

Understanding the Difference between Macronutrients vs. Micronutrients

1. INTRODUCTION


1.1 Splash



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1.2 Learner Agreement



Hello & Welcome

To this e-learning module, where you'll learn more about **understanding the difference between macronutrients vs. micronutrients.**

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1.3 Important Tips

Here Are a Few Tips to Get You Started

This is an interactive e-learning course, meaning that you have to interact with different items within each slide to fully explore what it has to offer.

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Untitled Layer 1 (Slide Layer)

Here Are a Few Tips to Get You Started

This is an interactive e-learning course, meaning that you have to interact with different items within each slide to fully explore what it has to offer.

CLICK ME **NOW, CLICK ME**




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Here Are a Few Tips to Get You Started

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OKAY, LAST TIME **CLICK ME**



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Here Are a Few Tips to Get You Started

This is an interactive e-learning course, meaning that you have to interact with different items within each slide to fully explore what it has to offer.

You're all set! Now click on the highlighted arrow below to go to the next tip.



1.4 Important Tips (2/5)

Here Are a Few Tips to Get You Started

Throughout the module, you'll find info icons ⓘ at the bottom of most interactive slides, they act as a guide that tells you what you should do in order to fully explore that slide.

Hover your mouse over them to reveal what they contain.



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

Very good! Interact with the arrows above to see the rest of the tips.

1.5 Important Tips (3/5)

Here Are a Few Tips to Get You Started

Bold and underlined scientific terms are **glossary items**. You can hover your mouse over them to reveal what they mean.

Small numbers inside circle shapes at the bottom left corner in most slides indicate references of some items in that slide. Hover your mouse over those numbers to highlight the quoted text and view its respective reference.⁸



Ref 0 (Slide Layer)

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Small numbers inside circle shapes at the bottom left corner in most slides indicate references of some items in that slide. Hover your mouse over those numbers to highlight the quoted text and view its respective reference.⁰

0

Glossary
A glossary is an alphabetical list of words relating to a specific subject, text, or dialect, with definitions or brief dictionary entries.

Glossary (Slide Layer)

Here Are a Few Tips to Get You Started

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1.6 Important Tips (4/5)

Here Are a Few Tips to Get You Started



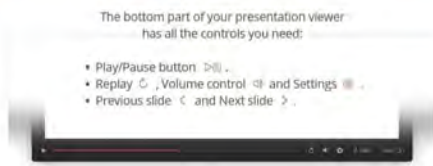
The upper left part of your presentation viewer has the Menu button , which has all slides in the module, the Search button , and the Glossary.

The upper right part has the Resources button, which shows you all references in one place, and the Exit button.









1.7 Important Tips (5/5)

Here Are a Few Tips to Get You Started



The bottom part of your presentation viewer has all the controls you need:


- Play/Pause button 
- Replay , Volume control  and Settings 
- Previous slide  and Next slide 



1.8 Introduction

Introduction

- Nutrition is essential to our health, so we will discuss macronutrients and micronutrients containing vitamins and minerals.
- The aim of this study is to determine the important role of micronutrients and macronutrients for all vital functions of the body.
- As a community pharmacist, you can assign the visitor essential nutrition for living a good lifestyle.



1.9 Learning Objectives

Learning Objectives

Upon successful completion of this module, you should be able to:



Objective #1	Objective #2	Objective #3	Objective #4
			



Untitled Layer 1 (Slide Layer)

Learning Objectives



Upon successful completion of this module, you should be able to:

Objective #1 Explore the macronutrient component. GOT IT	Objective #2 	Objective #3 	Objective #4 
--	--	--	--

Untitled Layer 2 (Slide Layer)

Learning Objectives

Upon successful completion of this module, you should be able to:

Objective #1 	Objective #2 Explain the difference between fat-soluble vitamins and water-soluble vitamins. GOT IT	Objective #3 	Objective #4 
---	---	---	---



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Learning Objectives

Upon successful completion of this module, you should be able to:

Objective #1	Objective #2	Objective #3	Objective #4
		Detect the major elements of macromolecules. GOT IT	

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Learning Objectives

Upon successful completion of this module, you should be able to:

Objective #1	Objective #2	Objective #3	Objective #4
			Explore different types of trace minerals. GOT IT



Info (Slide Layer)

Learning Objectives

Upon successful completion of this module, you should be able to:

Objective #1	Objective #2	Objective #3	Objective #4
			

Click on the pictures above to reveal the learning objectives.



Alert (Slide Layer)

Learning Objectives

Upon successful completion of this module, you should be able to:

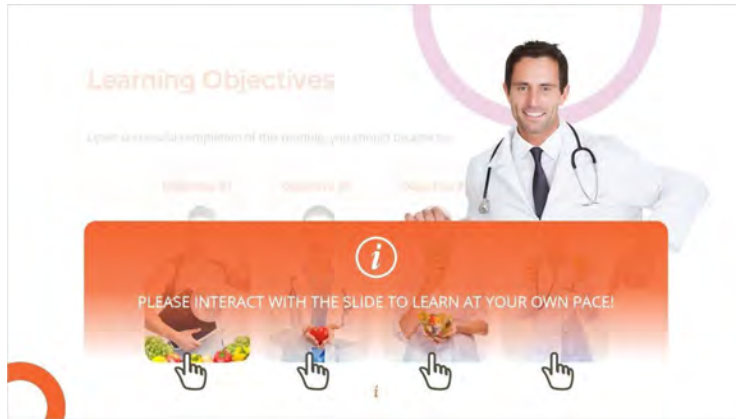


YOU MUST CHECK ALL OBJECTIVES BEFORE MOVING TO THE NEXT SLIDE

GOT IT



Guide (Slide Layer)



1.10 Module Lessons



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2. MACRONUTRIENTS OVERVIEW

2.1 Macronutrients Overview

SEGMENT 01

Macronutrients Overview

- Macronutrients are divided into three main sources: the first source is carbohydrates, the second source is protein, and the third source is fat.
- In this lesson, we will discuss the three sources of macronutrients.




2.2 Did You Know

SEGMENT 01: MACRONUTRIENTS OVERVIEW

Did You Know...

- The macronutrients are carbohydrates, proteins, and fats.
- While micronutrients are all vitamins like vitamin A, vitamin B, and all minerals such as iron and potassium.



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2.3 Carbohydrates

Carbohydrates

Carbohydrates

- Carbohydrates are a class of organic compounds made up of carbon, hydrogen, and oxygen in a 1:2:1 mole ratio.
- Carbohydrates are a major source of energy in human nutrition.
- Theoretically, the oxidation of 1 gram of carbohydrates results in 4 kcal.
- Humans can store carbohydrates as glycogen in the liver and muscles for later use.⁷

Carbohydrate Requirements Healthy Adults

	The Recommended Dietary Allowances (RDA)

Info (Slide Layer)

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Ref 2 (Slide Layer)

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Ref 3 (Slide Layer)

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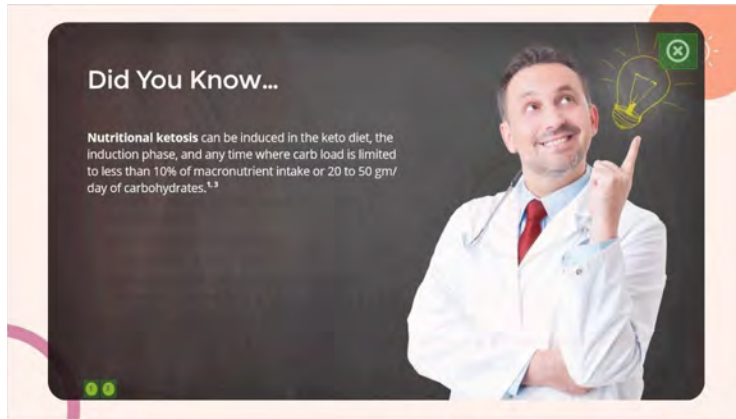
Carbohydrate Requirements Healthy Adults
The Recommended Dietary Allowances (RDA)



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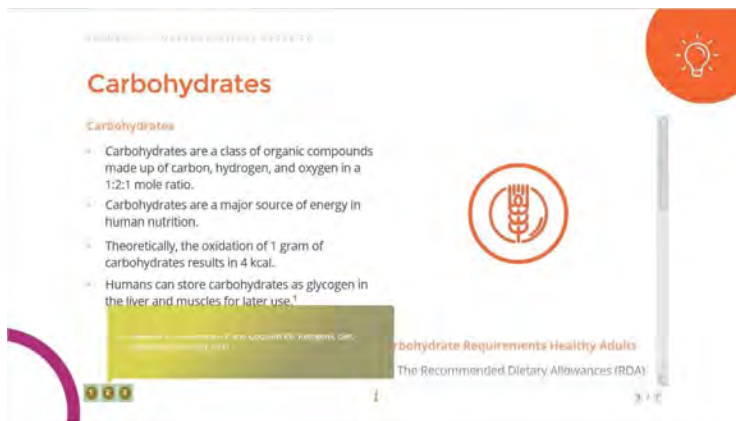
Did You Know (Slide Layer)



Did You Know...

Nutritional ketosis can be induced in the keto diet, the induction phase, and any time where carb load is limited to less than 10% of macronutrient intake or 20 to 50 gm/day of carbohydrates.^{4,5}

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Carbohydrates

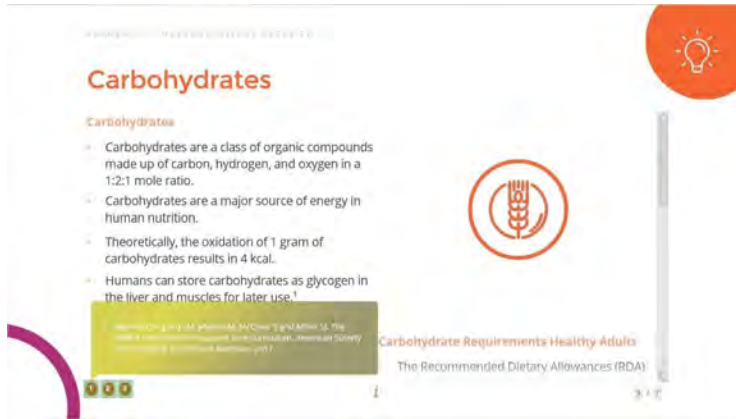
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Carbohydrate Requirements Healthy Adults
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Carbohydrates

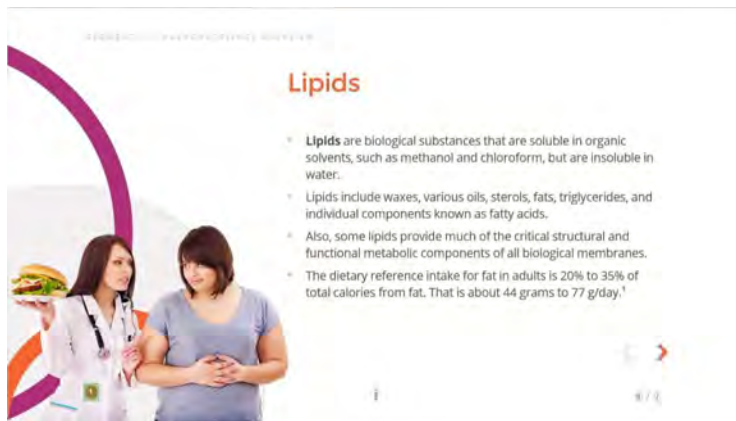
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Carbohydrate Requirements Healthy Adults
The Recommended Dietary Allowances (RDA)

1. American Dietetic Association. "The Recommended Dietary Allowances (RDA) for Carbohydrates." *Journal of the American Dietetic Association*. 1997; 97(1): 1-7.

2.4 Lipids

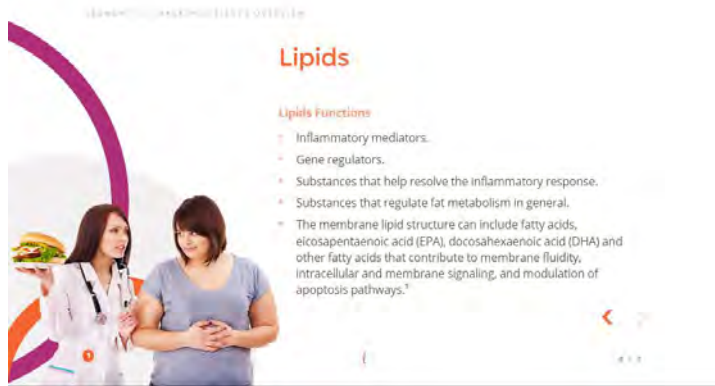


Lipids

- Lipids** are biological substances that are soluble in organic solvents, such as methanol and chloroform, but are insoluble in water.
- Lipids include waxes, various oils, sterols, fats, triglycerides, and individual components known as fatty acids.
- Also, some lipids provide much of the critical structural and functional metabolic components of all biological membranes.
- The dietary reference intake for fat in adults is 20% to 35% of total calories from fat. That is about 44 grams to 77 g/day.¹



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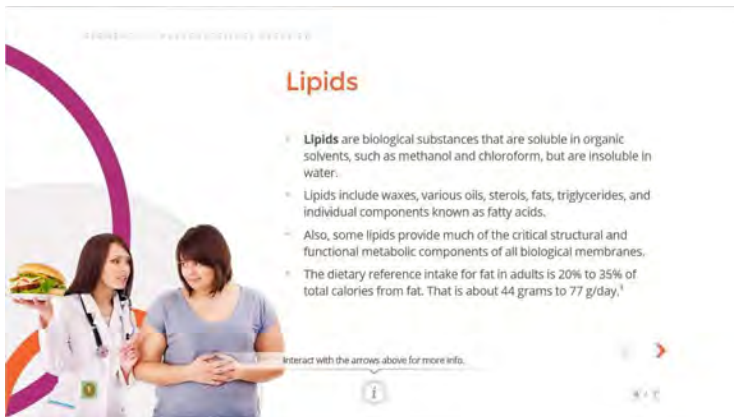


Lipids

Lipids Functions

- Inflammatory mediators.
- Gene regulators.
- Substances that help resolve the inflammatory response.
- Substances that regulate fat metabolism in general.
- The membrane lipid structure can include fatty acids, eicosapentaenoic acid (EPA), docosahexaenoic acid (DHA) and other fatty acids that contribute to membrane fluidity, intracellular and membrane signaling, and modulation of apoptosis pathways.²

Info (Slide Layer)



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Interact with the arrows above for more info.

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Martin, DM. (1992) M. Martin, M. McCreary and J. McCreary. (2015) Adult Nutrition: A Practical Approach to Assessment for Paramedics and EMTs. Elsevier, p. 111.

2.5 Proteins

Proteins

Proteins:

- Proteins are the most abundant organic molecules in cells and are fundamental to cell structure and function.
- All proteins are created from the same basic group of 20 amino acids, covalently linked in distinct sequences.
- The Recommended Dietary Allowance (RDA) for protein is a modest 0.8 g/ kg of body weight.¹



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Proteins

Protein Function

- Growth, maintenance, and movement.
- Enzymes.
- Hormones.
- Immunity.¹

The slide features a title 'Proteins' in orange, a central orange circle with a white icon of a cell, and a list of functions under the heading 'Protein Function'. Navigation icons are visible at the bottom.

Untitled Layer 2 (Slide Layer)

Proteins

Protein Function

- Proteins regulate gene transcription and translation through the mammalian target of rapamycin (mTOR) signaling pathway.
- Fluid and electrolyte balance.
- Acid-base balance.
- Transport and storage.¹

The slide features a title 'Proteins' in orange, a central orange circle with a white icon of a flask, and a list of functions under the heading 'Protein Function'. Navigation icons are visible at the bottom.



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2.6 Macronutrients' Guidelines for General Population and Health



Macronutrients' Guidelines for General Population and Health

- The health and wellness of the general population can be achieved by following the dietary guidelines established by the United States Department of Agriculture (USDA) and the Institute of Medicine.
- These guidelines are intended to promote general health and ward off chronic diseases (e.g., diabetes, hypertension, cardiovascular disease, etc.).^{1,4}

EXPLORE

1 2

A thumbnail image of a slide. The slide has a white background with a purple decorative arc on the right side. The title 'Macronutrients' Guidelines for General Population and Health' is in orange. Below the title are two bullet points in black text. An orange button with the word 'EXPLORE' is positioned below the text. At the bottom left, there are two small green icons. On the right side of the slide, there is a photograph of a male and female doctor in white coats looking at a tablet together.

layer 1 (Slide Layer)



Macronutrients' Guidelines for General Population and Health

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EXPLORE

1 2

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Ref 1 (Slide Layer)

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1. Muehle JM, Lavin JA, Muehle M. *Macronutrients and population health: A review of the evidence for the United States Department of Agriculture and the Institute of Medicine.*

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4. Muehle JM, Lavin JA, Muehle M. *Macronutrients and population health: A review of the evidence for the United States Department of Agriculture and the Institute of Medicine.*



Info (Slide Layer)



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EXPLORE

Click on the explore button for more for more info.





Explore (Slide Layer)



Macronutrients' Guidelines for General Population and Health

These guidelines recommend that:⁴

- At least half of the carbohydrates consumed should be from whole, complex grains.
- A diet full of fruits and vegetables.
- The protein sources should be fat-free.

Guidelines state that this macronutrient should be consumed at:^{1,4}

- 45 - 65% carbohydrates.
- 10 - 35% protein.
- 20 - 35% fat.







2.7 Summary



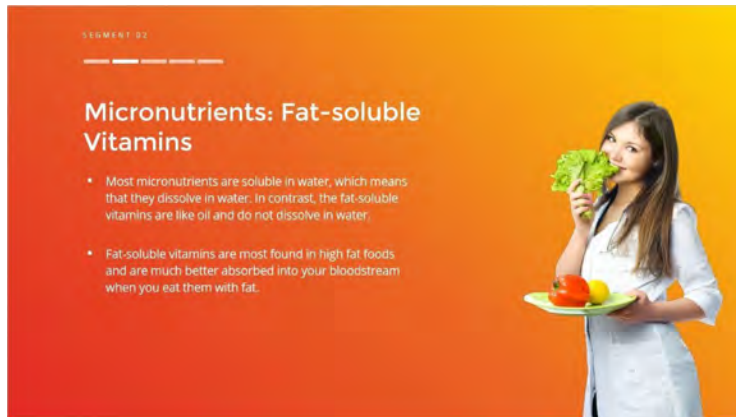
SEGMENT 01: MACROVITAMINS OVERVIEW

Summary

- Nutrition is the source of energy and biological function of the body and nutrition is divided into macronutrient and micronutrient.
- To make it easy to understand, macronutrients are the food which people eat, and this food will be divided into three sources carbohydrate and protein and fat.

3. MICRONUTRIENTS: FAT-SOLUBLE VITAMINS

3.1 Micronutrients: Fat-soluble Vitamins



SEGMENT 02

Micronutrients: Fat-soluble Vitamins

- Most micronutrients are soluble in water, which means that they dissolve in water. In contrast, the fat-soluble vitamins are like oil and do not dissolve in water.
- Fat-soluble vitamins are most found in high fat foods and are much better absorbed into your bloodstream when you eat them with fat.

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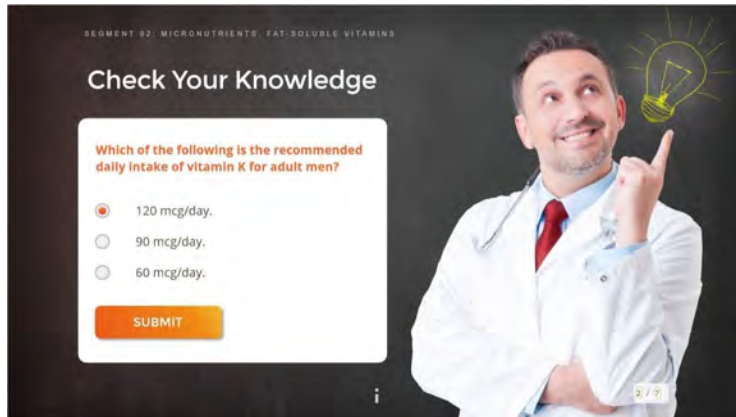


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3.2 Check Your Knowledge

(Multiple Choice, 10 points, 1 attempt permitted)



Correct	Choice
X	120 mcg/day.
	90 mcg/day.
	60 mcg/day.

Feedback when correct:

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Feedback when incorrect:

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

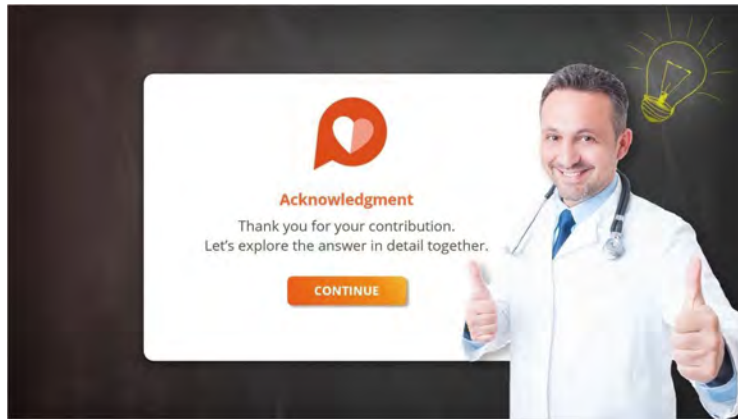
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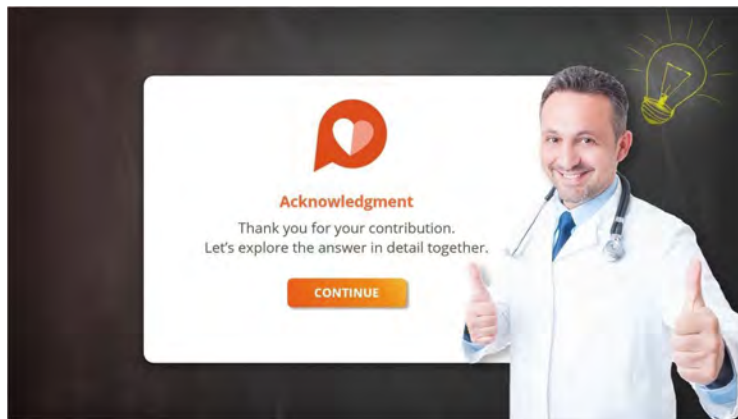
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Correct (Slide Layer)



Incorrect (Slide Layer)



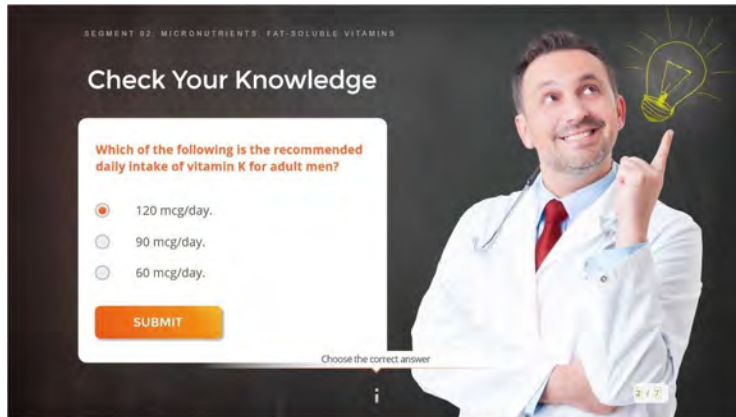
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Info (Slide Layer)



SEGMENT 02: MICRONUTRIENTS: FAT-SOLUBLE VITAMINS

Check Your Knowledge

Which of the following is the recommended daily intake of vitamin K for adult men?

- 120 mcg/day.
- 90 mcg/day.
- 60 mcg/day.

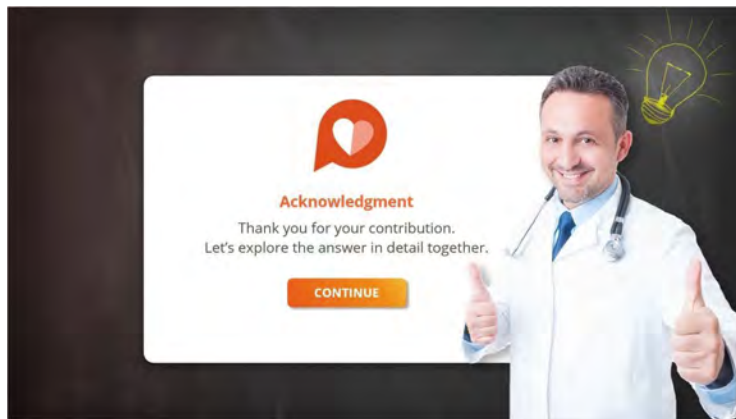
SUBMIT

Choose the correct answer

2 / 7

A slide featuring a doctor in a white coat pointing upwards. A lightbulb icon is drawn above his head. The slide contains a quiz question about the recommended daily intake of vitamin K for adult men, with three radio button options: 120 mcg/day (selected), 90 mcg/day, and 60 mcg/day. A 'SUBMIT' button is at the bottom of the question box. Below the question box, it says 'Choose the correct answer' and '2 / 7'.

Acknowledgment 1 (Slide Layer)



Acknowledgment

Thank you for your contribution.
Let's explore the answer in detail together.

CONTINUE

A slide featuring a doctor in a white coat giving two thumbs up. A lightbulb icon is drawn above his head. The slide contains an acknowledgment message: 'Thank you for your contribution. Let's explore the answer in detail together.' and a 'CONTINUE' button. There is also a heart icon in a speech bubble above the text.

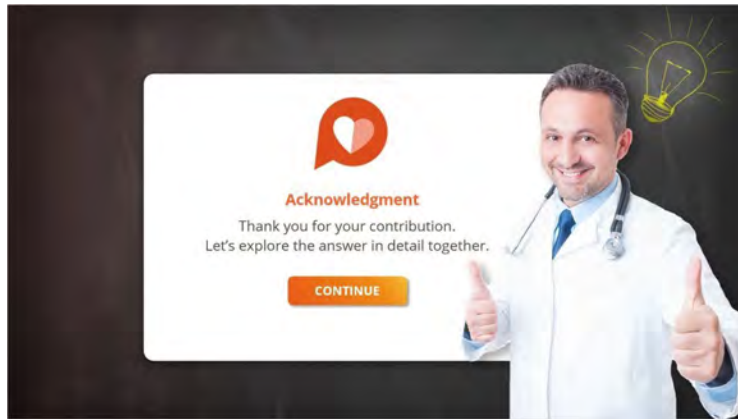
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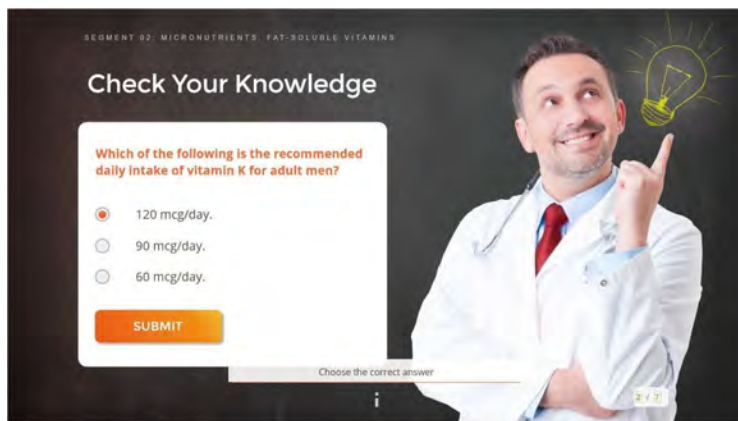
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Acknowledgment (Slide Layer)



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3.3 Vitamin A



Vitamin A

- Beta-carotene, the primary provitamin A carotenoid.
- Vitamin A exists in 3 forms: retinol, retinaldehyde, and retinoic acid.¹

Functions of Vitamin A

- Vision.
- Regulates epithelial cell differentiation.
- Wound healing.
- Bone and cellular health.¹

3 / 8

Untitled Layer 1 (Slide Layer)



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3 / 8

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3.4 Vitamin D

Vitamin D

Vitamin D is essential for maintaining healthy bones and teeth. It also plays many other important roles in the body.¹

Function of Vitamin D

Essential function of vitamin D is to maintain serum calcium and phosphorus levels to support neuromuscular function, bone calcification, and other cellular processes.¹



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Vitamin D



Other Functions of Vitamin D

Important in managing:

- Musculoskeletal disorders.
- Autoimmunity, and infections.
- Cancer.
- Diabetes.
- Cardiovascular disease.

The innate and adaptive immune system:

- Role in infection control.
- Macrophages are activated by calcitriol.
- Increased ability to oxidize **cytokines**, acid phosphatases, and hydrogen peroxide in response to pathogens.^{3,4}



Untitled Layer 2 (Slide Layer)


Vitamin D

Recommended Daily Intakes of Vitamin D

- For adults younger than 70 years is 600 IU.
- For adults 70 years or older is 800 IU.
- For age 9 years and older is 4000 IU.¹

Sources of Vitamin D

- Sun exposure lasts 5 to 15 minutes in spring, summer, and fall between 10 a.m. and 3 p.m.
- Fish liver oils, fatty fish, fortified milk and breakfast cereals.¹



1 2 3 4

Vitamin D

Possible Causes of Vitamin D Deficiency

- Older adults.
- Nursing home.
- Dark-skinned individuals.
- People who wear clothing.
- People who are indoors much of the time.
- Patients with extensive skin damage.
- Fat-malabsorptive disorders.
- Renal disease (insufficient renal calcitriol production).
- Long-term parenteral nutrition (PN).¹



1 2 3 4

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Info (Slide Layer)

Vitamin D

Vitamin D is essential for maintaining healthy bones and teeth. It also plays many other important roles in the body.¹

Function of Vitamin D

Essential function of vitamin D is to maintain serum calcium and phosphorus levels to support neuromuscular function, bone calcification, and other cellular processes.¹

Click on the icons in the rounded rectangles above for more info.

The slide features a title 'Vitamin D' in orange, followed by a paragraph explaining its importance for bone health and other roles. Below this, a section titled 'Function of Vitamin D' describes its role in maintaining calcium and phosphorus levels. To the right of the text are four orange rounded rectangles, each containing an icon: a hand holding a bone, a cell with a nucleus, a human silhouette, and two pills. At the bottom, a small 'i' icon is highlighted with a line pointing to the text 'Click on the icons in the rounded rectangles above for more info.' There are also navigation icons in the bottom left and right corners.

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Cytokine (Slide Layer)

Essential for maintaining healthy bones and teeth. It also plays many other important roles in the body.¹

Vitamin D

Cytokines:
(immunoregulatory proteins) such as interleukin-6 (IL-6) and interleukin-17 (IL-17) are secreted by cells in periphery of the immune system.

maintain serum calcium, neuromuscular function, and bone remodeling processes.¹



Osteomalacia (Slide Layer)

Essential for maintaining healthy bones and teeth. It also plays many other important roles in the body.¹

Vitamin D

Function:
Essential for bone health and phosphorus metabolism.

Osteomalacia:
A disease of adults that is characterized by softening of the bones and is analogous to rickets in the young.

maintain serum calcium, neuromuscular function, and bone remodeling processes.¹



[no notes on this page]

[no notes on this page]

Ref 1 (Slide Layer)

Vitamin D

Vitamin D is essential for maintaining healthy bones and teeth. It also plays many other important roles in the body.¹

Function of Vitamin D

Essential function of vitamin D is to maintain serum calcium and phosphorus levels to support neuromuscular function, bone calcification, and other cellular processes.¹

1. Mittleman, B. S. (2014). *Medical Nutrition and Metabolism: A Practical Approach to Clinical Nutrition*. Philadelphia, PA: Elsevier.

Ref 6 (Slide Layer)

Vitamin D

Vitamin D is essential for maintaining healthy bones and teeth. It also plays many other important roles in the body.¹

Function of Vitamin D

Essential function of vitamin D is to maintain serum calcium and phosphorus levels to support neuromuscular function, bone calcification, and other cellular processes.¹

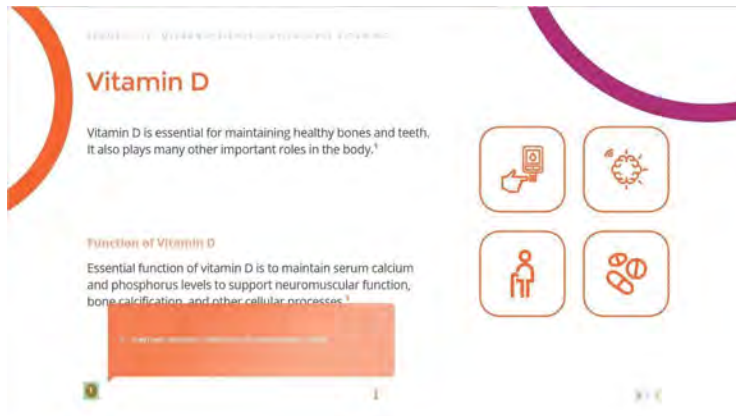
1. Mittleman, B. S. (2014). *Medical Nutrition and Metabolism: A Practical Approach to Clinical Nutrition*. Philadelphia, PA: Elsevier.



[no notes on this page]

[no notes on this page]

Ref 7 (Slide Layer)



Vitamin D

Vitamin D is essential for maintaining healthy bones and teeth. It also plays many other important roles in the body.¹

Function of Vitamin D

Essential function of vitamin D is to maintain serum calcium and phosphorus levels to support neuromuscular function, bone calcification, and other cellular processes.¹

The slide features a decorative orange and purple arc on the left and right sides. It includes four icons in a 2x2 grid: a hand holding a pill, a cell diagram, a person silhouette, and a pill diagram. A navigation bar at the bottom shows a play button, a list icon, and a right arrow.

3.5 Vitamin E



Vitamin E

Vitamin E

- Vitamin E is a fat-soluble vitamin with several forms, but alpha tocopherol is the only one used by the human body.¹

The Function of Vitamin E

- It acts as an antioxidant by trapping peroxy free radicals in cell membranes to protect against oxidation.¹

The slide features a decorative purple and orange arc on the left side. It includes a photograph of a woman in a white lab coat holding various vegetables. A navigation bar at the bottom shows a play button, a list icon, and a right arrow.



APR 2015 10:30 AM 10:30 AM 10:30 AM 10:30 AM 10:30 AM



Vitamin E

Vitamin E

- Vitamin E is a fat-soluble vitamin with several forms, but alpha tocopherol is the only one used by the human body.¹

The Function of Vitamin E

- It acts as an antioxidant by trapping peroxy free radicals in cell membranes to protect against oxidation.¹

Interact with the arrows above for more info.

APR 2015 10:30 AM 10:30 AM 10:30 AM 10:30 AM 10:30 AM



Vitamin E

Vitamin E

- Vitamin E is a fat-soluble vitamin with several forms, but alpha tocopherol is the only one used by the human body.¹

The Function of Vitamin E

- It acts as an antioxidant by trapping peroxy free radicals in cell membranes to protect against oxidation.¹

Crohn's disease:
 is chronic inflammation that typically involves the lower portion of the ileum, often spreads to the colon, and is characterized by diarrhea, cramping, loss of appetite and weight, and the development of abscesses and scarring.



3.6 Vitamin K

Vitamin K

1. Vitamin K
2. The Function of Vitamin K
3. Recommended Daily Intakes of Vitamin K
4. Sources of Vitamin K
5. Possible Causes of Vitamin K Deficiency
6. Deficiency of Vitamin K Results



Vitamin K

1. Vitamin K
2. The Function of Vitamin K
3. Recommended Daily Intakes of Vitamin K
4. Sources of Vitamin K
5. Possible Causes of Vitamin K Deficiency
6. Deficiency of Vitamin K Results

Vitamin K

* Vitamin K refers to a group of fat-soluble vitamins.¹



[no notes on this page]

Untitled Layer 2 (Slide Layer)



Vitamin K


- 1. Vitamin K
- 2. The Function of Vitamin K
- 3. Recommended Daily Intakes of Vitamin K
- 4. Sources of Vitamin K
- 5. Possible Causes of Vitamin K Deficiency
- 6. Deficiency of Vitamin K Results

The Function of Vitamin K

- Clotting function Vitamin K is involved in a variety of enzymatic reactions within the body that affect blood coagulation.
- Bone health through its role in converting protein-bound glutamate to gamma-carboxyglutamate.¹

Navigation icons: back, forward, search, and a large orange arc.

Untitled Layer 3 (Slide Layer)



Vitamin K

- 1. Vitamin K
- 2. The Function of Vitamin K
- 3. Recommended Daily Intakes of Vitamin K
- 4. Sources of Vitamin K
- 5. Possible Causes of Vitamin K Deficiency
- 6. Deficiency of Vitamin K Results

Recommended Daily Intakes of Vitamin K

- Adult men 120 mcg/ day.
- Adult women 90 mcg/ day.¹

Navigation icons: back, forward, search, and a large orange arc.



Untitled Layer 4 (Slide Layer)

Vitamin K

1. Vitamin K	Sources of Vitamin K <ul style="list-style-type: none">• Liver.• Green leafy vegetables.• Broccoli.• Green beans.¹
2. The Function of Vitamin K	
3. Recommended Daily Intakes of Vitamin K	
4. Sources of Vitamin K	
5. Possible Causes of Vitamin K Deficiency	
6. Deficiency of Vitamin K Results	

Navigation icons: back, forward, search, and a large orange semi-circle at the bottom right.

Untitled Layer 5 (Slide Layer)

Vitamin K

1. Vitamin K	Possible Causes of Vitamin K Deficiency <ul style="list-style-type: none">• In fat malabsorption.• Inflammatory bowel disease.• Antibiotic therapy.• Long-term parenteral nutrition without lipid emulsion.• Some medication.¹
2. The Function of Vitamin K	
3. Recommended Daily Intakes of Vitamin K	
4. Sources of Vitamin K	
5. Possible Causes of Vitamin K Deficiency	
6. Deficiency of Vitamin K Results	

Navigation icons: back, forward, search, and a large orange semi-circle at the bottom right.



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[no notes on this page]

Untitled Layer 6 (Slide Layer)

Vitamin K

1. Vitamin K
2. The Function of Vitamin K
3. Recommended Daily Intakes of Vitamin K
4. Sources of Vitamin K
5. Possible Causes of Vitamin K Deficiency
6. Deficiency of Vitamin K Results

Deficiency of Vitamin K Results

- Prolonged bleeding.
- Decreased bone density.
- Increased prothrombin time.¹

Navigation icons: back, forward, search, and a red semi-circle at the bottom.

Ref 1 (Slide Layer)

Vitamin K

1. Vitamin K
2. The Function of Vitamin K
3. Recommended Daily Intakes of Vitamin K
4. Sources of Vitamin K
5. Possible Causes of Vitamin K Deficiency
6. Deficiency of Vitamin K Results

1. Vitamin K

Martin CM, Lyle C. *Medical Nutrition Therapy and Assessment*. Elsevier; 2013. [Chapter 10: Nutrition Assessment and Management of the Patient with a Medical Nutrition Therapy](#). p. 10-10.

Navigation icons: back, forward, search, and a red semi-circle at the bottom.



[no notes on this page]

[no notes on this page]

Info (Slide Layer)



3.7 Summary



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4. MICRONUTRIENTS: WATER-SOLUBLE VITAMINS

4.1 Micronutrients: Water-soluble Vitamins

SEGMENT 03

Micronutrients: Water-soluble Vitamins

- Water-soluble vitamins include Vitamin C and Vitamin B complex.
- Which is found in many foods, especially vegetables and fruits, as well as meat, liver, eggs, fortified cereals, and cereals.



4.2 Check Your Knowledge

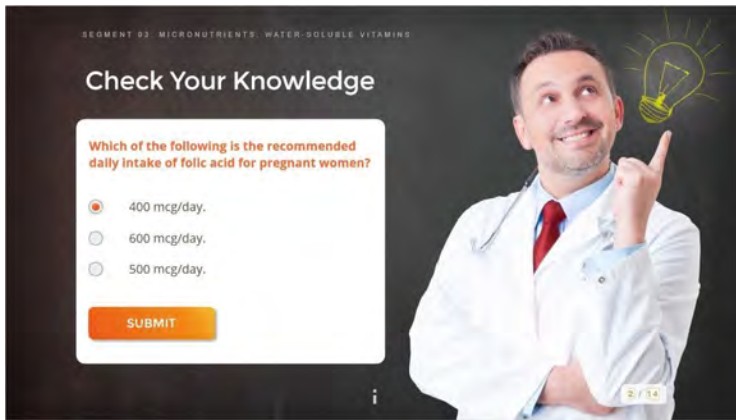
(Multiple Choice, 10 points, 1 attempt permitted)

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Correct	Choice
X	400 mcg/day.
	600 mcg/day.
	500 mcg/day.

Feedback when correct:

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Feedback when incorrect:

Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

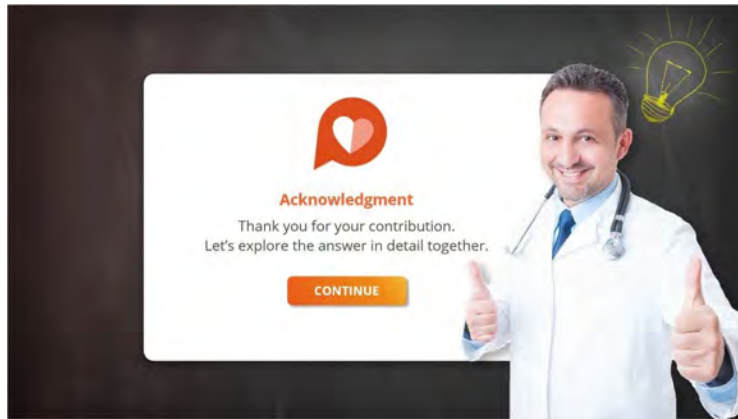
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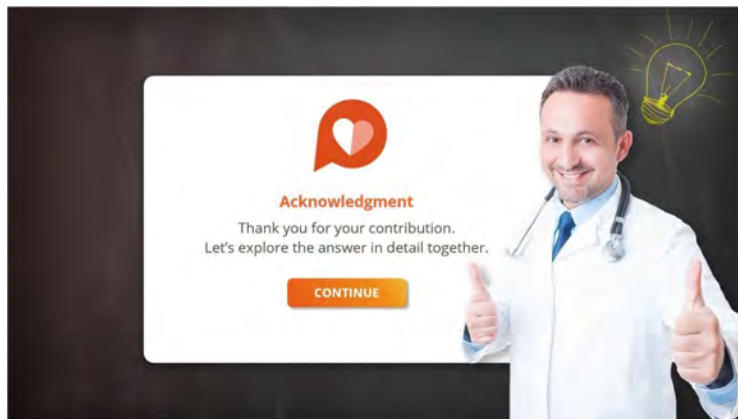
[no notes on this page]

[no notes on this page]

Correct (Slide Layer)



Incorrect (Slide Layer)



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[no notes on this page]

Info (Slide Layer)

SEGMENT 03: MICRONUTRIENTS: WATER-SOLUBLE VITAMINS

Check Your Knowledge

Which of the following is the recommended daily intake of folic acid for pregnant women?

- 400 mcg/day.
- 600 mcg/day.
- 500 mcg/day.

SUBMIT

Choose the correct answer

2 / 14

Acknowledgment 1 (Slide Layer)

Acknowledgment

Thank you for your contribution.
Let's explore the answer in detail together.

CONTINUE

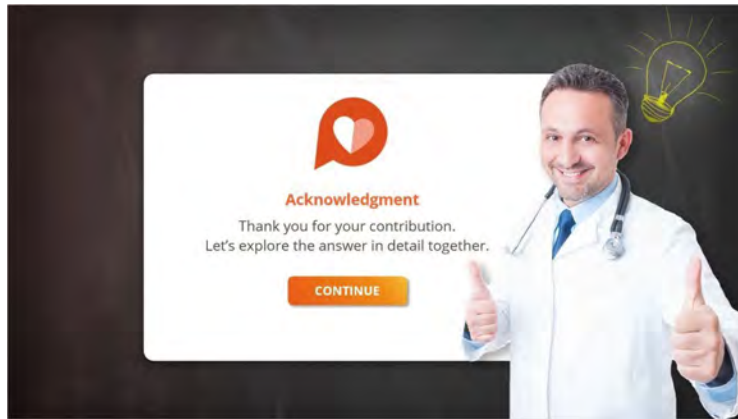
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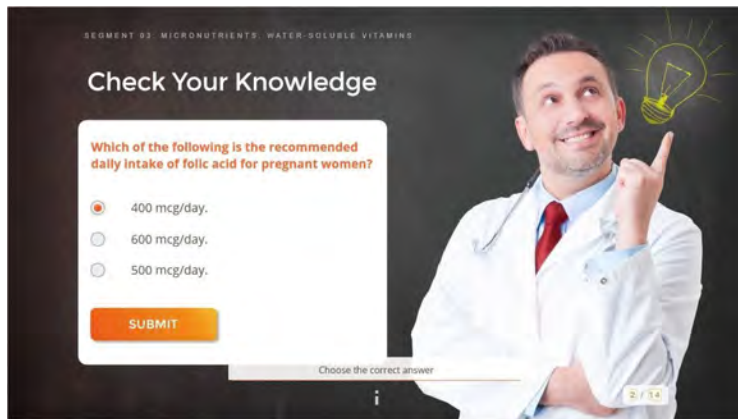
[no notes on this page]

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Acknowledgment (Slide Layer)



Info - Copy (Slide Layer)



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4.3 Vitamin B Complex

The vitamin B complex is vital for normal body growth and development, healthy skin, the proper function of nerves and the heart, and red blood cell formation.¹

There are several types of vitamin B complex:¹

1. Thiamin (vitamin B1).
2. Riboflavin (vitamin B2).
3. Niacin (vitamin B3).
4. Pantothenic acid (vitamin B5).
5. Pyridoxine (vitamin B6).
6. Biotin (vitamin B7).
7. Folic acid (vitamin B9).
8. Cobalamin (vitamin B12).

1. National Institutes of Health. (2019). Vitamin B complex. <https://ods.od.nih.gov/factsheets/vitaminbcomplex/>

© 2019

Info (Slide Layer)

The vitamin B complex is vital for normal body growth and development, healthy skin, the proper function of nerves and the heart, and red blood cell formation.¹

There are several types of vitamin B complex:¹

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2. Riboflavin (vitamin B2).
3. Niacin (vitamin B3).
4. Pantothenic acid (vitamin B5).
5. Pyridoxine (vitamin B6).
6. Biotin (vitamin B7).
7. Folic acid (vitamin B9).
8. Cobalamin (vitamin B12).

1. National Institutes of Health. (2019). Vitamin B complex. <https://ods.od.nih.gov/factsheets/vitaminbcomplex/>

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Click on the buttons above for more info.



Ref 1 (Slide Layer)

APRENDO CON MODOVIVO.COM

Vitamin B Complex

The vitamin B complex is vital for normal body growth and development, healthy skin, the proper function of nerves and the heart, and red blood cell formation.¹

There are several types of vitamin B complex:¹

1. Thiamin (vitamin B1).
2. Riboflavin (vitamin B2).
3. Niacin (vitamin B3).
4. Pantothenic acid (vitamin B5).
5. Pyridoxine (vitamin B6).

1. MedlinePlus. (2019, March 14). <https://medlineplus.gov/healthguides/healthguides/vitamin-b-complex.html>. Retrieved from <https://medlineplus.gov/healthguides/healthguides/vitamin-b-complex.html>



4.4 Thiamin


APRENDO CON MODOVIVO.COM

Thiamin

Thiamin (or thiamine) is one of the water-soluble B vitamins. It is also known as vitamin B1.¹

Functions of Vitamin B1¹

- Energy transformation.
- Membrane and nerve conduction.
- A major role in carbohydrate metabolism.
- Serving as coenzyme for the oxidative decarboxylation of α -ketoacids and for the activity of transketolase in the pentose phosphate pathway.¹



Untitled Layer 1 (Slide Layer)

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Thiamin

Recommended Daily Intakes of Vitamin B1

- Adult men: 1.2 mg /day.
- Adult women: 1.1 mg/day.
- Pregnant women: 1.4 mg /day.
- Lactating women: 1.5 mg/day.¹

Sources of Vitamin B1

- Enriched whole grain products.
- Pork products.
- Sunflower seeds.
- Wheat germ.¹



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Thiamin

Possible Causes of Vitamin B1 Deficiency

- Gastric bypass surgery, also called beriberi for obesity.
- Ethanol abuse can cause Wernicke encephalopathy.
- Drug and nutrient interactions furosemide treatment has been shown to cause thiamine deficiency.
- **There are several other causes of thiamine deficiency:**
 - Patients receiving long-term dialysis.
 - Patients with malabsorption.
 - Patients recurrent vomiting.
 - Patients receiving insufficient thiamine supplementation during multivitamin injections.¹



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Untitled Layer 3 (Slide Layer)

LEARN | KNOW | UNDERSTAND | INTERACT | APPLY | EVALUATE

Thiamin

Deficiency of Vitamin B1 Results

- Fatal **lactic acidosis**.
- Neurological diseases such as:
 - o **Beriberi**.
 - o **Wernicke encephalopathy**.^{1,9}



LEARN | KNOW | UNDERSTAND | INTERACT | APPLY | EVALUATE

Thiamin

Thiamin (or thiamine) is one of the water-soluble B vitamins. It is also known as vitamin B1.¹

Functions of Vitamin B1

- Energy transformation.
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- A major role in carbohydrate metabolism.
- Serving as coenzyme for the oxidative decarboxylation of α -ketoacids and for the activity of transketolase in the pentose phosphate pathway.¹



Interact with arrows above for more info.



Ref 1 (Slide Layer)


Thiamin

Thiamin (or thiamine) is one of the water-soluble B vitamins. It is also known as vitamin B1.¹

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- Energy transformation.
- Membrane and nerve conduction.
- A major role in carbohydrate metabolism.
- Serving as coenzyme for the oxidative decarboxylation of α -ketoacids and for the activity of transketolase in the pentose phosphate

1. Mente EM, Lind EA. Medical Biochemistry and Physiology: A Practical Approach. London: Taylor & Francis; 2008: 101-102.



Lactic acidosis (Slide Layer)

Thiamin


Thiamin (or thiamine) is one of the water-soluble B vitamins. It is also known as vitamin B1.¹

Functions of Vitamin B1

- Energy transformation.
- Membrane and nerve conduction.
- A major role in carbohydrate metabolism.
- Serving as coenzyme for the oxidative decarboxylation of α -ketoacids and for the activity of transketolase in the pentose phosphate pathway.¹

Lactic acidosis:
A condition characterized by the accumulation of lactic acid in body tissues.

1. Mente EM, Lind EA. Medical Biochemistry and Physiology: A Practical Approach. London: Taylor & Francis; 2008: 101-102.



Ref 9 (Slide Layer)

Thiamin

Thiamin (or thiamine) is one of the water-soluble B vitamins. It is also known as vitamin B1.¹

Functions of Vitamin B1

- Energy transformation.
- Membrane and nerve conduction.
- A major role in carbohydrate metabolism.
- Serving as coenzyme for the oxidative decarboxylation of α -ketoacids and for the activity of transketolase in the pentose phosphate

The slide features a woman in a white lab coat holding a stethoscope and a yellow object, standing next to a large orange and purple graphic element.

4.5 Riboflavin

Riboflavin

- RIBOFLAVIN
- FUNCTIONS
- RECOMMENDED
- SOURCES
- CAUSES
- DEFICIENCY

The slide features a woman in a white lab coat holding a stethoscope and a yellow object, standing next to a large orange and purple graphic element.



Untitled Layer 1 (Slide Layer)



GENERAL INFORMATION | FUNCTIONS | RECOMMENDED | SOURCES | CAUSES | DEFICIENCY

Riboflavin

RIBOFLAVIN

FUNCTIONS

RECOMMENDED

SOURCES

CAUSES

DEFICIENCY

Riboflavin

- Riboflavin is one of the water-soluble B vitamins. It is also known as vitamin B2.¹

1 / 74

A slide titled "Riboflavin" with a navigation menu on the left. The menu items are: RIBOFLAVIN (highlighted), FUNCTIONS, RECOMMENDED, SOURCES, CAUSES, and DEFICIENCY. The main content area shows the title "Riboflavin" and a single bullet point: "Riboflavin is one of the water-soluble B vitamins. It is also known as vitamin B2.¹". On the right, a female doctor in a white coat holds a plate of fresh vegetables. The slide number "1 / 74" is at the bottom right.

Untitled Layer 2 (Slide Layer)



GENERAL INFORMATION | FUNCTIONS | RECOMMENDED | SOURCES | CAUSES | DEFICIENCY

Riboflavin

RIBOFLAVIN

FUNCTIONS

RECOMMENDED

SOURCES

CAUSES

DEFICIENCY

Functions of Vitamin B2

- As electron transfer for oxidation-reduction reactions.
- A major player in macronutrient metabolism.
- Electron transport chain to produce adenosine triphosphate (ATP).
- It has antioxidant activity.¹

1 / 74

A slide titled "Riboflavin" with a navigation menu on the left. The menu items are: RIBOFLAVIN, FUNCTIONS (highlighted), RECOMMENDED, SOURCES, CAUSES, and DEFICIENCY. The main content area shows the title "Riboflavin" and a sub-header "Functions of Vitamin B2" followed by four bullet points: "As electron transfer for oxidation-reduction reactions.", "A major player in macronutrient metabolism.", "Electron transport chain to produce adenosine triphosphate (ATP).", and "It has antioxidant activity.¹". On the right, a female doctor in a white coat holds a pineapple. The slide number "1 / 74" is at the bottom right.



Untitled Layer 3 (Slide Layer)

4800010 - 001 - 11/20/2019 11:58:00 AM - 11/20/2019 11:58:00 AM

Riboflavin

RIBOFLAVIN

FUNCTIONS

RECOMMENDED

SOURCES

CAUSES

DEFICIENCY

Recommended Daily Intakes of Vitamin B2

- Adult men 1.3 mg/day.
- Adult women 1.1 mg/day.¹

1/7/14

A doctor in a white lab coat stands next to a shopping cart filled with fresh produce, including apples, oranges, and leafy greens. He is giving a thumbs up. The background features a large purple circular graphic.

Untitled Layer 4 (Slide Layer)

4800010 - 001 - 11/20/2019 11:58:00 AM - 11/20/2019 11:58:00 AM

Riboflavin

RIBOFLAVIN

FUNCTIONS

RECOMMENDED

SOURCES

CAUSES

DEFICIENCY

Sources of Vitamin B2

- Organ meats.
- Milk.
- Bread products.
- Cereals.¹

1/7/14

A doctor in a white lab coat holds a bunch of fresh green leafy vegetables. The background features a large purple circular graphic.



[no notes on this page]

[no notes on this page]

Untitled Layer 2 (Slide Layer)

SECTION 02 - MICROBIOLOGY (PARTS) (L20202) (STANDARD)

Niacin

Recommended Daily Intakes of Vitamin B3

- Adult men: 16 mg/day.
- Adult women: 14 mg/day.
- Pregnant women: 18 mg/day.
- Lactating women: 17 mg/day.¹



2

SECTION 02 - MICROBIOLOGY (PARTS) (L20202) (STANDARD)

Niacin

Sources of Vitamin B3

- Meat.
- Fish.
- Chicken.
- Fortified breads.
- Cereals.¹



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Pellagra (Slide Layer)

RESEARCH | ONLINE | MICHIGAN STATE UNIVERSITY | BIRMINGHAM

Niacin

Niacin is one of the water-soluble B vitamins. It is also known as vitamin B3.¹

Pellagra:
A disease marked by dermatitis, gastrointestinal disorders, and mental disturbances and associated with a diet deficient in niacin.



Ref 10 (Slide Layer)

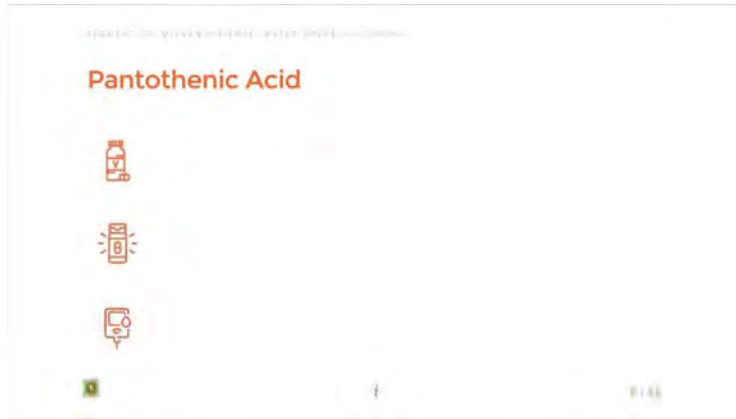
RESEARCH | ONLINE | MICHIGAN STATE UNIVERSITY | BIRMINGHAM

Niacin

Niacin is one of the water-soluble B vitamins. It is also known as vitamin B3.¹



4.7 Pantothenic Acid



Untitled Layer 1 (Slide Layer)

Pantothenic Acid

Pantothenic Acid

- Pantothenic acid is one of the water-soluble B vitamins. It is also known as vitamin B5.¹

Functions of Vitamin B5

- Involved in energy from fats, carbohydrates, and ketogenic amino acids.
- Heme and sterol synthesis.
- It is required for the synthesis of bile salts, cholesterol, and steroid hormones.
- Transport of long fatty acids to mitochondria for catabolism through beta-oxidation.¹



Untitled Layer 2 (Slide Layer)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

Pantothenic Acid



Recommended Daily Intakes of Vitamin B5

- Adult men and women: 5 mg/day.
- Pregnant women: 6 mg/day.
- Lactating women: 7 mg/day.*

Sources of Vitamin B5


- Sunflower seeds.
- Mushrooms.
- Eggs.
- Milk.¹
- Beef liver.
- Peanuts.
- Broccoli.

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

Untitled Layer 3 (Slide Layer)

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

Pantothenic Acid



Possible Causes of Vitamin B5 Deficiency

- Diabetes mellitus.
- Inflammatory bowel disease (IBD).
- Alcoholism.
- Medication-nutrient interactions such as tetracycline (antibiotic).¹

Deficiency of Vitamin B5 Results

- Neuromuscular disturbance.
- Restlessness.
- Muscle cramp.
- Nausea.
- Fatigue.
- Mental depression.
- Sleep disturbance.
- Abdominal cramp.
- Vomiting.
- Compressed immune function.⁴

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100



Info (Slide Layer)

PANTOTHENIC ACID

Pantothenic Acid

Hover your mouse over the icons above for more info.

Ref 1 (Slide Layer)

PANTOTHENIC ACID

Pantothenic Acid

Muller DM, Lutz M. Molar Mass, Density and Refractive Index of Pantothenic Acid. *J Pharm Biomed Anal*. 2015;111:102-105. doi:10.1016/j.jpba.2015.05.011

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[no notes on this page]

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4.8 Pyridoxine

Pyridoxine

Pyridoxine

- Pyridoxine is one of the water-soluble B vitamins. It is also known as vitamin B6.¹

Functions of Vitamin B6

- Necessary in more than 100 enzymatic reactions not limited to protein and fat metabolism.
- The development of the central nervous system and the formation of neurotransmitters.
- Has a normal immune function.¹

Untitled Layer 1 (Slide Layer)

Pyridoxine

Recommended Daily Intakes of Vitamin B6

- Men 50 years or younger: 1.3 mg/ day.
- Men older than 50 years: 1.7 mg/ day.
- Women older than 50 years: 1.9 mg/ day.
- Pregnant women: 1.9 mg/ day.
- Lactating women: 2.0 mg/ day.¹

Sources of Vitamin B6

- Fortified cereals.
- Organ meats.
- Whole grains.¹

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Untitled Layer 2 (Slide Layer)

Pyridoxine

Possible Causes of Vitamin B6 Deficiency

- Alcoholism.
- Renal patients maintained on dialysis.
- Older adults.
- Medication-nutrient interactions.¹

Deficiency of Vitamin B6 Results

- Epileptiform convulsion.
- Confusion.
- Depression.
- Microcytic anemia.¹

Info (Slide Layer)

Pyridoxine

Pyridoxine

- Pyridoxine is one of the water-soluble B vitamins. It is also known as vitamin B6.¹

Functions of Vitamin B6

- Necessary in more than 100 enzymatic reactions not limited to protein and fat metabolism.
- The development of the central nervous system and the formation of neurotransmitters.
- Has a normal immune function.¹

Interact with the arrows above for more info.

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Ref 1 (Slide Layer)

Pyridoxine

Pyridoxine is one of the water-soluble B vitamins. It is also known as vitamin B6.¹

Functions of Vitamin B6

- Necessary in more than 100 enzymatic reactions not limited to protein and fat metabolism.
- The development of the central nervous system and the formation of neurotransmitters.
- Has a normal immune function.²

1. MARRAS, G.M., J. J. AND (Eds.) (2019) 'Nutrition and Health: A Practical Approach', 2nd Edition, CRC Press, Boca Raton, FL, USA, pp. 1-10.

4.9 Biotin

Biotin

Biotin is one of the water-soluble B vitamins. It is also known as vitamin B7.¹

Functions of Vitamin B7

- Gene expression of more than 2000 enzymes.
- Cofactor of four carboxylase enzymes in mammalian systems.²



Untitled Layer 1 (Slide Layer)

EXERCISE 11: WATER-SOLUBLE VITAMINS

Biotin

Recommended Daily Intakes of Vitamin B7

- For men and nonpregnant women: 30 mcg/ day.
- Pregnant women: 35 mcg/ day.¹

Sources of Vitamin B7

- Liver.
- Smaller amounts are also found in other cuts of meat and in fruits.¹



0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

8 / 14

Untitled Layer 2 (Slide Layer)

EXERCISE 11: WATER-SOLUBLE VITAMINS



Biotin

Possible Causes of Vitamin B7 Deficiency

- Deficiency is rare because biotin is synthesized by coliform bacteria but may occur due to:
 - Alcoholism.
 - In patients with partial gastrectomy.
 - Medication-nutrient interactions such as carbamazepine (antiepileptic).¹

Deficiency of Vitamin B7 Results

- Nervous instability.
- Hallucination.
- Dementia.
- Depression.



0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

8 / 14



Info (Slide Layer)

Biotin

Biotin is one of the water-soluble B vitamins. It is also known as vitamin B7.¹

Functions of Vitamin B7

- Gene expression of more than 2000 enzymes.
- Cofactor of four carboxylase enzymes in mammalian systems.¹

Click on the icons in the rounded rectangles above for more info.

1. MATHIAS, D.M. (2002) Biotin: A Multifunctional and Pleiotropic Cofactor with Implications for Gene Expression and Human Health. *Journal of Cellular Biochemistry* 84: 1-10.

The slide features a purple semi-circle at the top right and an orange semi-circle at the bottom left. It contains two orange rounded rectangles with icons: a bottle with a drop and a bandage. A small information icon is at the bottom center.

Ref 1 (Slide Layer)

Biotin

Biotin is one of the water-soluble B vitamins. It is also known as vitamin B7.¹

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1. MATHIAS, D.M. (2002) Biotin: A Multifunctional and Pleiotropic Cofactor with Implications for Gene Expression and Human Health. *Journal of Cellular Biochemistry* 84: 1-10.

The slide features a purple semi-circle at the top right and an orange semi-circle at the bottom left. It contains two orange rounded rectangles with icons: a bottle with a drop and a bandage. A small information icon is at the bottom center.



4.10 Folic Acid

Folic Acid

Folic acid is one of the water-soluble B vitamins. It is also known as vitamin B9.¹

Functions of Vitamin B9

- As a coenzyme in the transfer of a single carbon from one compound to another for amino acid metabolism and DNA synthesis.
- Donates a methyl group to cobalamin (B12) to replenish methionine from homocysteine.¹

1

Untitled Layer 1 (Slide Layer)

Folic Acid

Recommended Daily Intakes of Vitamin B9

- Adult men and women: 400 mcg **DFE**.
- Pregnant women: 600 mcg DFE.
- Lactating women: 500 mcg DFE.¹

Sources of Vitamin B9

- Enriched grain foods.
- Dark-green leafy vegetables.
- Fortified cereals.¹

2

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Untitled Layer 2 (Slide Layer)



Slide content for Folic Acid: Possible Causes of Vitamin B9 Deficiency. The slide features a woman in a white lab coat holding a plate of vegetables (broccoli, tomatoes, and bell peppers) on the left. The title "Folic Acid" is in orange. Below it, the text "Possible Causes of Vitamin B9 Deficiency" is followed by a bulleted list: "Pregnant women.", "Premenopausal women.", "Nutrient-nutrient interactions.", and "Medication-nutrient interactions.¹". A navigation bar at the bottom shows a red dot on a line, a small 'f' icon, and a "10 / 14" indicator.

Untitled Layer 3 (Slide Layer)



Slide content for Folic Acid: Deficiency of vitamin B9 results. The slide features a woman in a white lab coat holding a plate of vegetables (broccoli, tomatoes, and bell peppers) on the left. The title "Folic Acid" is in orange. Below it, the text "Deficiency of vitamin B9 results" is followed by a bulleted list: "Neural tube defects (NTDS) are caused during fetal development in pregnant women.", "Megaloblastic anemia or megaloblastic anemia,¹¹", "Immune-mediated inhibition (neutrophil cells).", "Weight loss.", "Cardiovascular disease.", and "Nervous instability.¹". A navigation bar at the bottom shows a red dot on a line, a small 'f' icon, and a "10 / 14" indicator.



Info (Slide Layer)

Folic Acid

Folic acid is one of the water-soluble B vitamins. It is also known as vitamin B9.¹

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Drag the knob in the slider above to the right and left for more info.

1. Martin JB, Jiro D. *Medical Nutrition and Pharmacology: A Practical Approach to Parenteral and Enteral Nutrition*. 1st ed. London: Taylor & Francis; 2010.

Ref 1 (Slide Layer)

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Megaloblast anemia (Slide Layer)

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- Donates a methyl group to cobalamin (B12) to replenish methionine from homocysteine.¹

Megaloblast anemia:
A large erythroblast that appears in the blood especially in pernicious anemia.

1. Nutrition Center. Medical Definition of Megaloblast anemia.

Ref 11 (Slide Layer)

Folic Acid

Folic acid is one of the water-soluble B vitamins. It is also known as vitamin B9.¹

Functions of Vitamin B9

- As a coenzyme in the transfer of a single carbon from one compound to another for amino acid metabolism and DNA synthesis.
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1. Nutrition Center. Medical Definition of Megaloblast anemia.



DFE (Slide Layer)

Folic Acid

Folic acid is one of the water-soluble B vitamins. It is also known as vitamin B9.¹

Functions:

- 1 As a coenzyme, it transfers a single carbon from one compound to another for amino acid metabolism and DNA synthesis.
- 2 Donates a methyl group to cobalamin (B12) to replenish methionine from homocysteine.¹

DFE: Dietary folate equivalents

1 of 14

Info - Copy (Slide Layer)

Folic Acid

Folic acid is one of the water-soluble B vitamins. It is also known as vitamin B9.¹

Functions of Vitamin B9

- 1 As a coenzyme in the transfer of a single carbon from one compound to another for amino acid metabolism and DNA synthesis.
- 2 Donates a methyl group to cobalamin (B12) to replenish methionine from homocysteine.¹

Drag the knob in the slider to the right and left for more info.

1 of 14



Untitled Layer 2 (Slide Layer)

Cobalamin

Possible Causes of Vitamin B12 Deficiency

- Gastrectomy.
- Crohn's disease.
- Malabsorption syndromes.
- Vegetarian populations.
- Medication-nutrient interactions.¹

Deficiency of Vitamin B12 Results

- Bone fracture.
- Poor memory.
- Confusion.
- Depression.

Megaloblastic anemia.

3 / 4

1 2 3

i

A doctor in a white coat and glasses, holding a basket of fresh fruits and vegetables, giving a thumbs up. The background is white with a large purple curved line on the right side.

Info (Slide Layer)

Cobalamin

Cobalamin is one of the water-soluble B vitamins. It is also known as vitamin B12.¹

Functions of Vitamin B12

- Convert homocysteine to the benign amino acid methionine.
- Conversion of 5-methyltetrahydrofolate to its active form tetrahydrofolate THF.¹

Interact with the arrows above for more info.

1

i

A doctor in a white coat and glasses, holding a basket of fresh fruits and vegetables, giving a thumbs up. The background is white with a large purple curved line on the right side.



Leukopenia (Slide Layer)

Cobalamin

Cobalamin is one of the water-soluble B vitamins. It is also known as vitamin B12.¹

Functions of Vitamin B12

- Convert homocysteine to the benign methionine.
- Conversion of 5-methyltetrahydrofolate form tetrahydrofolate THF.¹

Leukopenia

A condition in which the number of white blood cells circulating in the blood is abnormally low.

1 / 3

The slide features a doctor in a white coat and glasses, holding a shopping basket full of fruits and vegetables. The background is white with decorative curved lines in orange and purple.

Ref 12 (Slide Layer)

Cobalamin

Cobalamin is one of the water-soluble B vitamins. It is also known as vitamin B12.¹

Functions of Vitamin B12

- Convert homocysteine to the benign amino acid methionine.
- Conversion of 5-methyltetrahydrofolate to its active form tetrahydrofolate THF.¹

1 / 3

The slide features a doctor in a white coat and glasses, holding a shopping basket full of fruits and vegetables. The background is white with decorative curved lines in orange and purple.



Ref 13 (Slide Layer)

Cobalamin

Cobalamin is one of the water-soluble B vitamins. It is also known as vitamin B12.¹

Functions of Vitamin B12

- Convert homocysteine to the benign amino acid methionine.
- Conversion of 5-methyltetrahydrofolate to its active form tetrahydrofolate THF.¹

The slide includes a photograph of a male doctor in a white lab coat and glasses, giving a thumbs-up and holding a shopping cart filled with fresh produce. The background features decorative curved lines in orange and purple.

4.12 Choline

Choline

- Choline is an essential nutrient that is naturally present in some foods and available as a dietary supplement.¹

The slide features a central orange rounded rectangle containing a white pill icon and the word 'Choline'. To the right, there is a blurred image of a product box. The slide has a clean, modern design with a white background and orange accents.



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Untitled Layer 1 (Slide Layer)

Choline

Functions of Choline

- Neurotransmitter synthesis (acetylcholine), cell membrane signaling (phospholipids), and transport of lipids (lipoproteins).
- Acts as an alternative to Vitamin B12 in replenishing methionine.¹

12 / 14

Untitled Layer 2 (Slide Layer)

Choline

Recommended Daily Intakes of Choline

- Adult men 550 mg/ day.
- Adult women 425 mg/ day.¹

12 / 14



Untitled Layer 3 (Slide Layer)

Choline

Sources of Vitamin Choline

- Milk.
- Liver.
- Eggs.
- Peanuts.¹

12 / 14

This slide is part of a presentation on Choline. It features a central orange box with a white icon of a bottle and the title 'Sources of Vitamin Choline'. Below the title is a bulleted list of food sources: Milk, Liver, Eggs, and Peanuts. The slide is numbered 12 out of 14.

Untitled Layer 4 (Slide Layer)

Choline

Possible Causes of Choline Deficiency

- Pregnancy.
- Lactation.
- Postmenopausal women.
- Hypermetabolic states.¹

12 / 14

This slide is part of a presentation on Choline. It features a central orange box with a white icon of a scale and the title 'Possible Causes of Choline Deficiency'. Below the title is a bulleted list of causes: Pregnancy, Lactation, Postmenopausal women, and Hypermetabolic states. The slide is numbered 12 out of 14.



Untitled Layer 5 (Slide Layer)

Choline

Deficiency of Choline Results

Development of diseases such as:

- Liver disease,
- Atherosclerosis,¹¹
- Neurologic disorders e.g. (Alzheimer's disease, and memory problems).¹

12 / 14

Info (Slide Layer)

Choline

- Choline is an essential nutrient that is naturally present in some foods and available as a dietary supplement.¹

Interact with the arrows above for more info.

12 / 14



[no notes on this page]

[no notes on this page]

Ref 1 (Slide Layer)

Choline

- Choline is an essential nutrient that is naturally present in some foods and available as a dietary supplement.*

*Mandel, JM, Lyle, DA, Mandel, M, McQueen, and Miller, K. (2019). Adult nutrition support care curriculum. American Society for Parenteral and Enteral Nutrition. Unit 5.

Atherosclerosis (Slide Layer)

Choline

Atherosclerosis:
Atherosclerosis characterized by atheromatous deposits in and fibrosis of the inner layer of the arteries.

- Choline is an essential nutrient that is naturally present in some foods and available as a dietary supplement.*



[no notes on this page]

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Ref 14 (Slide Layer)

Choline

Choline

- Choline is an essential nutrient that is naturally present in some foods and available as a dietary supplement.¹

14. Merriam-Webster. Definition of choline. (2022).

12 / 14

4.13 Vitamin C

Vitamin C

Vitamin C

- Vitamin C, or ascorbic acid, is a water-soluble vitamin.¹

Functions of Vitamin C

- Serves as an antioxidant.
- Synthesis of collagen, carnitine, and neurotransmitters.
- Enhancement of intestinal absorption of nonheme iron.
- Cholesterol hydroxylation into bile acids.
- The reduction of toxic transition.
- Immune mediated and antibacterial functions of white blood cells.¹

13 / 14



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Untitled Layer 1 (Slide Layer)

Vitamin C

Recommended Daily Intakes of Vitamin C

- Adult men: 90 mg / day.
- Adult women 75 mg/ day.
- Pregnant women: 100 mg/ day.
- Lactating women: 120 mg/day.¹

Sources of Vitamin C

- Citrus fruit.
- Other fruits and vegetables.¹

13 / 14

Untitled Layer 2 (Slide Layer)

Vitamin C

Possible Causes of Vitamin C Deficiency

- Older adults.
- Malabsorptive disorders.
- Alcoholism.
- Type 2 diabetes mellitus.
- Certain types of cancer.
- Smoke tobacco.¹

Deficiency of Vitamin C Results

- Capillary rupture.
- Bleeding gum.
- Delayed wound healing and increased susceptibility to infection.¹

13 / 14



Info (Slide Layer)

Vitamin C

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- Vitamin C, or ascorbic acid, is a water-soluble vitamin.¹

Functions of Vitamin C

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- Immune mediated and antibacterial functions of white blood cells.²

Interact with the arrows above for more info.

  13 / 14

Ref 1 (Slide Layer)

Vitamin C

Vitamin C

- Vitamin C, or ascorbic acid, is a water-soluble vitamin.¹

Functions of Vitamin C

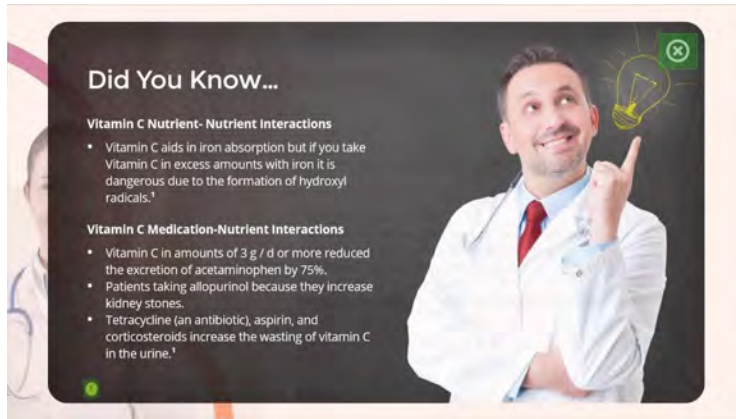
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- Synthesis of collagen, carnitine, and neurotransmitters.
- Enhancement of intestinal absorption of nonheme iron.
- Cholesterol hydroxylation into bile acids.
- The reduction of toxic transition.
- Immune mediated and antibacterial functions of white blood cells.²

1. MARIANO, LUIS (M. MARIANO, PH.D.) and MARIANO, ANDREA. Acid-base balance in human cardiovascular system. In: Parenteral and Enteral Nutrition, 2017.

  13 / 14



Did You Know (Slide Layer)



Did You Know...

Vitamin C Nutrient- Nutrient Interactions

- Vitamin C aids in iron absorption but if you take Vitamin C in excess amounts with iron it is dangerous due to the formation of hydroxyl radicals.¹

Vitamin C Medication-Nutrient Interactions

- Vitamin C in amounts of 3 g / d or more reduced the excretion of acetaminophen by 75%.
- Patients taking allopurinol because they increase kidney stones.
- Tetracycline (an antibiotic), aspirin, and corticosteroids increase the wasting of vitamin C in the urine.¹

Info - Copy (Slide Layer)



Vitamin C

Vitamin C

- Vitamin C, or ascorbic acid, is a water-soluble vitamin.¹

Functions of Vitamin C

- Serves as an antioxidant.
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- The reduction of toxic transition.
- Immune mediated and antibacterial functions of white blood cells.¹

Click on the icon at the upper right corner for more info.



Ref 1 - Copy (Slide Layer)

Vitamin C

Vitamin C

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- Immune-mediated and antibacterial functions of white blood cells.²

1. Murray RK, Van Vleet D, Mitchell M, McClellan J, and Moore S. The human body: an introduction to anatomy and physiology. American Society of Human Anatomy and Physiology. 2017.

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4.14 Summary

Summary

- Water-soluble vitamins that are not stored in the body and must be taken every day and easily disposed of or washed during food storage and preparation.
- These vitamins include vitamin c and eight types of vitamin B (thiamin, niacin, riboflavin, folate, vitamin b6, vitamin b12, biotin, and pantothenic acid).
- Malabsorption, medications, certain medical conditions, and alcohol can interfere with digestion and absorption of vitamins, thus altering vitamin requirements and nutritional status.

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5. MICRONUTRIENTS: MAJOR MINERALS

5.1 Micronutrients: Major Minerals

SEGMENT 02

Micronutrients: Major Minerals

- Electrolytes are minerals in your body that have an electric charge.
- Sodium, calcium, potassium, chloride, phosphate, and magnesium are all electrolytes.
- You get it from the foods you eat and the fluids you drink.




5.2 Why are Electrolytes Important?

SEGMENT 03

Why are Electrolytes Important?

Electrolytes are important for the following reasons:

- Balance the amount of water in your body.
- Balance the acid/basic level in the body.
- Transport nutrients into your cells.
- Move waste from your cells.
- Make sure your nerves, muscles, heart, and mind work the way they should.



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5.3 Sodium (Na+)

A screenshot of a presentation slide titled "Sodium (Na+)" in orange text. The slide features a list of six topics in a light gray box: 1. Sodium (Na+), 2. Functions of Sodium (Na+), 3. Hyponatremia, 4. Possible Causes of Hyponatremia, 5. Hypernatremia, and 6. Possible Causes of Hypernatremia. The slide has a decorative orange and purple curved graphic on the right side. At the bottom, there is a small green square icon, a magnifying glass icon, and a "8 / 8" indicator.

Info (Slide Layer)

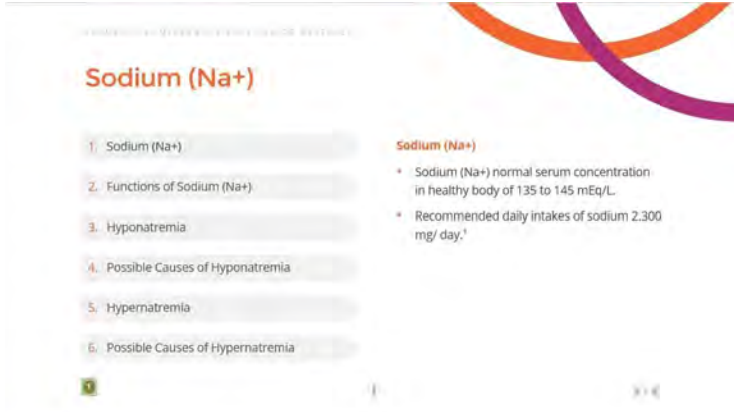
A screenshot of the same presentation slide as above, but with an information icon (a lowercase 'i' in a circle) highlighted over the sixth topic, "Possible Causes of Hypernatremia". A tooltip text "Hover your mouse over each topic for more details." is visible next to the icon. The slide also features the decorative orange and purple curved graphic on the right side. At the bottom, there is a small green square icon, the highlighted info icon, and a "8 / 8" indicator.



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Untitled Layer 1 (Slide Layer)



Navigation icons: back, forward, search, refresh, close.

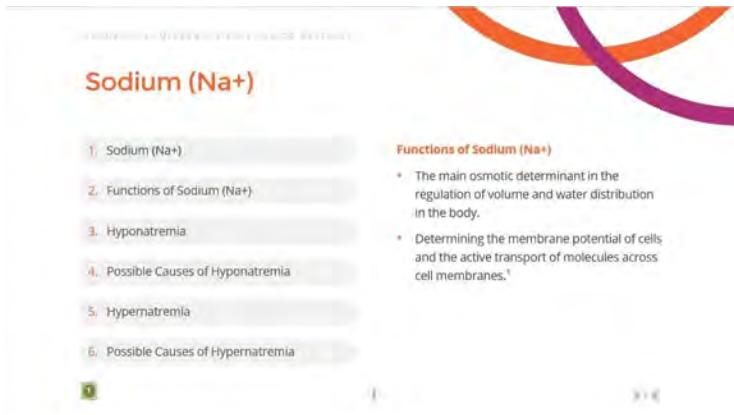
Sodium (Na⁺)

1. Sodium (Na⁺)
2. Functions of Sodium (Na⁺)
3. Hyponatremia
4. Possible Causes of Hyponatremia
5. Hypernatremia
6. Possible Causes of Hypernatremia

Sodium (Na⁺)

- Sodium (Na⁺) normal serum concentration in healthy body of 135 to 145 mEq/L.
- Recommended daily intakes of sodium 2,300 mg/day.¹

Untitled Layer 2 (Slide Layer)



Navigation icons: back, forward, search, refresh, close.

Sodium (Na⁺)

1. Sodium (Na⁺)
2. Functions of Sodium (Na⁺)
3. Hyponatremia
4. Possible Causes of Hyponatremia
5. Hypernatremia
6. Possible Causes of Hypernatremia

Functions of Sodium (Na⁺)

- The main osmotic determinant in the regulation of volume and water distribution in the body.
- Determining the membrane potential of cells and the active transport of molecules across cell membranes.¹



Untitled Layer 3 (Slide Layer)

Sodium (Na⁺)

1. Sodium (Na ⁺)	
2. Functions of Sodium (Na ⁺)	
3. Hyponatremia	
4. Possible Causes of Hyponatremia	
5. Hypernatremia	
6. Possible Causes of Hypernatremia	

Hyponatremia

- Hyponatremia (serum sodium concentration less than 135 mEq/L) occurs in 25% of hospitalized patients.¹

Untitled Layer 4 (Slide Layer)

Sodium (Na⁺)

1. Sodium (Na ⁺)	
2. Functions of Sodium (Na ⁺)	
3. Hyponatremia	
4. Possible Causes of Hyponatremia	
5. Hypernatremia	
6. Possible Causes of Hypernatremia	

Possible Causes of Hyponatremia

- Diuretic use.
- Diarrhea.
- Gastric fistula output.
- Excessive sweating.
- Burns.
- Fluid drains.
- Renal failure.
- Hepatic failure with ascites.
- Heart failure.
- CNS malignancies.
- Head trauma.
- Lung malignancies and pneumonia.
- Hypothyroidism.¹



Untitled Layer 5 (Slide Layer)

Sodium (Na⁺)

1. Sodium (Na ⁺)	Hypernatremia
2. Functions of Sodium (Na ⁺)	<ul style="list-style-type: none">• Hypernatremia is a serum sodium greater than 145 mEq/L occurs in approximately 2% of hospitalized patients.¹
3. Hyponatremia	
4. Possible Causes of Hyponatremia	
5. Hypernatremia	
6. Possible Causes of Hypernatremia	

Untitled Layer 6 (Slide Layer)

Sodium (Na⁺)

1. Sodium (Na ⁺)	Possible Causes of Hypernatremia
2. Functions of Sodium (Na ⁺)	<ul style="list-style-type: none">• Use of a diuretic and the diuresis of dissolved urine associated with hyperglycemia.• Diarrhea and excessive sweating.• diabetes insipidus.• Excessive isotonic or hypertonic sodium intake.• Malignant tumor of the adrenal gland.¹
3. Hyponatremia	
4. Possible Causes of Hyponatremia	
5. Hypernatremia	
6. Possible Causes of Hypernatremia	



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Ref 1 (Slide Layer)

ADDITIONAL VIDEO RESOURCES AVAILABLE

Sodium (Na⁺)

1. Sodium (Na⁺)
2. Functions of Sodium (Na⁺)
3. Hyponatremia
4. Possible Causes of Hyponatremia

Hyponatremia (low Na⁺) is a condition in which the sodium concentration in the blood is abnormally low. It is a common electrolyte imbalance that can be caused by a variety of factors, including excessive fluid intake, certain medications, and underlying medical conditions.

5.4 Potassium (K⁺)


ADDITIONAL VIDEO RESOURCES AVAILABLE

Potassium (K⁺)

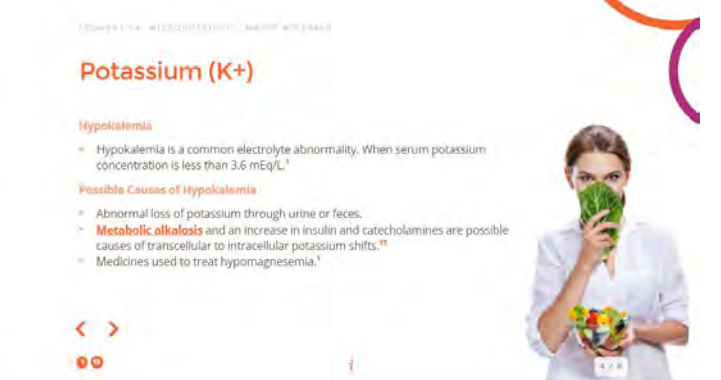
- Potassium (K⁺) normal serum concentration of 3.5 to 5 mEq/L
- Normal daily potassium requirements range from 0.5 to 2 mEq/kg, about 3,400 mg/day.¹

Functions of Potassium (K⁺)

- Cell metabolism, including protein and glycogen synthesis.
- Maintaining resting membrane potential is thus essential for normal neuromuscular function.¹



Untitled Layer 1 (Slide Layer)



LEARNING OBJECTIVES: KNOWLEDGE, SKILLS, ATTITUDE

Potassium (K⁺)


Hypokalemia

- Hypokalemia is a common electrolyte abnormality. When serum potassium concentration is less than 3.6 mEq/L.¹

Possible Causes of Hypokalemia

- Abnormal loss of potassium through urine or feces.
- **Metabolic alkalosis** and an increase in insulin and catecholamines are possible causes of transcellular to intracellular potassium shifts.¹²
- Medicines used to treat hypomagnesemia.¹

Navigation icons: back, forward, search, refresh.



Untitled Layer 2 (Slide Layer)



LEARNING OBJECTIVES: KNOWLEDGE, SKILLS, ATTITUDE

Potassium (K⁺)

Hyperkalemia

- Hyperkalemia when serum potassium greater than 5.0 mEq/L.³

Possible Causes of Hyperkalemia

- Chronic kidney failure.
- **Metabolic acidosis.**¹³
- False hyperkalemia.
- Trauma-related tissue breakdown during.
- Patients with **leukocytosis.**^{1,12}

Navigation icons: back, forward, search, refresh.



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Info (Slide Layer)

Potassium (K⁺)

- Potassium (K⁺) normal serum concentration of 3.5 to 5 mEq/L
- Normal daily potassium requirements range from 0.5 to 2 mEq/kg, about 3,400 mg/day.¹

Functions of Potassium (K⁺)

- Cell metabolism, including protein and glycogen synthesis.
- Maintaining resting membrane potential is thus essential for normal neuromuscular function.¹

Interact with arrows above for more info.

Ref 1 (Slide Layer)

Potassium (K⁺)

- Potassium (K⁺) normal serum concentration of 3.5 to 5 mEq/L
- Normal daily potassium requirements range from 0.5 to 2 mEq/kg, about 3,400 mg/day.¹

Functions of Potassium (K⁺)

- Cell metabolism, including protein and glycogen synthesis.
- Maintaining resting membrane potential is thus essential for normal neuromuscular function.¹

Medical Diet (MD) (M. Medical Nutrition and Metabolism)
A diet with potassium-based components: potassium
D. potassium with fluid balance.¹



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Metabolic acidosis (Slide Layer)

GENERAL AND MEDICAL SCIENCES - MAJOR SYSTEMS


Potassium (K⁺)

- Potassium normal serum concentration of 3.5 to 5 mEq/L
- Normal daily potassium requirements range from 0.5 to 2 mEq/kg, about 3,400 mg/day.¹

Metabolic acidosis: Acidosis resulting from excess acid due to abnormal metabolism, excessive acid intake, renal retention or from excessive loss of bicarbonate (e.g. diarrhea)

Functions of Potassium:

- Cell metabolism, including protein and glycogen synthesis.
- Maintaining resting membrane potential is thus essential for normal neuromuscular function.¹



Leukocytosis (Slide Layer)

GENERAL AND MEDICAL SCIENCES - MAJOR SYSTEMS


Potassium (K⁺)

- Potassium (K⁺) normal serum concentration of 3.5 to 5 mEq/L
- Normal daily potassium requirements range from 0.5 to 2 mEq/kg, about 3,400 mg/day.¹

Leukocytosis: An increase in the number of white blood cells in the circulating blood.

Functions of Potassium:

- Cell metabolism, including protein and glycogen synthesis.
- Maintaining resting membrane potential is thus essential for normal neuromuscular function.¹



Metabolic alkalosis (Slide Layer)

GENERAL AND MEDICAL PHYSIOLOGY: BASIC PRINCIPLES


Potassium (K⁺)

- Potassium (K⁺) normal serum concentration of 3.5 to 5 mEq/L
- Normal daily potassium requirements range from 0.5 to 2 mEq/kg, about 3,400 mg/day.¹

Metabolic alkalosis:
Alkalosis resulting from excessive alkali intake or excessive loss of acid from vomiting.

Functions of Potassium (K⁺):

- Cell metabolism, including protein and glycogen synthesis.
- Maintaining resting membrane potential is thus essential for normal neuromuscular function.¹



Ref 16 (Slide Layer)


GENERAL AND MEDICAL PHYSIOLOGY: BASIC PRINCIPLES

Potassium (K⁺)

- Potassium (K⁺) normal serum concentration of 3.5 to 5 mEq/L
- Normal daily potassium requirements range from 0.5 to 2 mEq/kg, about 3,400 mg/day.¹

Functions of Potassium (K⁺):

- Cell metabolism, including protein and glycogen synthesis.
- Maintaining resting membrane potential is thus essential for normal neuromuscular function.¹



Ref 17 (Slide Layer)

GENERAL: CAN. MED. ASSOC. JOURNAL: 2010; 163(11):1181-1184


Potassium (K⁺)

- Potassium (K⁺) normal serum concentration of 3.5 to 5 mEq/L
- Normal daily potassium requirements range from 0.5 to 2 mEq/kg, about 3,400 mg/day.¹

Functions of Potassium (K⁺)

- Cell metabolism, including protein and glycogen synthesis.
- Maintaining resting membrane potential is thus essential for normal neuromuscular function.¹

11. Nutrition Assessment: Overview of Assessment (2014)



Ref 15 (Slide Layer)

GENERAL: CAN. MED. ASSOC. JOURNAL: 2010; 163(11):1181-1184


Potassium (K⁺)

- Potassium (K⁺) normal serum concentration of 3.5 to 5 mEq/L
- Normal daily potassium requirements range from 0.5 to 2 mEq/kg, about 3,400 mg/day.¹

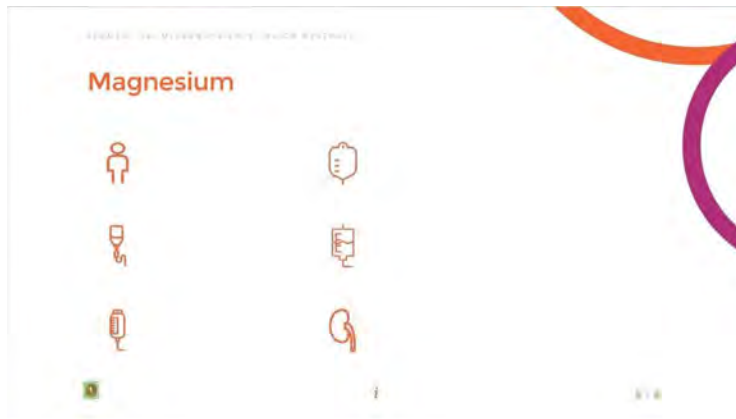
Functions of Potassium (K⁺)

- Cell metabolism, including protein and glycogen synthesis.
- Maintaining resting membrane potential is thus essential for normal neuromuscular function.¹

11. Nutrition Assessment: Overview of Assessment (2014)



5.5 Magnesium



Untitled Layer 1 (Slide Layer)

A slide titled "Magnesium" with a decorative orange and purple arc in the top right corner. The slide contains a diamond-shaped icon with a person inside, a brain icon, a hand holding a pill icon, a hand holding a syringe icon, and a hand holding a pill icon. The slide number "114" is visible in the bottom right corner.

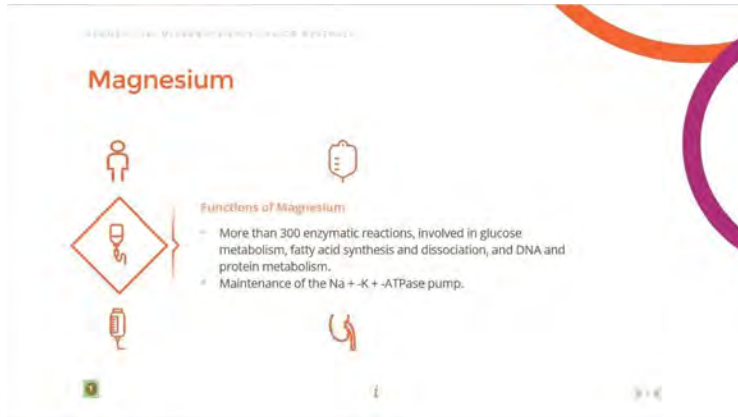
Magnesium

- Magnesium is crucial for your brain and body.
- Normal serum concentration of 1.8 to 2.8 mg/dL.
- Total body magnesium content is 25 g.
- RDA of magnesium:
 - Adult men 400-420 mg/day.
 - Women 310-320 mg/day.
 - Pregnancy requires about 350-360 mg/day.
 - Lactation 310-320 mg/day.²



Untitled Layer 2 (Slide Layer)

Magnesium



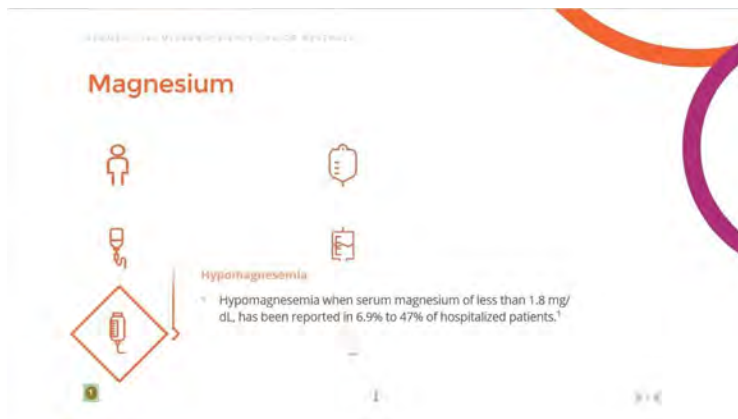
The slide features a central text box titled "Functions of Magnesium" with two bullet points. To the left, there is a diamond-shaped icon containing a syringe and a person icon. To the right, there are icons for a clipboard and a hand holding a pen. The slide is decorated with orange and purple curved shapes on the right side.

Functions of Magnesium

- More than 300 enzymatic reactions, involved in glucose metabolism, fatty acid synthesis and dissociation, and DNA and protein metabolism.
- Maintenance of the Na⁺-K⁺-ATPase pump.

Untitled Layer 3 (Slide Layer)

Magnesium



The slide features a central text box titled "Hypomagnesemia" with one bullet point. To the left, there is a diamond-shaped icon containing a syringe and a person icon. To the right, there are icons for a clipboard and a hand holding a pen. The slide is decorated with orange and purple curved shapes on the right side.

Hypomagnesemia

- Hypomagnesemia when serum magnesium of less than 1.8 mg/dL, has been reported in 6.9% to 47% of hospitalized patients.¹



Untitled Layer 4 (Slide Layer)

Magnesium

Possible Causes of Hypomagnesaemia:

- Prolonged administration of magnesium-free intravenous fluids.
- Colostomy and malabsorption syndromes.
- Acute tubular necrosis, renal tubular acidosis.
- Some medicines.¹

Untitled Layer 5 (Slide Layer)

Magnesium

Hypermagnesaemia

- Hypermagnesaemia occurs when serum magnesium greater than 2.8 mg/dL.¹



Untitled Layer 6 (Slide Layer)

Magnesium

Possible Causes of Hypomagnesemia

- Chronic kidney disease combination with magnesium intake.¹

This slide features a grid of six icons: a human figure, a kidney, a blood test tube, a syringe, a kidney, and a diamond-shaped icon with a kidney symbol. A callout box points to the diamond icon, listing a cause of hypomagnesemia. The slide includes a navigation bar at the bottom with a green square, a magnifying glass, and a close button.

Info (Slide Layer)

Magnesium

Hover your mouse over the icons above for more info.

This slide is identical to the one above but lacks the callout box. It features the same grid of six icons and the same navigation bar at the bottom.



Ref 1 (Slide Layer)

REQUIREMENTS: VIDEO/PHOTO/SLIDE/GRAPH/WEBPAGE

Magnesium





1. Magnesium (Mg) is a mineral necessary for energy production, ATP production, and protein synthesis. It is also essential for bone health and muscle function.

5.6 Calcium

REQUIREMENTS: VIDEO/PHOTO/SLIDE/GRAPH/WEBPAGE

Calcium

- Calcium: A mineral found mainly in the hard part of bones.
- Calcium (Ca²⁺) concentrations range from 8.6 to 10.2 mg/dL.
- RDA of calcium 1000 - 1200 mg/day.¹



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Untitled Layer 1 (Slide Layer)

LEARN BY MICROBIOLOGY @ CREDIT HOURS

Calcium

Functions of Calcium

- Preservation of cell membrane integrity.
- Neuromuscular activity.
- Regulation of endocrine secretory activities.
- Blood coagulation.
- Bone metabolism.¹



LEARN BY MICROBIOLOGY @ CREDIT HOURS

Calcium

Hypocalcemia

- Hypocalcemia occurs when serum calcium less than 8.6 mg/dL or ionized calcium less than 1.12 mmol/L.¹



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Untitled Layer 3 (Slide Layer)

... (unreadable) ...

Calcium

Possible Causes of Hypocalcemia

- Decreased vitamin D activity.
- Decreased parathyroid hormone activity.
- Citrate anticoagulation during continuous renal replacement therapy.
- Sepsis.
- Some drugs.¹



Untitled Layer 4 (Slide Layer)

... (unreadable) ...

Calcium

Hypercalcemia

- Hypercalcemia occurs when serum calcium greater than 10.2 mg/dL or ionized calcium greater than 1.3 mmol/L.¹



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Untitled Layer 5 (Slide Layer)

LEARNING OBJECTIVE: MICROELEMENTS (CALCIUM) PART 1

Calcium

Possible Causes of Hypercalcemia

- Hyperparathyroidism and cancer with bone metastases.
- It can also occur with toxic levels of vitamin A or vitamin D.
- Chronic ingestion of milk and/or calcium carbonate-containing antacids in the setting of renal insufficiency.
- Adrenal insufficiency.
- Tuberculosis.
- Some Medications.¹



... (Slide Layer)

LEARNING OBJECTIVE: MICROELEMENTS (CALCIUM) PART 2

Calcium

- Calcium: A mineral found mainly in the hard part of bones.
- Calcium (Ca²⁺) concentrations range from 8.6 to 10.2 mg/dL.
- RDA of calcium 1000 - 1200 mg/day.¹



Drag the knob in the dial above to the right and left for more info.



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Ref 1 (Slide Layer)

GENERAL SCIENCE: MICROBIOLOGY: GRADE 11/12

Calcium

- * Calcium: A mineral found mainly in the hard part of bones.
- * Calcium (Ca²⁺) concentrations range from 8.6 to 10.2 mg/dL.
- * RDA of calcium 1000 – 1200 mg/day.¹



1. Mendenhall CL, Lynd LA. Medical nutrition therapy and pharmacology. 4th ed. Adult nutrition support care conference. International Association of Parenteral and Enteral Nutritionists. 2011.

5.7 Phosphorus

GENERAL SCIENCE: MICROBIOLOGY: GRADE 11/12

Phosphorus

- PHOSPHORUS
- FUNCTIONS
- HYPOPHOSPHATEMIA
- POSSIBLE CAUSES
- HYPERPHOSPHATEMIA
- POSSIBLE CAUSES



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Untitled Layer 1 (Slide Layer)

Phosphorus

- PHOSPHORUS
- FUNCTIONS**
- HYPOPHOSPHATEMIA
- POSSIBLE CAUSES
- HYPERPHOSPHATEMIA
- POSSIBLE CAUSES

Phosphorus

- * Phosphorus is a mineral that naturally occurs in many foods and is also available as a supplement.
- * Phosphorus serum phosphorus concentration of 2.7 to 4.5 mg/dL.
- * RDA of phosphorus for adult 700mg/day.*

2 / 8

Untitled Layer 2 (Slide Layer)

Phosphorus

- PHOSPHORUS
- FUNCTIONS**
- HYPOPHOSPHATEMIA
- POSSIBLE CAUSES
- HYPERPHOSPHATEMIA
- POSSIBLE CAUSES

Functions of Magnesium

- * Bone and cell membrane composition and maintenance of normal PH.
- * Energy-rich bonds in the form of adenosine triphosphate.
- * Necessary for oxygen release from hemoglobin.
- * Neurologic and muscular function.¹

7 / 8



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Untitled Layer 3 (Slide Layer)

ELEMENT: 344 - METABOLISM/ENERGISTICS/ACID-BASE/MINERALS

Phosphorus

- PHOSPHORUS
- FUNCTIONS
- HYPOPHOSPHATEMIA
- POSSIBLE CAUSES
- HYPERPHOSPHATEMIA
- POSSIBLE CAUSES

Hypophosphatemia

- Hypophosphatemia occurs when serum phosphorus concentration less than 2.7 mg/dL.¹



Untitled Layer 4 (Slide Layer)


ELEMENT: 344 - METABOLISM/ENERGISTICS/ACID-BASE/MINERALS

Phosphorus

- PHOSPHORUS
- FUNCTIONS
- HYPOPHOSPHATEMIA
- POSSIBLE CAUSES
- HYPERPHOSPHATEMIA
- POSSIBLE CAUSES

Possible Causes of Hypophosphatemia

- Chronic alcoholism.
- Respiratory and metabolic alkalosis.¹
- After treatment of diabetic ketoacidosis.
- In patients receiving phosphate-bound drugs.¹
- Parenteral nutrition with insufficient amount of phosphate.¹



Untitled Layer 5 (Slide Layer)

GENERAL SCIENCE: SCIENCE OF LIFE

Phosphorus

- PHOSPHORUS
- FUNCTIONS
- HYPOPHOSPHATEMIA
- POSSIBLE CAUSES
- HYPERPHOSPHATEMIA
- POSSIBLE CAUSES

Hyperphosphatemia

- Hyperphosphatemia occurs when serum phosphorus greater than 4.5 mg/dL.¹



Untitled Layer 6 (Slide Layer)


GENERAL SCIENCE: SCIENCE OF LIFE

Phosphorus

- PHOSPHORUS
- FUNCTIONS
- HYPOPHOSPHATEMIA
- POSSIBLE CAUSES
- HYPERPHOSPHATEMIA
- POSSIBLE CAUSES

Possible Causes of Hyperphosphatemia

- Chronic kidney disease CKD.
- Cellular destruction, such as with massive trauma, cytotoxic agents (especially in the treatment of leukemias with large tumors).
- Hyper catabolism and malignant hyperthermia.
- The administration of large quantities of phosphate-containing laxatives or enemas.¹



Ref 15 (Slide Layer)

GENERAL SKILLS: MEDICINOTERMINOLOGY/ANATOMY/PHYSIOLOGY

Phosphorus

- PHOSPHORUS
- FUNCTIONS
- HYPOPHOSPHATEMIA
- POSSIBLE CAUSES
- HYPERPHOSPHATEMIA
- POSSIBLE CAUSES

HYPOPHOSPHATEMIA
Metabolic acidosis, Malnutrition, Dehydration of metabolic acidosis.

Metabolic acidosis (Slide Layer)

GENERAL SKILLS: MEDICINOTERMINOLOGY/ANATOMY/PHYSIOLOGY

Phosphorus

- PHOSPHORUS
- FUNCTIONS
- HYPOPHOSPHATEMIA
- POSSIBLE CAUSES
- HYPERPHOSPHATEMIA
- POSSIBLE CAUSES

Metabolic alkalosis:
Alkalosis resulting from excessive alkali intake or excessive acid loss (e.g. from vomiting).



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5.8 Summary



Info (Slide Layer)



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6. MICRONUTRIENTS: TRACE MINERALS

6.1 Micronutrients: Trace Minerals

SEGMENT 05

Micronutrients: Trace Minerals

- Trace elements are required for all aspects of metabolism.
- Trace elements are defined as minerals needed by humans in amounts less than 100 mg/day.
- These minerals include iron, zinc, copper, manganese, selenium, iodine, chromium, fluoride, and molybdenum.



6.2 Check Your Knowledge

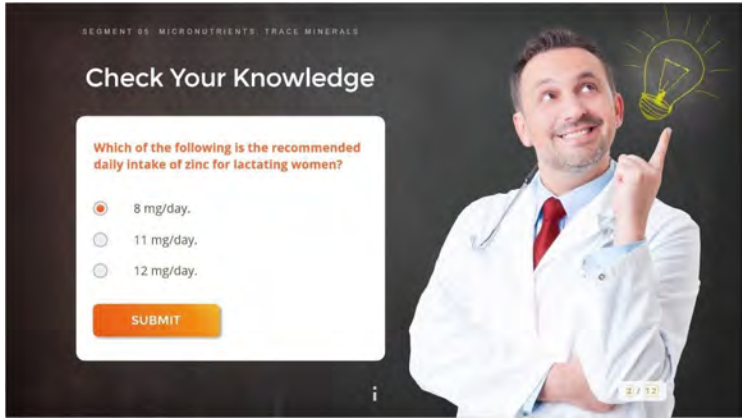
(Multiple Choice, 10 points, 1 attempt permitted)

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Correct	Choice
X	8 mg/day.
	11 mg/day.
	12 mg/day.

Feedback when correct:

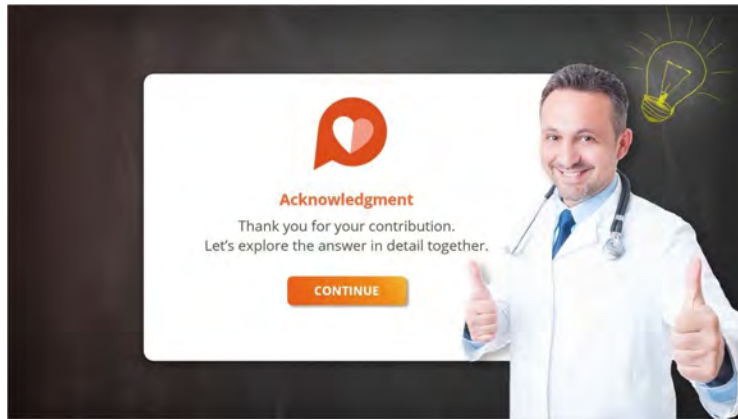
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.

Feedback when incorrect:

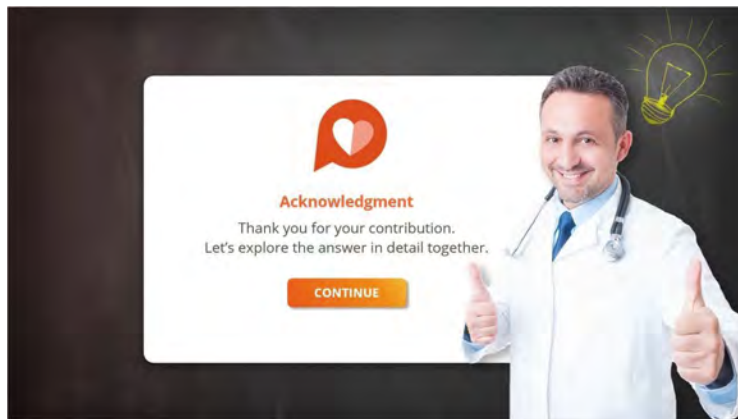
Lorem ipsum dolor sit amet, consectetur adipiscing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua.



Correct (Slide Layer)



Incorrect (Slide Layer)



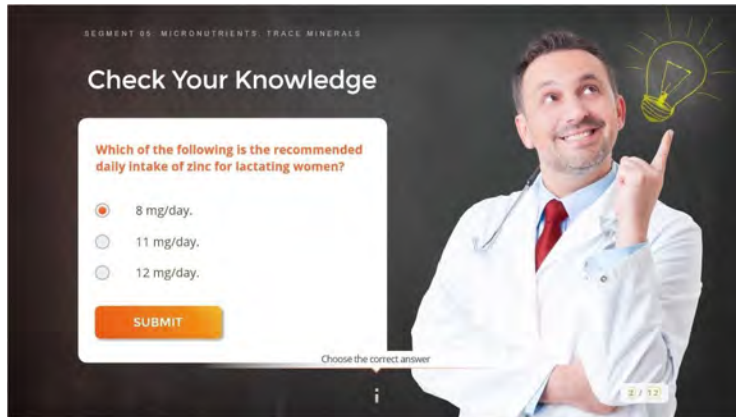
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Info (Slide Layer)



SEGMENT 05: MICRONUTRIENTS, TRACE MINERALS

Check Your Knowledge

Which of the following is the recommended daily intake of zinc for lactating women?

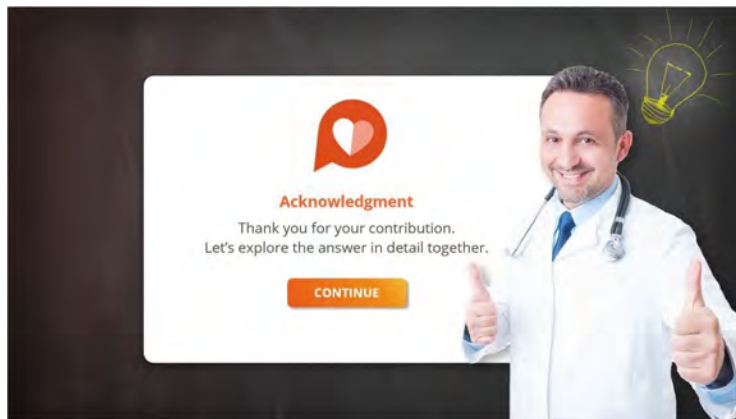
- 8 mg/day.
- 11 mg/day.
- 12 mg/day.


SUBMIT

Choose the correct answer

2 / 12

Acknowledgment 1 (Slide Layer)





Acknowledgment

Thank you for your contribution.
Let's explore the answer in detail together.

CONTINUE

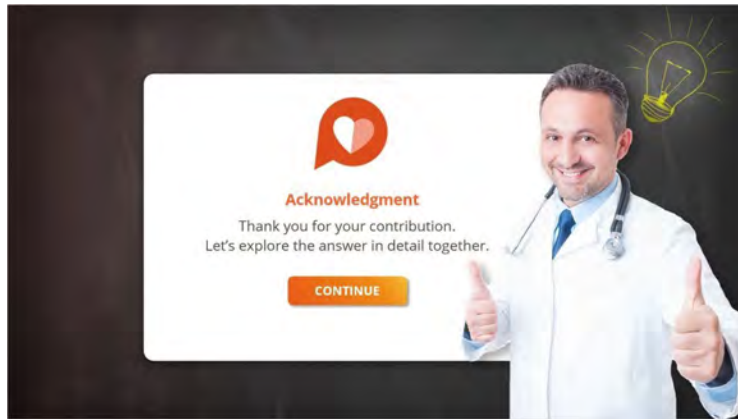
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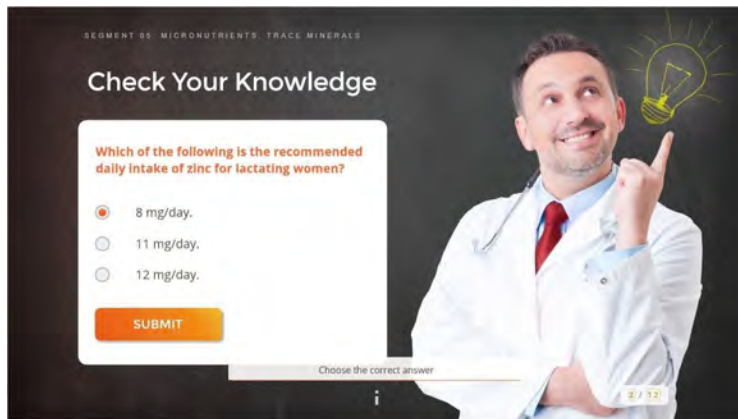
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Acknowledgment (Slide Layer)



Info - Copy (Slide Layer)



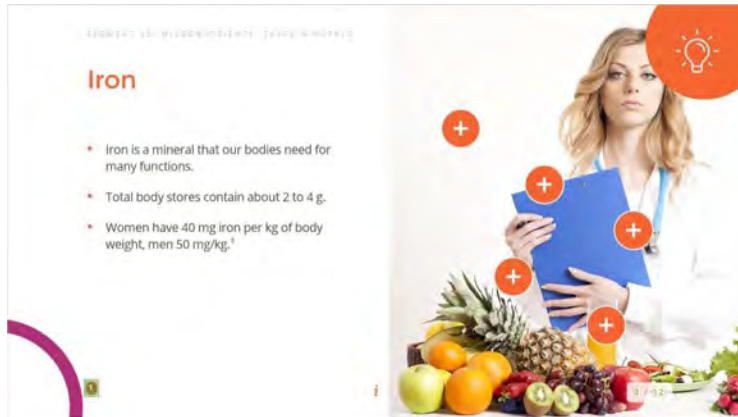
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6.3 Iron

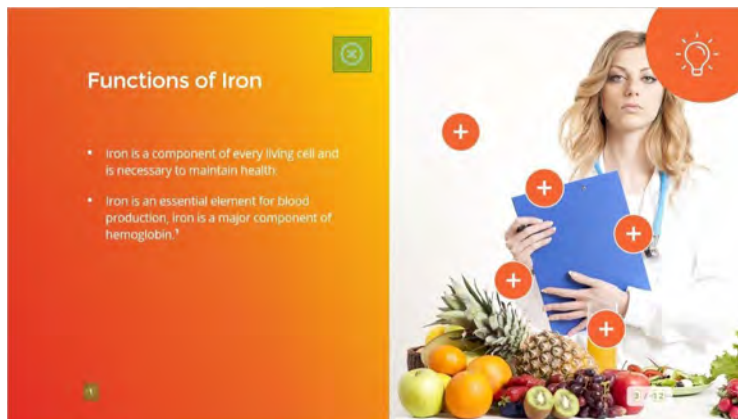


Iron

- Iron is a mineral that our bodies need for many functions.
- Total body stores contain about 2 to 4 g.
- Women have 40 mg iron per kg of body weight, men 50 mg/kg.¹

The slide features a background image of a female doctor in a white coat holding a blue folder, standing next to a basket of fresh fruits including apples, oranges, kiwis, and grapes. Several red circular icons with white plus signs are overlaid on the image. A lightbulb icon is visible in the top right corner.

Untitled Layer 1 (Slide Layer)



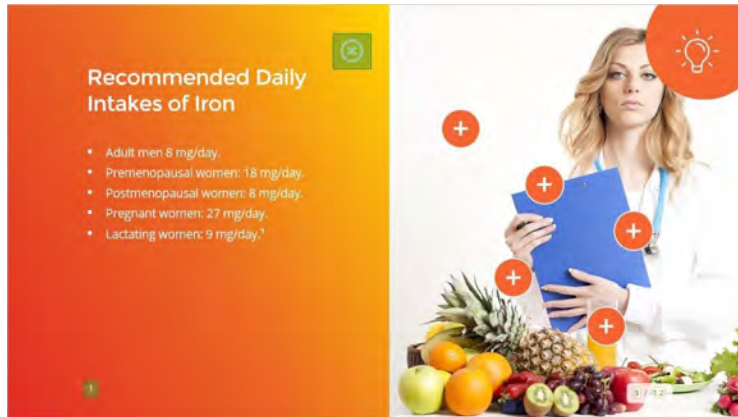
Functions of Iron

- Iron is a component of every living cell and is necessary to maintain health.
- Iron is an essential element for blood production, iron is a major component of hemoglobin.¹

The slide features a background image of a female doctor in a white coat holding a blue folder, standing next to a basket of fresh fruits including apples, oranges, kiwis, and grapes. Several red circular icons with white plus signs are overlaid on the image. A lightbulb icon is visible in the top right corner.



Untitled Layer 2 (Slide Layer)

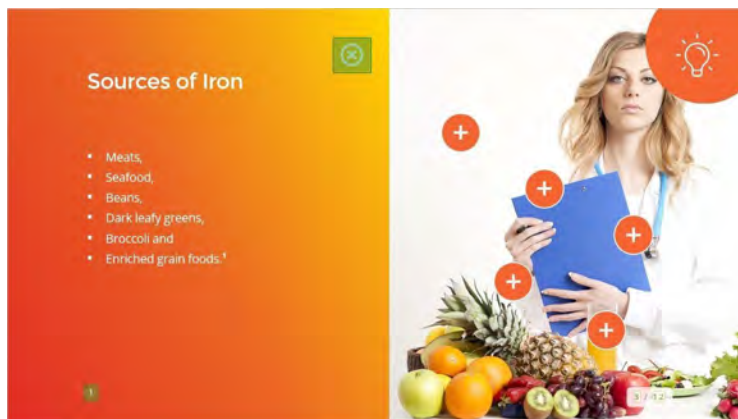


Recommended Daily Intakes of Iron

- Adult men 8 mg/day.
- Premenopausal women: 18 mg/day.
- Postmenopausal women: 8 mg/day.
- Pregnant women: 27 mg/day.
- Lactating women: 9 mg/day.¹

The slide features a background image of a female doctor in a white coat holding a blue folder, standing behind a large basket of fresh fruits including apples, oranges, kiwis, and grapes. Several red circular icons with white plus signs are overlaid on the image. A lightbulb icon is in the top right corner, and a green circular icon with a white 'x' is in the top right corner of the text area.

Untitled Layer 3 (Slide Layer)



Sources of Iron

- Meats,
- Seafood,
- Beans,
- Dark leafy greens,
- Broccoli and
- Enriched grain foods.¹

The slide features a background image of a female doctor in a white coat holding a blue folder, standing behind a large basket of fresh fruits including apples, oranges, kiwis, and grapes. Several red circular icons with white plus signs are overlaid on the image. A lightbulb icon is in the top right corner, and a green circular icon with a white 'x' is in the top right corner of the text area.



Untitled Layer 4 (Slide Layer)

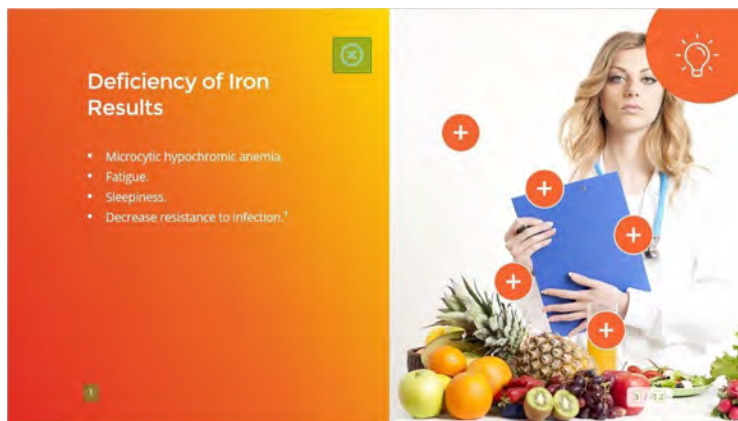


Possible Causes of Iron Deficiency

- Women of childbearing age.
- Patients in hospital with excessive blood loss.
- Crohn's disease and gastrointestinal surgery.
- Oxalic acid in spinach, tea and chocolate, and polyphenols in coffee, tea, and cocoa.
- Some medications.⁹

The slide features a background image of a female doctor in a white coat holding a blue folder, standing behind a large basket of fresh fruits including apples, oranges, kiwis, and grapes. Several red circular icons with white plus signs are overlaid on the image. A lightbulb icon is in the top right corner, and a green circular icon with a white 'x' is in the top right corner of the text area.

Untitled Layer 5 (Slide Layer)



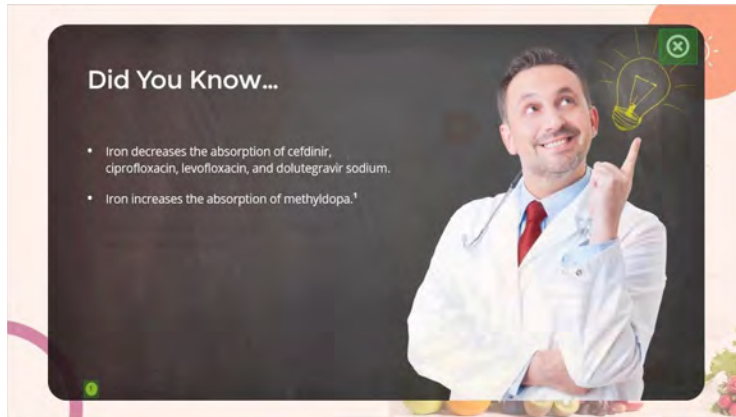
Deficiency of Iron Results

- Microcytic hypochromic anemia
- Fatigue.
- Sleepiness.
- Decrease resistance to infection.¹

The slide features a background image of a female doctor in a white coat holding a blue folder, standing behind a large basket of fresh fruits including apples, oranges, kiwis, and grapes. Several red circular icons with white plus signs are overlaid on the image. A lightbulb icon is in the top right corner, and a green circular icon with a white 'x' is in the top right corner of the text area.



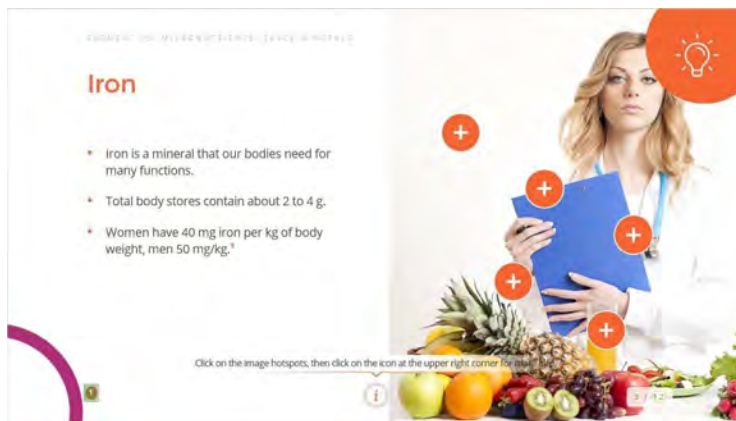
Did You Know (Slide Layer)



Did You Know...

- Iron decreases the absorption of cefdinir, ciprofloxacin, levofloxacin, and dolutegravir sodium.
- Iron increases the absorption of methyldopa.¹

Info (Slide Layer)



Iron

- Iron is a mineral that our bodies need for many functions.
- Total body stores contain about 2 to 4 g.
- Women have 40 mg iron per kg of body weight, men 50 mg/kg.¹

Click on the image hotspots, then click on the icon at the upper right corner for more information.

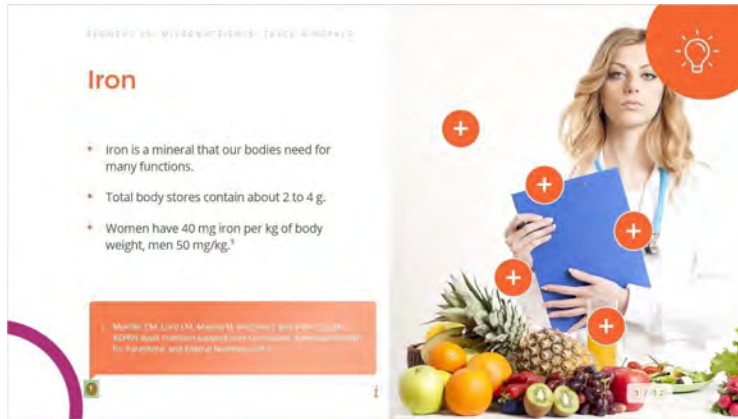
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Ref 1 (Slide Layer)



IRON: THE ESSENTIAL MINERAL FOR YOUR HEALTH

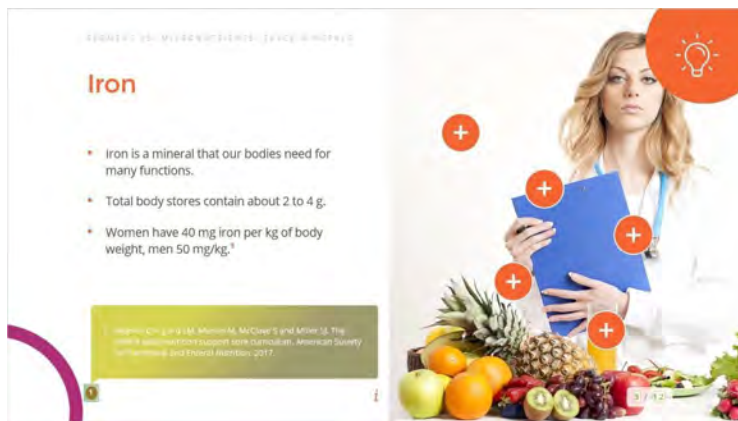
Iron

- Iron is a mineral that our bodies need for many functions.
- Total body stores contain about 2 to 4 g.
- Women have 40 mg iron per kg of body weight, men 50 mg/kg.¹

¹ MEDICINE: JAMES M. SMITH, M.D., M.Sc., and M.P.H. © The author's name and contact information are not included. American Society for Parenteral and Enteral Nutrition, 2017.

The slide features a photograph of a female doctor in a white coat holding a blue folder, standing behind a basket of fresh fruits. Several red circular icons with white plus signs are overlaid on the image. A lightbulb icon is in the top right corner.

Ref 1 - Copy (Slide Layer)



IRON: THE ESSENTIAL MINERAL FOR YOUR HEALTH

Iron

- Iron is a mineral that our bodies need for many functions.
- Total body stores contain about 2 to 4 g.
- Women have 40 mg iron per kg of body weight, men 50 mg/kg.¹

¹ MEDICINE: JAMES M. SMITH, M.D., M.Sc., and M.P.H. © The author's name and contact information are not included. American Society for Parenteral and Enteral Nutrition, 2017.

This is an identical copy of the slide above, featuring the same text, image of a doctor with fruit, and decorative icons.

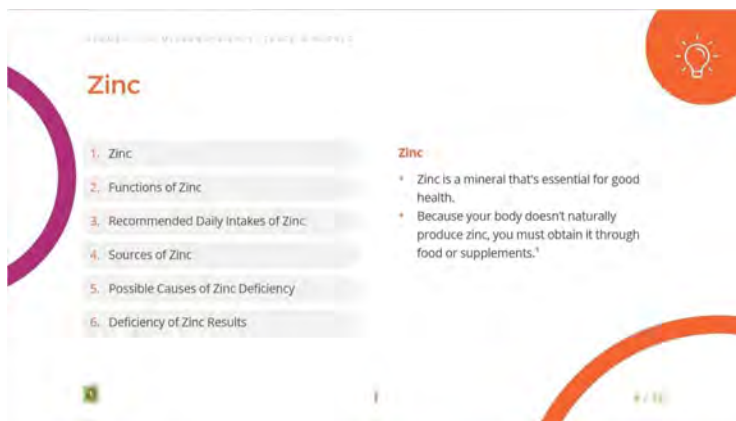


6.4 Zinc



A slide thumbnail titled "Zinc" with a lightbulb icon in the top right corner. The slide content includes a table of contents with six items: 1. Zinc, 2. Functions of Zinc, 3. Recommended Daily Intakes of Zinc, 4. Sources of Zinc, 5. Possible Causes of Zinc Deficiency, and 6. Deficiency of Zinc Results. The slide is numbered 4/10 at the bottom right.

Untitled Layer 1 (Slide Layer)



A slide titled "Zinc" with a lightbulb icon in the top right corner. The slide content includes a table of contents with six items: 1. Zinc, 2. Functions of Zinc, 3. Recommended Daily Intakes of Zinc, 4. Sources of Zinc, 5. Possible Causes of Zinc Deficiency, and 6. Deficiency of Zinc Results. To the right of the table of contents, there is a section titled "Zinc" with two bullet points: "Zinc is a mineral that's essential for good health." and "Because your body doesn't naturally produce zinc, you must obtain it through food or supplements." The slide is numbered 4/10 at the bottom right.



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Untitled Layer 2 (Slide Layer)

Zinc

1. Zinc

2. Functions of Zinc

3. Recommended Daily Intakes of Zinc

4. Sources of Zinc

5. Possible Causes of Zinc Deficiency

6. Deficiency of Zinc Results

Functions of Zinc

- Catalyst for more than 200 enzymes such as alkaline phosphatase, carbonic anhydrase.
- A regulatory role in gene expression.
- Necessary for other physiological processes.¹

Untitled Layer 3 (Slide Layer)

Zinc

1. Zinc

2. Functions of Zinc

3. Recommended Daily Intakes of Zinc

4. Sources of Zinc

5. Possible Causes of Zinc Deficiency

6. Deficiency of Zinc Results

Recommended Daily Intakes of Zinc

- Adult men 11 mg /day.
- Adult women: 8 mg/ day.
- Pregnant women: 11 mg /day.
- Lactating women: 12 mg/day.¹



Untitled Layer 4 (Slide Layer)

Zinc

1. Zinc	Sources of Zinc
2. Functions of Zinc	• Seafood.
3. Recommended Daily Intakes of Zinc	• Meats.
4. Sources of Zinc	• Greens.
5. Possible Causes of Zinc Deficiency	• Whole grains. ¹
6. Deficiency of Zinc Results	

The slide features a purple circular graphic on the left and an orange lightbulb icon in the top right corner. A navigation bar at the bottom shows a green square on the left and a '1 / 10' indicator on the right.

Untitled Layer 5 (Slide Layer)

Zinc

1. Zinc	Possible Causes of Zinc Deficiency
2. Functions of Zinc	• Older adults.
3. Recommended Daily Intakes of Zinc	• Alcoholism.
4. Sources of Zinc	• Postoperative patients.
5. Possible Causes of Zinc Deficiency	• Burn patients.
6. Deficiency of Zinc Results	• Malabsorptive diseases.
	• Renal disease.
	• Liver disease.
	• Malignancy.
	• Some medication. ¹

The slide features a purple circular graphic on the left and an orange lightbulb icon in the top right corner. A navigation bar at the bottom shows a green square on the left and a '1 / 10' indicator on the right.



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Untitled Layer 6 (Slide Layer)

Zinc

1. Zinc

2. Functions of Zinc

3. Recommended Daily Intakes of Zinc

4. Sources of Zinc

5. Possible Causes of Zinc Deficiency

6. Deficiency of Zinc Results

Deficiency of Zinc Results

- Impaired immune function.
- Impaired night vision.
- Alteration taste and smell.¹

Ref 1 (Slide Layer)

Zinc

1. Zinc

2. Functions of Zinc

3. Recommended Daily Intakes of Zinc

4. Sources of Zinc

5. Possible Causes of Zinc Deficiency

6. Deficiency of Zinc Results

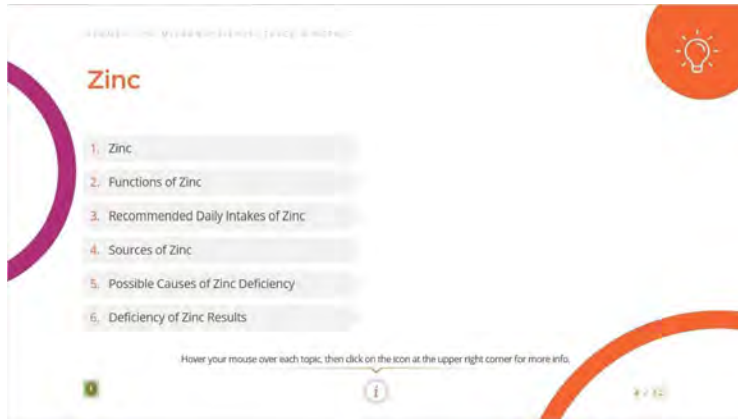
1. Murray IM, Layman D. Zinc: deficiency and pathogenesis. ACSM's Health-Related Fitness Assessment: Comprehensive for Professionals, 4th Edition. Boston: Elsevier; 2010:107-117.



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Info (Slide Layer)



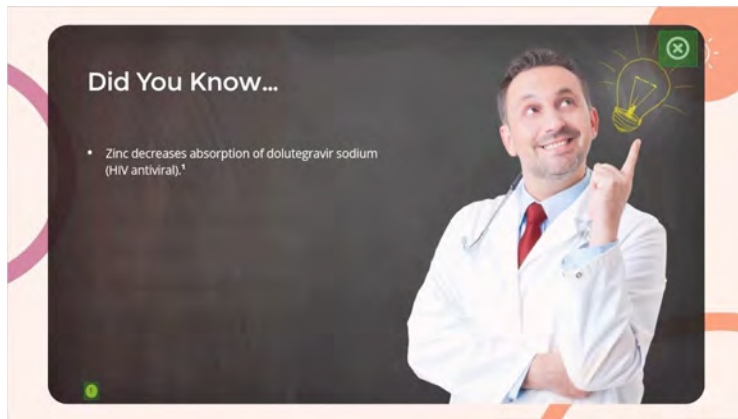
A slide layer titled "Zinc" with a lightbulb icon in the top right corner. The slide contains a numbered list of six topics: 1. Zinc, 2. Functions of Zinc, 3. Recommended Daily Intakes of Zinc, 4. Sources of Zinc, 5. Possible Causes of Zinc Deficiency, and 6. Deficiency of Zinc Results. Below the list, there is a small information icon and a text prompt: "Hover your mouse over each topic, then click on the icon at the upper right corner for more info." The slide also features a green navigation icon in the bottom left and a red curved graphic element at the bottom right.

Zinc

1. Zinc
2. Functions of Zinc
3. Recommended Daily Intakes of Zinc
4. Sources of Zinc
5. Possible Causes of Zinc Deficiency
6. Deficiency of Zinc Results

Hover your mouse over each topic, then click on the icon at the upper right corner for more info.

Did You Know (Slide Layer)



A "Did You Know..." slide layer featuring a doctor in a white coat pointing upwards. The slide contains a single bullet point: "Zinc decreases absorption of dolutegravir sodium (HIV antiviral).¹" There is a lightbulb icon in the top right corner and a green close button. The slide also has a green navigation icon in the bottom left and a red curved graphic element at the bottom right.

Did You Know...

- Zinc decreases absorption of dolutegravir sodium (HIV antiviral).¹

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Ref 1 - Copy (Slide Layer)



1. Zinc

2. Functions of Zinc

3. Recommended Daily Intakes of Zinc

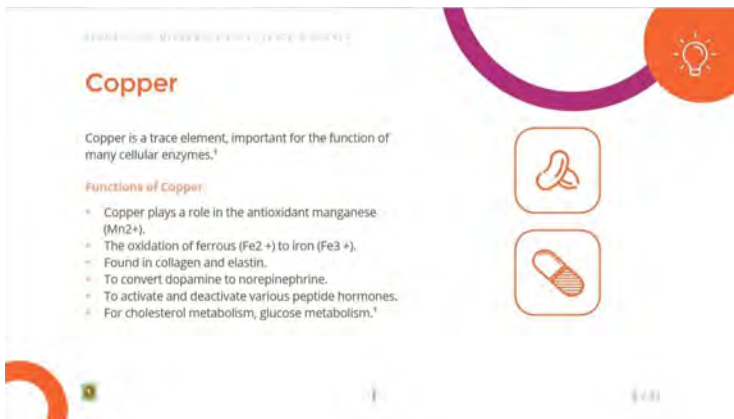
4. Sources of Zinc

5. Possible Causes of Zinc Deficiency

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1

6.5 Copper



Copper is a trace element, important for the function of many cellular enzymes.¹

Functions of Copper

- Copper plays a role in the antioxidant manganese (Mn^{2+}).
- The oxidation of ferrous (Fe^{2+}) to iron (Fe^{3+}).
- Found in collagen and elastin.
- To convert dopamine to norepinephrine.
- To activate and deactivate various peptide hormones.
- For cholesterol metabolism, glucose metabolism.¹

1



Untitled Layer 1 (Slide Layer)

Copper

Recommended Daily Intakes of Copper

- Adult men and women 900 mcg /day.
- Pregnant women: 1000 mcg/day.
- Lactating women: 1300 mcg/day.¹

Sources of Copper:

- Liver.
- Cocoa.
- Beans.
- Nuts.
- Whole grains.²
- Dried fruits.



Untitled Layer 2 (Slide Layer)

Copper

Possible Causes of Copper Deficiency

- Intestinal surgery.
- Hemodialysis.
- Some Medication.¹

Deficiency of Copper Results

- Hypopigmentation of skin.
- Hypochromic microcytic anemia.
- Leukopenia and neutropenia.¹



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Info (Slide Layer)

Copper

Copper is a trace element, important for the function of many cellular enzymes.¹

Functions of Copper:

- Copper plays a role in the antioxidant manganese (Mn^{2+}).
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Click on the icons in the rounded rectangles above, then click on the icon at the upper right corner for more info.

Ref 1 (Slide Layer)

Copper

Copper is a trace element, important for the function of many cellular enzymes.¹

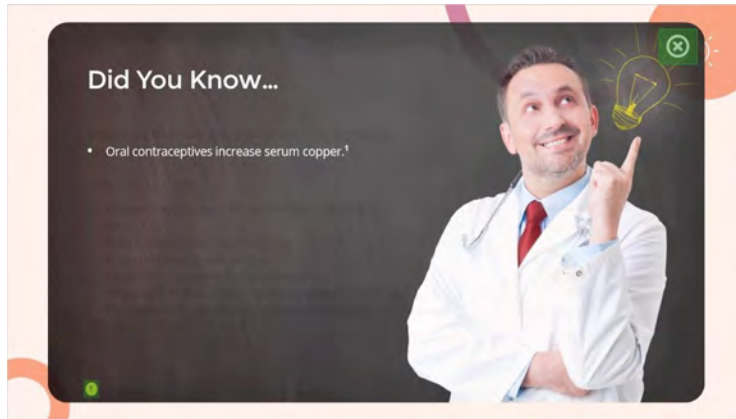
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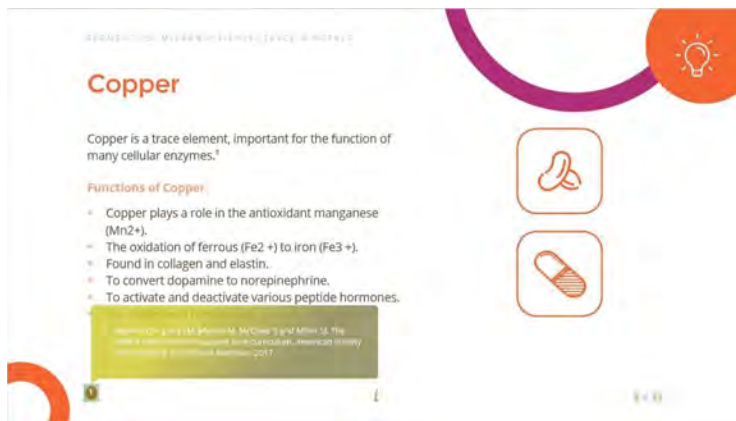
¹ Mottola DM, Luzzo EA. Manganese, zinc, and copper: A review of their role in human health. *Journal of the American Dietetic Association*. 2000;100(10):1000-1005.



Did You Know (Slide Layer)



Ref 1 - Copy (Slide Layer)



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6.6 Manganese



Manganese

Manganese is a trace mineral that is present in tiny amounts in the body.¹

Functions of Manganese

- Necessary for urea formation.
- Neutralization of free radicals.
- Activates numerous enzymes.¹

1 / 11

Untitled Layer 1 (Slide Layer)



Manganese

Recommended Daily Intakes of Manganese

- Adult men: 2.3 mg/day.
- Adult women: 1.8 mg/day.
- Pregnant women: 2 mg/day.
- Lactating women: 2.6 mg/day.¹

Sources of Manganese

- Nuts.
- Whole grains.¹

1 / 11

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Untitled Layer 2 (Slide Layer)



Manganese

Possible Causes of Manganese Deficiency

- Any patient with hepatobiliary disease.
- Tetracycline antibiotic.¹

Deficiency of Manganese Results

- Abnormal bone formation.
- Growth retardation.
- Congenital abnormalities.
- Poor reproductive performance.¹

6 / 12

Info (Slide Layer)



Manganese

Manganese is a trace mineral that is present in tiny amounts in the body.¹

Functions of Manganese

- Necessary for urea formation.
- Neutralization of free radicals.
- Activates numerous enzymes.¹

Drag the knob in the slider above to the right and left for more info.

6 / 12



6.7 Selenium

Selenium

Selenium is essential for a healthy immune system.¹

Functions of Selenium

- Antioxidants.
- A cofactor in iodine metabolism and the thyroid gland.
- As a catalyst for glutathione peroxidase reactions to get rid of hydrogen peroxide.
- Regulating metabolism.²

7 / 12

The slide features a female doctor in a white coat holding a bowl of fresh vegetables. The text is presented in a clean, sans-serif font with orange and purple accents.

Untitled Layer 1 (Slide Layer)

Selenium

Recommended Daily Intakes of Selenium

- Adult men and women: 55 mcg/day.
- Pregnant women: 60 mcg/day.
- Lactating women: 70 mcg/day.¹

Sources of Selenium

- Fish.
- Organ meats.
- Eggs.
- Milk.²

7 / 12

The slide features a female doctor in a white coat holding a bunch of green leafy vegetables. The text is presented in a clean, sans-serif font with orange and purple accents.

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Untitled Layer 2 (Slide Layer)

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Selenium

Possible Causes of Selenium Deficiency

- Patients who received long-term parenteral nutrition without selenium supplementation.
- Medication.
- Etrombopag (thrombocytopenia medication).¹

Deficiency of Selenium Results

- Altered thyroid hormone metabolism.
- Congestive cardiomyopathy.¹



Navigation icons: back, forward, search, and a small 'i' icon.

Info (Slide Layer)

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Selenium

Selenium is essential for a healthy immune system.¹

Functions of Selenium

- Antioxidants.
- A cofactor in iodine metabolism and the thyroid gland.
- As a catalyst for glutathione peroxidase reactions to get rid of hydrogen peroxide.
- Regulating metabolism.¹



Interact with arrows above for more info.

Navigation icons: back, forward, search, and a small 'i' icon.



Ref 1 (Slide Layer)

Selenium

Selenium is essential for a healthy immune system.¹

Functions of Selenium

- Antioxidants.
- A cofactor in iodine metabolism and the thyroid gland.
- As a catalyst for glutathione peroxidase reactions to get rid of hydrogen peroxide.
- Regulating metabolism.²

1. Selenium (Se) is an essential trace element. It is a cofactor for glutathione peroxidase, an antioxidant enzyme. 2. Selenium is essential for a healthy immune system.

The slide features a photograph of a female doctor in a white lab coat holding a bowl of fresh vegetables, including green leafy greens and a red tomato. The slide has a decorative orange and purple curved graphic on the right side.

6.8 Iodine

Iodine

The slide displays six red line-art icons arranged in two columns. The left column contains icons of a person, a leaf, and a female figure. The right column contains icons of a fish, an egg, and a muscle. The slide has a decorative orange and purple curved graphic on the right side.



Untitled Layer 1 (Slide Layer)

iodine



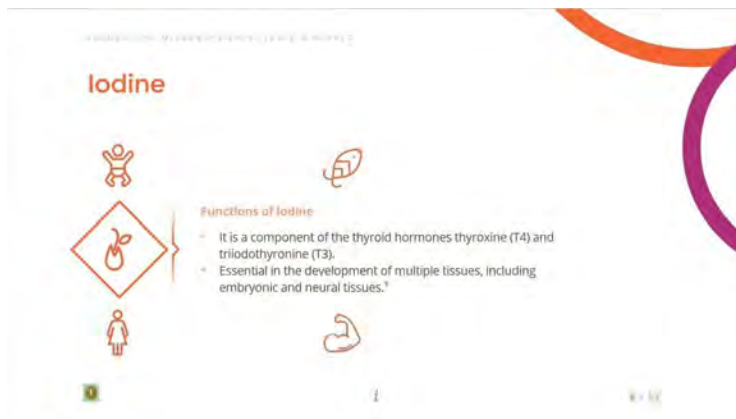
The infographic features a central diamond-shaped icon containing a baby figure. To the right, a text box explains the importance of iodine. Below the diamond are icons for a leaf, a woman, a fish, and a muscle. A navigation bar at the bottom includes a green square, a vertical line, and a double arrow.

iodine

- Iodine is a vital trace element required at all stages of life especially during formative years.*

Untitled Layer 2 (Slide Layer)

iodine



The infographic features a central diamond-shaped icon containing a leaf. To the right, a text box lists the functions of iodine. Below the diamond are icons for a baby, a woman, a fish, and a muscle. A navigation bar at the bottom includes a green square, a vertical line, and a double arrow.

Functions of Iodine

- It is a component of the thyroid hormones thyroxine (T4) and triiodothyronine (T3).
- Essential in the development of multiple tissues, including embryonic and neural tissues.*



Untitled Layer 3 (Slide Layer)

iodine

Recommended Daily Intakes of Iodine

- Adult men and women: 150 mcg/day.
- Pregnant women: 220 mcg/day.
- Lactating women: 290 mcg/day.*

Untitled Layer 4 (Slide Layer)

iodine

Sources of Iodine:

- Saltwater fish.
- Seafood.
- Iodized salt.*



Untitled Layer 5 (Slide Layer)

iodine

Possible Causes of Iodine Deficiency

- Low-salt diets.
- Lithium inhibits thyroid hormone.³

Untitled Layer 6 (Slide Layer)

iodine

Deficiency of Iodine Results

- Elevated TSH.
- Nodular goiter.
- Weight loss.
- Tachycardia.
- Muscle weakness.
- Skin warmth.⁴



Info (Slide Layer)



Ref 1 (Slide Layer)



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6.9 Chromium

LECTURE 22: MICRONUTRIENTS: TRACE ELEMENTS

Chromium

- * Chromium is an essential trace element associated with carbohydrate metabolism.¹



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Untitled Layer 1 (Slide Layer)

LECTURE 22: MICRONUTRIENTS: TRACE ELEMENTS

Chromium

Functions of Chromium

- * Strengthens the action of insulin, which has a role in glucose, protein, and fat metabolism.
- * Increased tyrosine kinase activity of the insulin receptor.¹



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Untitled Layer 2 (Slide Layer)

CHAPTER 11 | MICRONUTRIENTS: TRACE MINERALS

Chromium

Recommended Daily Intakes of Chromium

- Men younger than 50 years: 35 mcg/day.
- Men 50 years or older: 30 mcg/day.
- Women younger than 50 years: 25 mcg/day.
- Women 50 years or older: 20 mcg/day.
- Pregnant women: 30 mcg/day.
- Lactating women: 45 mcg/day.¹





Untitled Layer 3 (Slide Layer)

CHAPTER 11 | MICRONUTRIENTS: TRACE MINERALS

Chromium

Sources of Chromium

- Whole grain products,
- Egg yolks,
- Meats, and
- Mushrooms.¹



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Untitled Layer 4 (Slide Layer)

Chromium

Possible Causes of Chromium Deficiency

- Parental nutrition without chromium supplementation.
- Corticosteroids (anti-inflammatories).⁷



Untitled Layer 5 (Slide Layer)

Chromium

Deficiency of Chromium Results

- Weight loss.
- Elevated plasma free fatty acid.
- **Glycosuria.**⁸
- Hyperglycemia.⁷



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Info (Slide Layer)

ADDRESS: 1001 MUSEUM WALKWAY, FAYETTEVILLE, NC 27837

Chromium

* Chromium is an essential trace element associated with carbohydrate metabolism.¹



Drag the knob in the dial above to the right and left for more info.



Ref 1 (Slide Layer)

ADDRESS: 1001 MUSEUM WALKWAY, FAYETTEVILLE, NC 27837

Chromium

* Chromium is an essential trace element associated with carbohydrate metabolism.¹



1. Walker DM, Lippert M. Am J Clin Nutr. 2002;75(2):353-358. Chromium: A Review of Its Role in Metabolism and Health.



Glycosuria (Slide Layer)

Chromium

- Chromium is an essential trace element associated with carbohydrate metabolism.¹

Glycosuria:
The presence in the urine of abnormal amount of sugar.

1 2 3 4

1

Ref 18 (Slide Layer)

Chromium

- Chromium is an essential trace element associated with carbohydrate metabolism.¹

1. Merck's website: Definition of glycosuria.

1 2 3 4

1




6.10 Fluoride

4 points | 100% | 15 seconds | 100% | 100% | 100% | 100%

Fluoride

Fluoride is a mineral that occurs naturally in many foods and water.¹



1

Untitled Layer 1 (Slide Layer)

4 points | 100% | 15 seconds | 100% | 100% | 100% | 100%

Fluoride

Fluoride is a mineral that occurs naturally in many foods and water.¹



Functions of Fluoride

- A role in bone mineralization and tooth hardening.
- Prevent the progress of dental care.
- Stimulates new bone formation by stimulating osteoblasts.¹

1



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Untitled Layer 2 (Slide Layer)

Fluoride

Fluoride is a mineral that occurs naturally in many foods and water.¹



Recommended Daily Intakes of Fluoride

- Adult men 4 mg/day.
- Adult women 3 mg/day.¹

Sources of Fluoride

- Fluoridated water.
- Tea.¹
- Toothpaste

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Untitled Layer 3 (Slide Layer)

Fluoride

Fluoride is a mineral that occurs naturally in many foods and water.¹



Possible Causes of Fluoride Deficiency

- Populations with non-fluoridated water.¹

Deficiency of Fluoride Results

- Increase risk of dental caries.¹

16 / 12



Info (Slide Layer)

AP00101 - ONLINE MYP1000 - ONLINE MYP1000 - ONLINE MYP1000

Fluoride

Fluoride is a mineral that occurs naturally in many foods and water.¹



Hover your mouse over the icons above for more info.



Ref 1 (Slide Layer)

AP00101 - ONLINE MYP1000 - ONLINE MYP1000 - ONLINE MYP1000

Fluoride

Fluoride is a mineral that occurs naturally in many foods and water.¹



1. National Health and Medical Research Council. (2014). Australian Guidelines for the Use of Fluoride in Oral Health. Canberra: Australian Government Department of Health.



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Untitled Layer 2 (Slide Layer)

11 / 12

Molybdenum

Possible Causes of Molybdenum Deficiency

- Patients receiving long-term parenteral nutrition.¹

Deficiency of Molybdenum Results

- Dislocation of the lens of the eye.
- Nerve damage.
- Change in vision.
- Mental state.¹

The slide features a background image of two women, one in a patterned shirt and one in a white lab coat, holding fruit. A purple arc is in the top right, and an orange arc is in the bottom left. A navigation bar at the bottom shows a red dot on the left and a white dot on the right.

Info (Slide Layer)

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Molybdenum

Molybdenum is an essential trace element for virtually all life forms.¹

Functions of Molybdenum

- A cofactor for the enzymes metal aldehyde oxidase, xanthine oxidase, and sulfite oxidase, it catalyzes the hydroxylation of various substrates.¹

Click on the bullets above for more info.

The slide features a background image of two women, one in a patterned shirt and one in a white lab coat, holding fruit. A purple arc is in the top right, and an orange arc is in the bottom left. A navigation bar at the bottom shows a green dot on the left and a white dot on the right.



Ref 1 (Slide Layer)

LEARNING OBJECTIVES: MOLLUSCITRICHINOLIN (MOL) & MOLLUSCITRICHINOLIN (MOL)

Molybdenum

Molybdenum is an essential trace element for virtually all life forms.¹

Functions of Molybdenum

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1. Molybdenum (M) and Molybdenum deficiency and deficiency (MOL) and Molybdenum deficiency and deficiency (MOL) for Molybdenum and Molybdenum deficiency.

11 / 32

6.12 Summary

LEARNING OBJECTIVES: MOLLUSCITRICHINOLIN (MOL) & MOLLUSCITRICHINOLIN (MOL)

Summary

- Iron deficiency leads to microcytic anemia.
- Zinc deficiency leads to weak immunity.
- Copper deficiency leads to microcytic anemia.
- Deficiency of manganese and selenium leads to:
 - Growth retardation, poor reproductive performance and congestive cardiomyopathy.
- Iodine deficiency leads to an increase in thyroid hormone.
- Chromium deficiency leads to a high percentage of plasma free fatty acids.
- Fluoride deficiency increases the risk of tooth decay.
- Molybdenum deficiency leads to altered vision and mental state.

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Info (Slide Layer)



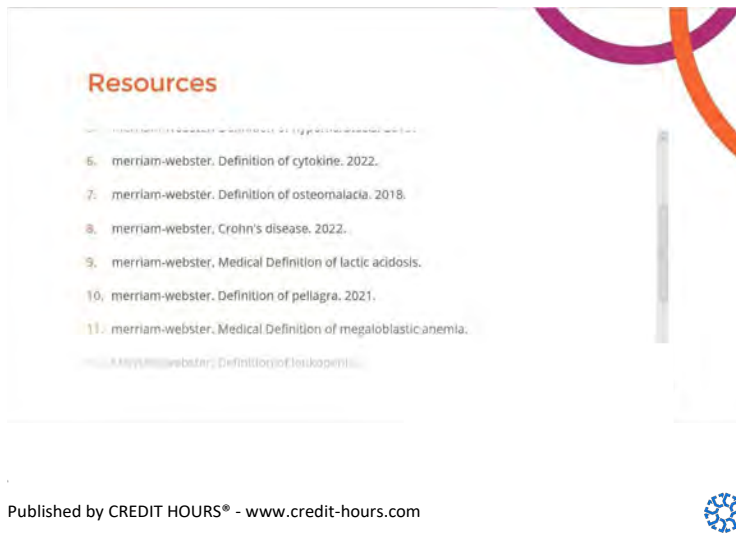
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- Chromium deficiency leads to a high percentage of plasma free fatty acids.
- Fluoride deficiency increases the risk of tooth decay.
- Molybdenum deficiency leads to altered vision and mental state.

Scroll up and down using your mouse or the slider on the right side for more info.

7. RESOURCES

7.1 Resources



Resources

6. merriam-webster. Definition of cytokine. 2022.
7. merriam-webster. Definition of osteomalacia. 2018.
8. merriam-webster. Crohn's disease. 2022.
9. merriam-webster. Medical Definition of lactic acidosis.
10. merriam-webster. Definition of pellagra. 2021.
11. merriam-webster. Medical Definition of megaloblastic anemia.
12. merriam-webster. Definition of leukopenia.

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Directed to Healthcare professional
Item code: PM-SA-CNT-22-00019

Preparation date: 16 OCT 2022

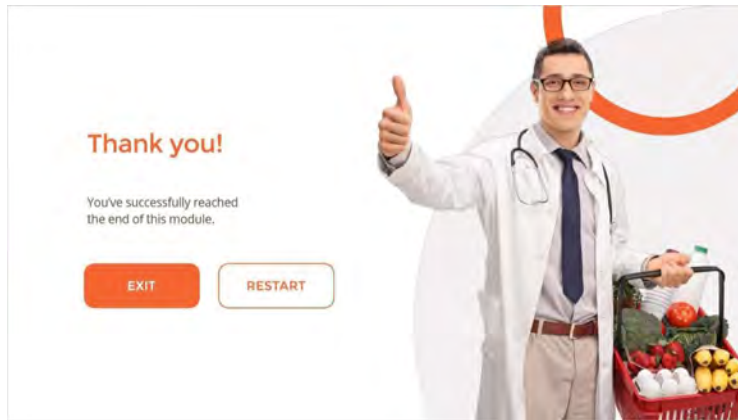
For full product information please refer to product pack & leaflet prior use.

For reporting any Adverse Events or Side Effects for any of GSK consumer Healthcare products. Please contact us on mystory.sa@haleon.com

Adverse Events hotline no.: +966 535533647

8. END OF THE MODULE

8.1 Thank You



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