LECTURE-4

VITAMINS

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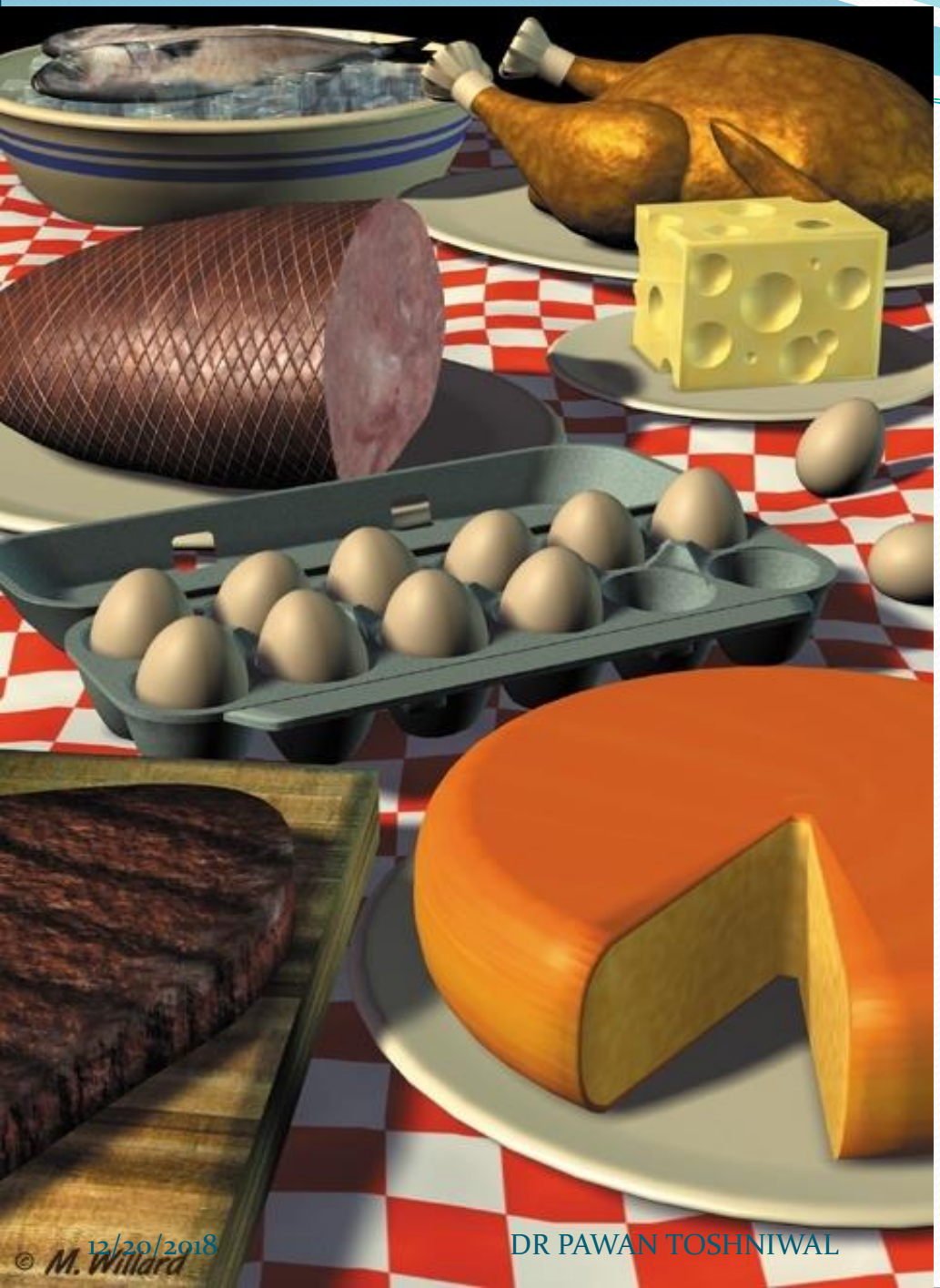


VITAMIN B_{12}

VITAMIN B-12

- COBALAMIN (COBALT ATOM IN CORRIN RING)
- EXTRINSIC FACTOR OF CASTLE (EF)
- ANTIPERNICIOUS ANEMIA FACTOR
- DEPENDING ON R GROUP
  - CYANIDE-CYANOCOBALAMIN
  - OH-HYDROXYCOBALAMIN
  - CH3- METHYL COBALAMIN

SOURCES

- Animal products
  - Meat, poultry fish, shellfish
  - Milk, cheese
  - Eggs
- Fortified cereals

RDA

- Adults: 1 - 2 μg/day
- Pregnancy and lactation – 2 μg/day
- Absorption requires : HCl, Pepsin, Intrinsic factor

ABSORPTION & TRANSPORT

- Vitamin B_{12} binds a glycoprotein (intrinsic factor) in stomach.
- I.F. is secreted by the parietal cells.
- Vitamin-IF complex recognises surface receptors of mucosal cells in ileum (small intestine) and is absorbed. (require calcium)
- Transport - bound to specific B_{12} binding protein (transcobalamin).
- Stored mainly in the liver (2 mg) sufficient to last for 2-3 years (exception).

FUNCTIONS

- Part of coenzymes methylcobalamin and deoxyadenosylcobalamin used in new cell synthesis
- Helps to maintain nerve cells
- Reforms folate coenzyme (Activates Folate)
- Helps to break down some fatty acids and amino acids

DEFICIENCY CAUSES

1. NUTRITIONAL INTAKE IS LESS
2. DECREASE IN ABSORPTION
3. ELDERLY PEOPLE
4. PERNISICIOUS ANEMIA
5. GASTRIC ATROPHY
6. PREGNANCY
7. INHERITED DEFECTS

DEFICIENCY

- ALSO CAUSES FOLIC ACID DEFICIENCY DUE TO FOLATE TRAP
- BLOOD – MEGALOBLAST, IMMATURE RBC (F)
- NS – SUBACUTE COMBINED DEGENERATION,
- DEMYELINATION AND NEURONAL DEATH
- ACHLORHYDRIA (ABSENCE OF GASTRIC JUICE)

SYMPTOMS

- PARESTHESIA OF EXTREMITIES
- ALTERATIONS OF TENDON AND DEEP SENSES AND REFLEXES
- LOSS OF POSITION SENSE
- POSITIVE ROMBERG'S SIGN (FALLING WHEN EYES ARE CLOSED)
- POSITIVE BABINSKI'S SIGN (EXTENSOR PLANTAR REFLEX)
- LATER LOSS OF MEMORY, CONFUSION,

ASSESSMENT OF B12 DEFICIENCY

- Serum Vit B12- quantitated by immunoassay or by ELISA
- Schilling test (for reduced absorption in gastric atrophy)
- Methyl malonic acid- in urine
- FIGLU excretion test (also along with folate deficiency)
- Homocysteinuria

- Vitamin B-12 can give you the energy
- Boost your energy levels
- Reduce the level of harmful homocysteine in your body
- Lower your risk of heart disease and stroke
- Diminish your risk of developing Alzheimers Disease
- Restore mental clarity and emotional balance

Fatigue, Irritability, Depression, it's Not You... it's a Vitamin B12 Deficiency

Vitamin-Like Compounds

- Choline
- Carnitine
- Inositol
- Taurine
- Lipoic acid
- Synthesized in the body at the expense of amino acids and other nutrients

Non-B Vitamin:Choline

- **Sources**
  - Milk
  - Liver
  - Eggs
  - Peanuts
- **Functions**

  Choline is involved in the synthesis of acetylcholine and lecithin. Acts as lipotropic factor

  RDA:
  - Men: 550 mg/day
  - Women: 425 mg/day

Choline is a basic cell building block that:

- **production of the phospholipids**
- **to synthesize acetylcholine, a neurotransmitter,**
- **lipoproteins, which shuttle nutrients around the body**

Choline is necessary for fetal and infant brain development

- **Choline is vital to the proper development of the brain and spinal cord**
- **Choline aids in memory development**

Functions of Choline

- **Choline is an essential nutrient**
  - **Strengthens cell membranes**
  - **Aids in memory development and cognition**
  - **Needed for proper fetal brain development**
  - **Maintains normal maternal homocysteine levels**
  - **Decreases the incidence of neural tube defects**
  - **Needed to make acetylcholine, a major neurotransmitter**
  - **Precursor for sphingomyelin, an essential element of cell membranes**

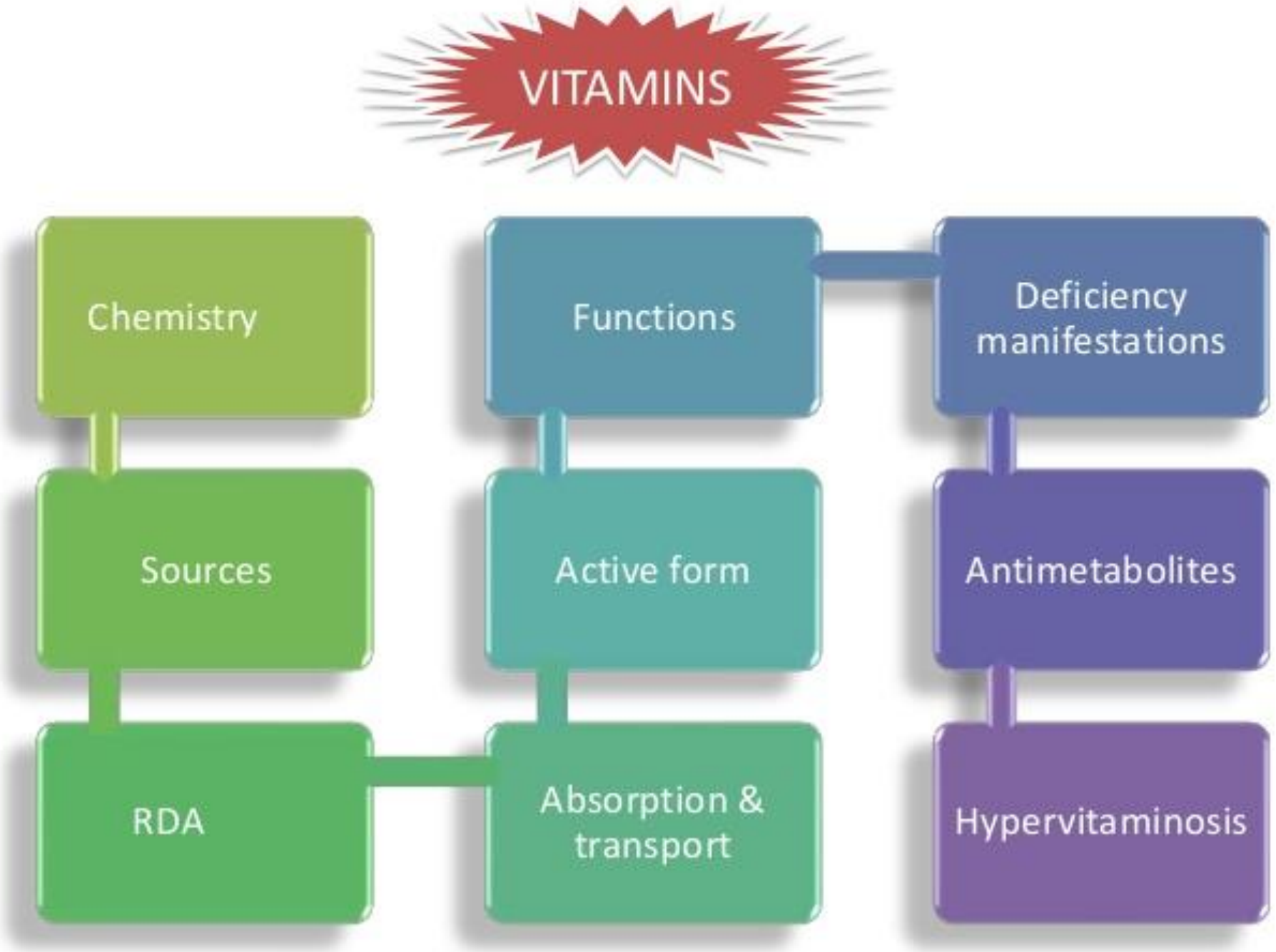
Biochemical role of Choline

- Formation of lecithin, sphingomyelin and acetylcholine
- Lipotropic factor; prevent fatty liver
- Choline after oxidation gives betaine, acts as methyl donor in transmethylation reactions.
- Choline and folate provide methyl groups for the conversion of homocysteine in the synthesis of the amino acid methionine
- When choline is deficient in the diet, folate metabolism is disturbed.

Non-B Vitamins (Choline)

Choline Deficiency and Toxicity

- **Deficiencies are rare.**
  - **Deficiency symptom is liver damage**
  - **important for pregnant and breastfeeding moms for proper fetal brain development**
  - **the risk of having a pregnancy affected by neural tube defects increases four-fold**
- **Toxicity Symptoms**
  - **Body odour and sweating**
  - **Reduced growth rate**
  - **Low blood pressure**
  - **Liver damage**
- **Upper level for adults: 3500 mg/day**


VITAMINS
Chemistry
Functions
Deficiency manifestations
Sources
Active form
Antimetabolites
RDA
Absorption & transport
Hypervitaminosis

THANK YOU

FOR LISTENING QUIETLY

DO YOU HAVE

ANY QUESTIONS TO ASK?

MCQ

QUESTIONS

1) What is the function of THFA as molecule?

A) Carrier molecule B) Transport molecule C) none D) both

2) Positive Romberg sign is seen in which vitamin deficiency?

A) B12 B) folic acid C) B7 D) B6

3) Which reaction of FA metabolism requires Vit-B12 ?

A) transamination B) transmethylation C) Both

D) None

4) RDA of vit b-12 for the body is _____

A) 2.0 µg/day B) 0.2 µg/day C) 20.0 µg/day D) 0.02 µg/day

5) Absorption of vitamin B 12 requires

A) HCl B) pepsin C) none D) both

ANSWERS

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