin) Structure



- NAD phosphorylated to NADP and reduced to (NADH and NADPH)
- NAD functions in oxidation-reduction (redox) reactions and non-redox reactions

# Vitamin B3 (Niacin): What's the role

- Oxidation-reduction (redox) reactions
  - Over 400 enzymes require the niacin coenzymes, NAD and NADP
  - Mainly to accept or donate electrons for redox reactions
  - NAD functions in energy-producing reactions involving the catabolism of carbohydrates, fats, proteins, and alcohol
  - NADP functions in biosynthetic (anabolic) reactions, synthesis of all macromolecules, including fatty acids and cholesterol
- 
- Source of ADP-Ribose
  - Source of ADP-ribosylation of proteins, Poly ADP-ribosylation of nucleoprotein
  - Nucleoproteins are involved in DNA repair



# Vitamin B3 (Niacin) : Deficiency

- The late stage of severe niacin deficiency is known as Pellagra
- The most common symptoms of niacin deficiency involve the skin, the digestive system, and the nervous system
- The symptoms of pellagra are commonly referred to as the three D's: Dermatitis, Diarrhea, and Dementia

# Vitamin B3 (Niacin) use in disease prevention

- Commonly prescribed with other lipid-lowering medications
- Pharmacologic doses of niacin, but not nicotinamide, reduces serum cholesterol
- Niacin increases HDL-cholesterol levels, decreases serum lipoprotein concentrations, and lowers LDL levels
- These changes in the blood lipid profile are considered cardioprotective

# Vitamin B3 (Niacin): How much do we need ?

1. Infants :  
2 - 4 mg/day
2. Children:  
6 - 12 mg/day
3. Adults:  
16 mg/day

# Vitamin B3 (Niacin): Food Source



Food sources of Niacin (vitamin B3) include dairy, poultry, fish, lean meat, nuts and eggs