Dairy Australia

Primary Industries Education Foundation Australia

Health and Nutrition – Healthy Bones

Lesson 3

Learning Areas and Australian Curriculum Content

An educational resource for

Years 3–4

Discover Aussie Dairy

Learning Areas and Australian Curriculum Content

Teacher guide

Design and Technologies

Describe the ways food can be selected and prepared for healthy eating. (AC9TDE4K04).

Health and Physical Education

Investigate and apply behaviours that contribute to their own and others' health, safety, relationships and wellbeing. (AC9HP4P10).

Lesson Objective

In this lesson, students will explore the importance of maintaining healthy bones through proper nutrition, physical activity, and lifestyle choices. They will learn about the structure and function of bones, the impact of conditions such as osteoporosis, and the role key nutrients found in foods, particularly in the dairy food group, play in bone health. Through interactive activities, videos, quizzes, and hands-on demonstrations, students will gain a deeper understanding of how foods rich in calcium, vitamins, and minerals, along with regular exercise and safe sun exposure, contribute to lifelong bone strength and health.

Lesson Overview

Activity 1 - Healthy Bones (30 mins)

Activity 2 - Preventing Bone Issues (40 mins)

Activity 3 - Preparing Dairy Foods for Healthy Bones (20 mins)

Contents

ATTRIBUTION, CREDIT & SHARING

This resource was produced by Primary Industries Education Foundation Australia (PIEFA) in collaboration with Dairy Australia. Primary Industries Education Foundation Australia's resources support and facilitate effective teaching and learning about Australia's food and fibre industries. We are grateful for the support of our industry and member organisations for assisting in our research efforts and providing industry-specific information and imagery to benefit the development and accuracy of this educational resource.

Primary Industries Education Foundation Australia

Dairy Australia

Teacher guide

Resources and Equipment

Teacher guide

Activity 1 - Healthy Bones

1. **Worksheet 3.1a - A Human Bone**
2. Digital devices
3. Build a Skeleton
4. **Worksheet 3.1b - Healthy Bones**
5. Scissors
6. Glue
7. Student workbooks

Activity 2 - Bones and Osteoporosis

1. Osteoporosis | Endocrine Society
2. Honeycomb
3. **Worksheet 3.2a - Osteoporosis**
4. Digital devices
5. Post Quiz
6. **Worksheet 3.2b - Dairy Quick Facts Crossword**

Activity 3 - Preparing Dairy Foods for Healthy Bones

1. Rainbow Smoothies (3:04)
2. Small blender
3. 2/3 cup milk, 1/3 cup yoghurt, 1/2 cup grated carrot, 1/2 cup chopped mango (fresh or frozen) 1/2 cup canned peach slices
4. Clear glass or container

Note: Teachers are responsible for generating their own risk assessments prior to practical tasks.

Additional Resources

How Much Dairy Do Kids Need? (2:02)

Lesson Guide

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Activity 1 - Healthy Bones

Students will explore the structure and function of bones, learning about their role in the body and the importance of maintaining healthy bones throughout life. Students will be able to identify key nutrients essential for bone health, understand how these nutrients support bone strength and growth, and apply this knowledge by completing activities that reinforce the importance of nutrition and bone care.

a Introduce the topic of healthy bones by encouraging a class discussion on bones and what keeps them healthy. Some stimulus questions include:

- What are bones, and what is their role in the body?
- What do we call the entire collection of bones in our body?
- How would humans look and function without a skeleton?
- What are our bones made up of?
- What do we do to take care of our bones and keep them healthy?
- (Answers page 8)

b Distribute or display **Worksheet 3.1a - A Human Bone** in a central area and show students the structure of a human bone. The top part of the bone has been cut through to show the internal structure. Explain that bones are living tissue. They constantly renew themselves and grow as we grow. They can even repair or fix themselves if they get broken. Looking after them and building strong and healthy bones is very important from childhood through to old age.

c Write the following nutrient names (minerals and vitamins) in a central area and ask if students have heard of them. These are all nutrients that are essential for bone health. **Calcium - Phosphorus - Vitamin D - Magnesium - Protein - Zinc - Potassium.**

- **Calcium** – Calcium is the main building block of a healthy bone. It binds together with other minerals, forming hard crystals that give our bones structure and strength.
- **Phosphorus** – Phosphorus is just as important for bones as calcium. It is essential for the formation and maintenance of strong bones.
- **Vitamin D** – Helps the body absorb calcium and supports bone mineralisation.
- **Magnesium** – Magnesium plays two important roles. It helps to regulate calcium levels within the bones to keep them at an optimum, as well as providing structure for the bones.
- **Protein** – Protein is needed to achieve and maintain an ideal bone mass throughout a lifetime and is essential for bone flexibility.
- **Zinc** – Zinc plays an important role in the natural process of breaking down old bone cells to replace them with new bone cells for growth and repair.
- **Potassium** – Potassium is involved in decreasing acidity levels within the body, preserving calcium.

d Brainstorm as a class what kind of foods we can eat that might provide these nutrients for the body. Explain that some nutrients can be found in food and others can be obtained through safe sun exposure, such as Vitamin D. (Answers page 8)

e As a class, access the **Build a Skeleton** interactive and complete the game. Alternatively, students can complete this activity independently or in small groups depending on digital device access and permissions.

f Distribute **Worksheet 3.1b - Healthy Bones** and outline the activity. Students will circle the seven nutrients required for bone health, write each of these words on a bone and then cut out and build a human skeleton and paste it into their workbooks. (Answers page 8).

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Activity 2 - Bones and Osteoporosis

Students will learn about osteoporosis, its effects on bone health, and the importance of maintaining bone strength through diet and a healthy lifestyle. Students will identify the differences between healthy bones and bones affected by osteoporosis and understand how regular exercise, calcium-rich foods such as milk, cheese and yoghurt, and safe sun exposure can help prevent this condition.

a Display the image from Osteoporosis | Endocrine Society to show the difference between healthy bone and one with osteoporosis. Ask students what differences they can see in the two images (the bone with osteoporosis is on the left, and the healthy bone is on the right). (Answers page 9)

b Explain that osteoporosis is a chronic disease of the bones. It is caused when bones lose their bone mineral density, which means they become weaker and more fragile. Normally, bones are strong because they are packed with important minerals like calcium. But with osteoporosis, the bones lose some of these minerals, making them more likely to break, even from small falls or bumps.

c If available, show students a piece of honeycomb and use it as an analogy to explain the internal structure of a bone. In a healthy bone, the honeycomb-like structure is strong and sturdy, with thick walls and tiny spaces, providing excellent support and strength. However, in a bone affected by osteoporosis, this structure changes: the walls become thinner and weaker, and the spaces larger, making the bone more fragile and prone to breaking. Just as a weakened honeycomb can crumble, bones with osteoporosis are much more vulnerable to fractures because they lose strength.

d Ask the class, 'Why do you think some people's bones lose mineral density, become weaker, and develop conditions like osteoporosis? Explain that staying active, eating calcium-rich foods such as milk, cheese, and yoghurt every day, and getting vitamin D from regular and safe sun exposure can help prevent this condition by keeping your bone mineral density (BMD) strong. (Answers page 9)

e Distribute **Worksheet 3.2a - Osteoporosis**. Students read the information and answer the questions. (Answers page 9)

f Students use digital devices to individually complete the self-marking **Post Quiz**. Alternatively, this may be projected and completed as a class. (Answers page 9)

g Reconvene as a class and review the importance of maintaining strong and healthy bones as a class. By consuming calcium-rich food, dairy in particular, as well as participating in regular exercise and engaging in safe exposure to the sun, students are taking active steps in promoting their own bone health.

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Teacher guide

Activity 3 - Preparing Dairy Foods for Healthy Bones

Students will learn about the importance of key nutrients for bone health by identifying which food groups contribute to strong bones. They will also watch a video on making a smoothie, observe a demonstration, and write an optional procedural text, reinforcing their understanding of healthy eating and how to prepare nutritious snacks.

Note: Teachers are responsible for generating their own risk assessments prior to practical tasks.

a Ask students to recall which food group contains the most important nutrients for building and maintaining healthy bones.

b As a class, view the video Rainbow Smoothies (3:04) and explain that students will write a procedural text for making an orange smoothie, as shown in the video.

c Demonstrate how to make an orange smoothie, or one of your choice. (The recipes for each colour are shown at the end of the video.) To make an orange smoothie add 2/3 cup milk, 1/3 cup yoghurt, 1/2 cup grated carrot, 1/2 cup chopped mango (fresh or frozen) 1/2 cup canned peach slices and blend until combined. Pour into a glass or clear container to show students.

d Discuss how preparing different coloured smoothies, as shown in the video, might encourage healthy eating. In this case, eating dairy, fruit, and vegetables. Discuss when a smoothie such as this might be a suitable snack.

e As an optional task, students may write a procedural text for making the smoothie demonstrated in class. This may be completed in class or set as a homework task.

f Summarise the lesson by playing hangman in a central area. One student thinks of a word to do with bone health and confirms this and its spelling with the teacher. Students take turns to guess a letter of the alphabet. If a guessed letter is correct, it's filled in the word. If wrong, a part of a "hangman" figure is drawn (each line representing a group of bones). The goal is to guess the word before the figure is fully drawn, typically after six incorrect guesses.2/3

Answers

Answer

Activity 1 - Healthy Bones

a Student responses will vary. Some suggested responses may include:

- Bones are hard, rigid structures that form the framework of the body. They provide support to our body, protect internal organs (heart, lungs etc.), and allow movement by working with muscles. Some bones also have bone marrow inside, which makes new blood cells to keep us healthy.
- The collection of all the bones in the body is called the skeleton.
- Without a skeleton, humans would have no structure or shape and would collapse. We wouldn't be able to stand, move, or have protection for our internal organs.
- Bones are made of collagen (a protein that provides flexibility) and calcium (a mineral that gives strength and hardness).
- To keep bones healthy, we need a diet high enough in calcium, vitamin D (through safe sun exposure and diet) and regular exercise. (Not smoking and drinking too much alcohol is also important for bone health.)

b Student responses will vary. Some suggested responses may include:

- Calcium: Dairy products (milk, cheese, yoghurt), leafy green vegetables (kale, broccoli).
- Phosphorus: Dairy products (milk, cheese), meat and poultry, fish (especially salmon and tuna), eggs.
- Vitamin D: Fatty fish (salmon, mackerel, tuna), fortified cereals.
- Magnesium: Leafy green vegetables (spinach, kale), nuts and seeds (almonds, sunflower seeds), whole grains (brown rice, quinoa).
- Protein: Meat, dairy products (milk, cheese, yoghurt), eggs.
- Zinc: Dairy products (cheese, yoghurt), meat, shellfish (oysters).
- Potassium: Bananas, potatoes (with skin), leafy greens (spinach, swiss chard), tomatoes.

Note: Because our bodies can't make calcium, it must come from our diet. If we don't eat enough calcium-rich foods, calcium will be taken from the bones, and over time bones will become weak and brittle (leading to a disease called osteoporosis). This is why it is so crucial to have a daily supply of calcium-rich foods. Different foods contain different amounts of calcium and our bodies absorb calcium from certain foods better than others (ie. spinach contains a lot of calcium but only 5% is absorbed because of the presence of phytates)

Worksheet 3.1b - Healthy Bones

Calcium, Phosphorus, Vitamin D, Magnesium, Protein, Zinc and Potassium should be circled.

Answers

Answer

Activity 2 - Bones and Osteoporosis

a Student responses will vary. Suggested responses include:

- Healthy bone: Dense; small, regular spaces resembling a sturdy honeycomb; tightly packed bone tissue.
- Bone with osteoporosis: Thinner, larger, irregular spaces in the bone tissue, resemble a broken honeycomb.

b Student responses will vary. Suggested responses may include:

- As people age, their bones naturally lose some mineral density, which can make them weaker. This happens because the body becomes less efficient at replacing bone tissue and absorbing important minerals like calcium.
- Not getting enough calcium and vitamin D in the diet, lack of physical activity, or certain medical conditions can also speed up bone loss, leading to osteoporosis.
- Hormonal changes, especially in women (after menopause), can make bones lose density faster as well.
- There is also a strong genetic component to the disease.

Worksheet 3.2a - Osteoporosis

1 Student responses will vary. Suggested responses include:

Bone with osteoporosis: Thinner, larger, irregular spaces in the bone tissue, resemble a broken honeycomb.

Healthy bone: Dense; small, regular spaces resembling a sturdy honeycomb; tightly packed bone tissue.

2 What can you do throughout your lifetime to maintain strong and healthy bones and help lower the risk of osteoporosis?

1 Consuming plenty of calcium-rich foods, such as milk, cheese and yoghurt, every day.

2 Participating in regular exercise and physical activity.

3 Having regular and safe sun exposure for adequate vitamin D production.

Activity 3 - Preparing Dairy Foods for Healthy Bones

a The dairy food group.

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Worksheet 3.1a

A Human Bone

Activity

Bones are living tissues that continuously renew themselves. It is essential to build and maintain strong and healthy bones from childhood through to old age.

Children have around 300 bones when they are born. As they grow, some of these bones fuse (join together), so by the time they become adults, they have 206 bones. The bones fuse to make the skeleton stronger and better suited for adult bodies.

The smallest bone in the skeleton is in our ear, and the largest is in our leg.

Worksheet 3.1b

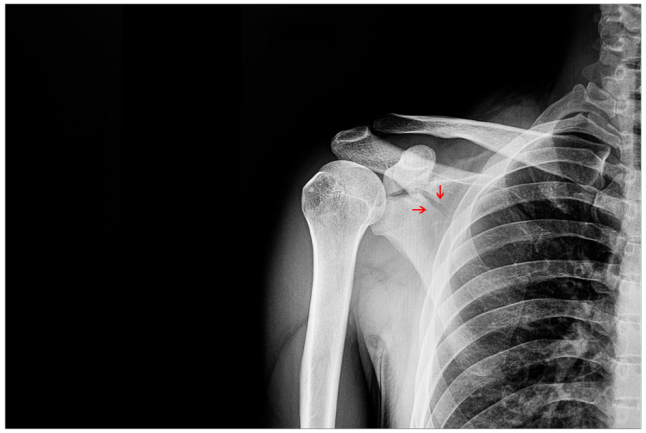
Healthy Bones

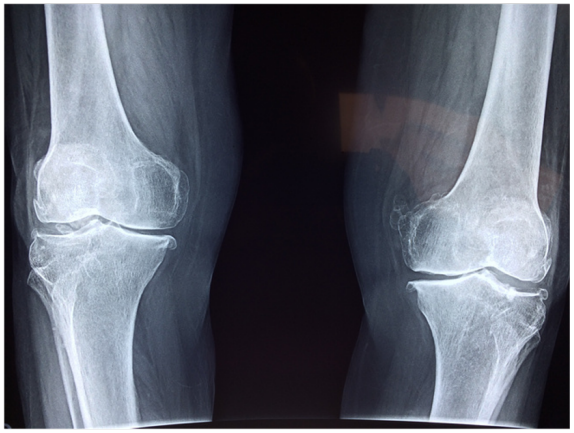
Activity

Healthy bones are very important because they help support the body as it grows and gets stronger. Bones give the body shape and protect vital organs like the heart and brain. Bones also store important minerals that help keep the body working well. Building strong bones when you're young helps set you up for a healthy life, giving you strength for all the things you love to do.

Circle the seven nutrients important for bone health.

Protein	Potassium
Vitamin B	Phosphorus
Vitamin D	Folate
Vitamin E	Magnesium
Calcium	Zinc
Iron	Sodium
Omega-3 Fatty Acids	Cholesterol



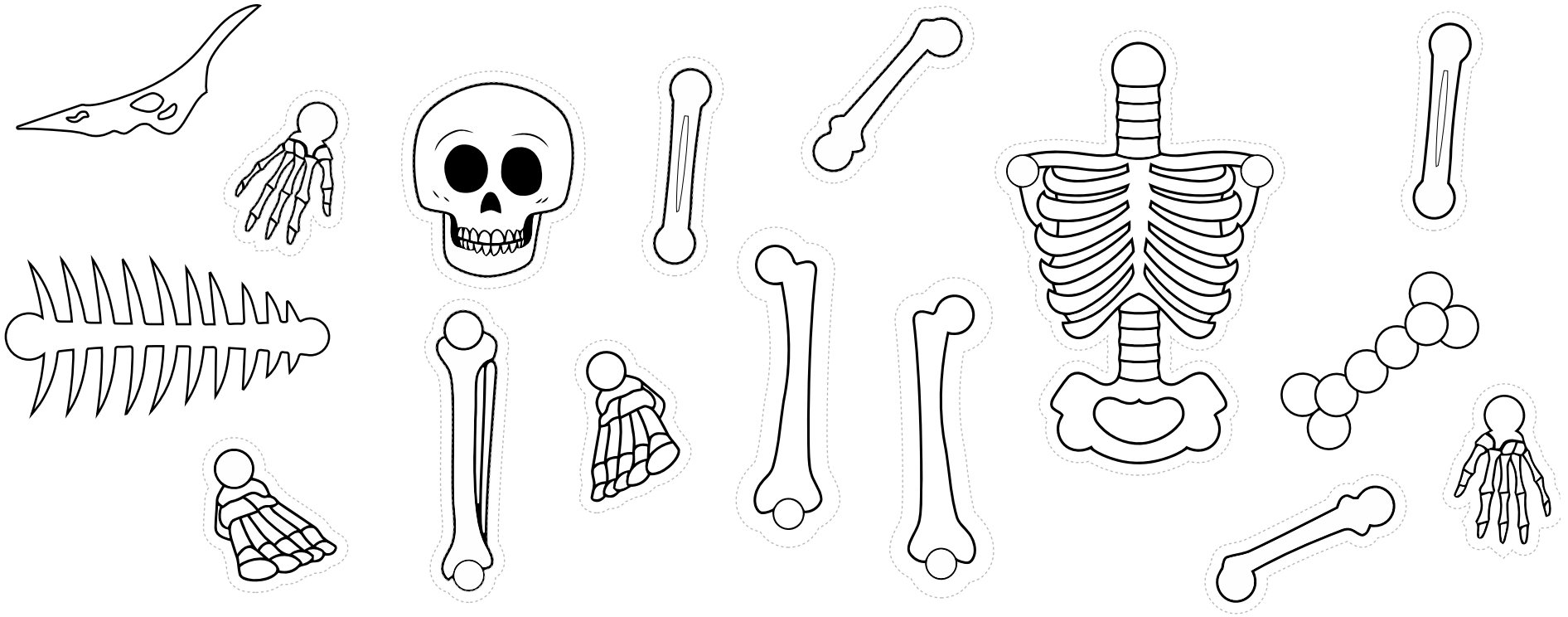


Worksheet 3.1b

Healthy Bones

Activity

1 Write the name of each nutrient you circled onto a human bone. Careful, some of these are not human bones!
2 Cut out the bones along the dotted lines.
3 Glue all the pieces together to create a human skeleton and glue this into a workbook.



Worksheet 3.2a

Osteoporosis

Activity

Osteoporosis currently affects 1.2 million Australians, and this number is expected to grow. It currently affects one in every five women and approximately one in 20 men (Dairy Australia, n.d.-c). The essential factors for maintaining strong bones throughout life include weight-bearing exercise, eating calcium-rich foods like milk, cheese, and yoghurt, and vitamin D from safe sun exposure.

1. Complete the table below to show the visual differences between a bone with osteoporosis and a healthy bone.

Bone with osteoporosis	Healthy bone

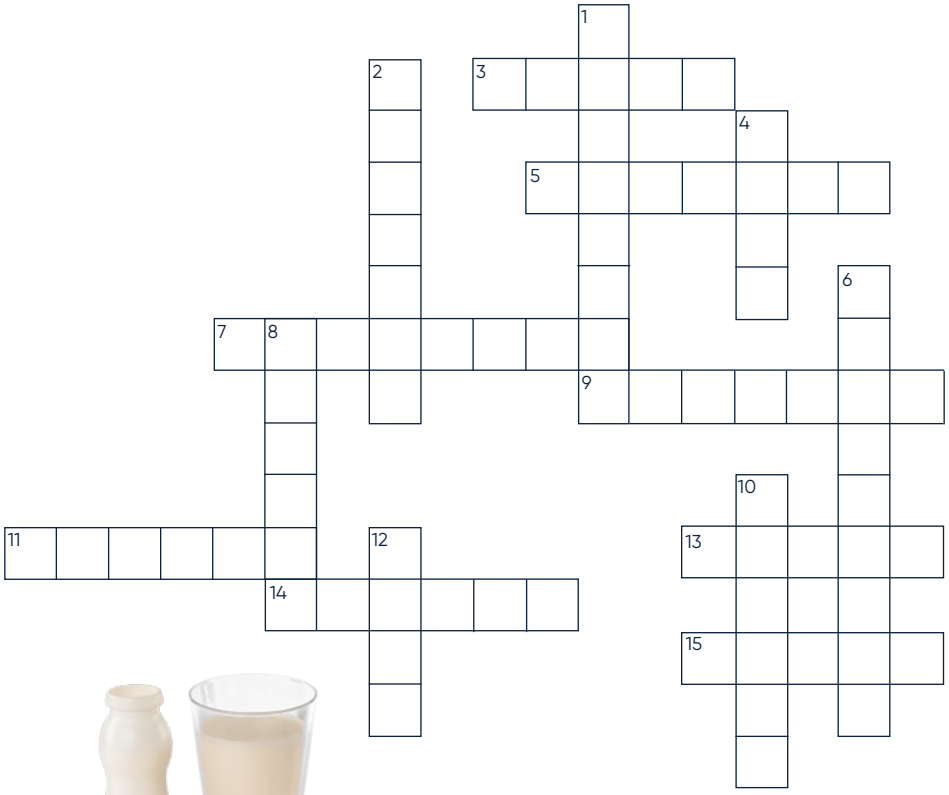
2. What can you do throughout your lifetime to maintain strong and healthy bones and help lower the risk of osteoporosis?

Worksheet 3.2b

Dairy Quick Facts Crossword

Activity



Across

3. Milk, cheese, and yogurt are all _____ foods.

5. People who have their recommended serves of the dairy food group every day are more likely to achieve their Recommended Dietary Intake (RDI) of _____ .

7. Almost half of all Australian _____ do not consume enough calcium every day to meet their requirements.

9. What does BMD stand for? Bone Mineral _____ .

11. One tub of _____ equals one serve of dairy.

13. How many serves of the dairy food group should a 10 year old girl eat every day?

14. When you increase your BMD you can increase the size and _____ of your skeleton.

15. 99% of calcium is found in your bones and _____ .

Down

1. _____ D is a bone building nutrient. To reduce the risk of _____ bones you need to achieve your RDI of calcium.

2. Along with water, what is the best drink for you? _____

6. Dairy foods are packed full of what? _____ .

8. RDI means the ideal amount to eat and drink every day for good _____.

10. One serve of dairy can be two slices of _____ .

12. Z_____ is a nutrient found in dairy foods.

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