D.1 Human Nutrition
### Understanding, Applications and Skills

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<td>D.1.A3</td>
<td>Lack of Vitamin D or calcium can affect bone mineralization and cause rickets or osteomalacia.</td>
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**Sources:**


D.1.U1. Essential Nutrients cannot be synthesized by the body therefore have to be included in the diet

Which of the following nutrients are essential?
D.1.U1. Essential Nutrients cannot be synthesized by the body therefore have to be included in the diet

- - -

- **NUTRIENTS** are chemical substances, found in foods, that are used in the human body.
- Some nutrients are **ESSENTIAL in the human diet** because foods are the only possible source of nutrition.
  - Examples: Amino acids, some unsaturated fatty acids, some minerals, calcium, vitamins and water
- Other nutrients are **NON-ESSENTIAL**, either because another nutrient can be used for the same purpose or because they can be made in the body from another nutrient.
  - Examples: glucose, starch, and other carbohydrates
  - Reason: they are used in respiration for energy and lipids can be used instead.
D.1.U1. Essential Nutrients cannot be synthesized by the body therefore have to be included in the diet.

- Other nutrients are CONDITIONALLY ESSENTIAL NUTRIENTS
  - Example: Vitamin K
  - Reason: It is produced by SYMBIOTIC BACTERIA in the intestine. INFANTS do not have these at birth, therefore require SUPPLEMENTARY INJECTIONS of vitamin K.
D1. U2: Dietary Minerals are essential chemical elements

- Minerals in the diet tend to be ions eg. Ca+2
- Inorganic

- If any minerals are missing from a diet, DEFICIENCY DISEASE can result.
  - Example: Iodine
  - Reason: Needed for the thyroid gland for synthesis of hormone THYROXIN

Minerals Chart
D.1.U3 Vitamins are chemically diverse carbon compounds that cannot be synthesized by the body.

- Organic
- Required in small amounts
- **Cannot be synthesized** by body, therefore must be **obtained through diet**
- Serve a variety of roles such as **co-factors for enzymes**

Two major groups

1. Fat soluble: A, E, D, K
2. Water soluble: B (1, 2, 3, 5, 6, 7, 9, 12)

[Vitamins Chart](#)
D.1.U3 Vitamins are chemically diverse carbon compounds that cannot be synthesized by the body.

Match the structure to the name of the vitamin A, B2, C
D.1.U3 Vitamins are chemically diverse carbon compounds that cannot be synthesized by the body.

Match the structure to the name of the vitamin A, B2, C

- Vitamin C
- Vitamin A
- Vitamin B2
D.1.A1: Production of ascorbic acid by some mammals, but not others that need a dietary supply.

- Vitamin C contributes to the **formation of collagen**
- Majority of **plants** and **animals** can synthesize vitamin C
- **Mutations in genes** that no longer produce the **protein** necessary to make Vitamin C have occurred multiple times in evolution.
D.1.U6 Malnutrition may be caused by a deficiency, imbalance or excess of nutrients in the diet.

Condition occurring when body does not receive enough nutrients

Causes include:

- Poor diet
- Starvation due to food not being available
- Eating disorders
- Problems with digesting food or absorbing nutrients from food
- Certain medical conditions that make a person unable to eat

You may develop malnutrition if you lack a single vitamin in your diet.
D.1.U4 Some fatty acids and some amino acids are essential.

- Omega-3 and Omega-6 Fatty Acids are essential in diet - linoleic acid and alpha-linoleic acid
- These polyunsaturated fats are important as there is growing evidence that they help lower the risk of heart disease.
- Some studies suggest these fats may also protect against type 2 diabetes, Alzheimer’s disease, and age-related brain decline.
- Development of brain and eye require large quantities.
Some amino acids are essential as they cannot be synthesized by our bodies. The other half can be made from simpler nitrogen compounds.

Which amino acids is required for synthesis of all proteins?

Which are “conditional essential” amino acids?
D.1.U4 Some fatty acids and some amino acids are essential.
D.1.U5 Lack of essential amino acids affects the production of proteins.

Which of the following amino acids is required for synthesis of all proteins?

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<tr>
<td>Histidine</td>
<td>Phenylalanine</td>
</tr>
<tr>
<td>Isoleucine</td>
<td>Tryptophan</td>
</tr>
<tr>
<td>Leucine</td>
<td>Valine</td>
</tr>
<tr>
<td>Lysine</td>
<td>Threonine (only if phenylalanine is not in the diet)</td>
</tr>
<tr>
<td>Methionine</td>
<td>Arginine (required in the diet of infants)</td>
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</table>
What are the effects of protein deficiency malnutrition (not enough protein)?

- Lack of blood plasma proteins
  - fluid retained in tissues
  - Edema (swelling)
  - More obvious in the abdominal
- Children may be impacted mentally and physically
  - Stunted growth & development disabilities
In your assigned groups research

(1) PKU (D.1A2)
(2) Vitamin D Deficiency (D.1.A3)
(3) Anorexia nervosa (D.1.A4)
(4) Scurvy (D.1.A1)

Outline the…

● cause (which nutrient lacking)
● symptoms
● prognosis
● reason for problem
D.1.U7 Appetite is controlled by a centre in the hypothalamus.

- Hypothalamus responsible for making us feel satisfied when eaten enough food

Hormones secreted:

- Small intestine secretes PYY3-36
- Pancreas secretes insulin when blood levels high
- Adipose tissue secrete leptin when stored fat tissue high
D.1.A5 Cholesterol in blood as an indicator of the risk of coronary heart disease.
D.1.U8 Overweight individuals are more likely to suffer hypertension and type II diabetes.

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Unhealthy diets with excessive fat and refined carbohydrates have health consequences. Two diseases are diabetes and hypertension.

READ (and research) about Type II diabetes and hypertension on pg 665 in your textbook.
D.1.S1 Determination of energy content of food by combustion

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**CALORIES**

What is a calorie?!

How can we calculate calories?

Fortunately we know the specific heat capacity of water $4.186 \text{J/}^\circ \text{C}$

$$Q = m(\text{water}) \times C(\text{specific heat capacity}) \times (\bigtriangleup) T$$

One calorie is the amount of energy that will raise the temperature of 1 g of water by 1 °C
D.1.S2 Use of databases of nutritional content of foods and software to calculate intakes of essential nutrients from a daily diet.

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**Foodtracker** ←-----Link here

Track your food until next class!