Unit 3.1.3

Diet, Gut Microbiota and Health

Key Knowledge and Key Skills

Key Knowledge 3.1.3

The role of diet in influencing gut microbiota and the relationship between gut microbiota and physical and mental health.

Key Skills 3.1.3

Explain the role of diet and gut microbiota for health.

Key Skills 3.1.6

Evaluate the nutritional quality of foods and meals.

Key Skills 3.1.7

Apply the healthy eating recommendations of the Australian Dietary Guidelines and Australian Guide to Healthy Eating to the planning of daily food intake and, through practical activities, create nutritious meals to cater to a diverse range of needs.

VCE Food Studies Study Design p. 20 and 21

Terms and Definitions

Fermented foods are produced when bacteria break down carbohydrates in food into alcohol and acids. These foods contain bacteria that help restore the balance of bacteria in the gut and support digestive health.

The term **gut** describes both the small and large intestine.

Inflammation occurs when the body releases white blood cells to protect damaged areas in the body, this causes swelling, soreness and often redness. Inflammation can also occur in response to unwanted substances in the body, such as body fat.

Non-digestible carbohydrates are also called prebiotics.

Metabolism is the term used to describe the chemical process where your body turns the food you eat into energy.

Mental health is a state of wellbeing where people can cope with the usual stresses of life and interact appropriately within the community.

Microbial fermentation, or fermentation in the gut, occurs when carbohydrates are broken down to fatty acids in the gut.

Microbiome is the term used to describe microorganisms that live on or in bodies. The largest population of bacteria is found in the gut.

Microbiota is the term used to describe the collective group of microorganisms that live on or in us.

Physical health refers to the state of the body and how well it functions.

Prebiotics are non-digestible carbohydrates. They are found in some high-fibre foods and promote the growth of 'good' bacteria in the large intestine.

Probiotics are living bacteria found in some foods, such as yoghurt and kimchi, or supplements and are beneficial to our health.

Short-chain fatty acids are a by-product of the fermentation process in the gut.

Diet, Gut Microbiota, and Health

Gut Microbiota

Microbiota is the term used to describe the microorganisms that live on or in humans. The human microbiota comprises trillions of microorganisms, including bacteria, fungi, and viruses. These microorganisms can be found in the respiratory and urinary tract, skin, nasal and oral cavities, oesophagus, stomach, small intestine, and large intestine. The small and large intestines are often collectively referred to as the gut, often used when discussing microbiota. The large intestine contains more variety and quantity of gut microbiota than the small intestine.

It was initially thought that the only role of the large intestine was to remove water from undigested food and store and excrete faeces. However, we now know that the large intestine or colon plays a more significant role in our health.

Watch this video to find out what the term microbiota refers to: https://youtu.be/sBVjnLXz9UU

Gut Microbiota and Physical Health

During digestion, non-digestible carbohydrates not absorbed by the small intestine enter the large intestine. These non-digestible carbohydrates are referred to as prebiotics.

The good bacteria in the gut feed on prebiotics, enabling them to produce energy and nutrients for the cells in the large intestine. This leads to a healthier digestive system. Fermentation occurs when the microbiota consume the prebiotics. During the fermentation process, the microbiota break down the non-digestible carbohydrates into a by-product called short-chain fatty acids. Many different short-chain fatty acids are produced; however, acetate, butyrate, and propionate are the main ones. In the right balance, these short-chain fatty acids can provide energy for the cells in the gut and have a range of other health benefits. If an imbalance occurs, where there is too much of one type of bacteria or not enough of another, adverse health consequences can result.

Research suggests that short-chain fatty acids are a source of energy for bacteria in the gut. They also absorb minerals and vitamins, help improve metabolism, reduce inflammation, and have other health benefits.

Protection Against Inflammation

Short-chain fatty acids can assist with reducing inflammation in the body.

Disease Prevention and Management

Short-chain fatty acids may assist with disease prevention and management of inflammatory diseases, type 2 diabetes, obesity, heart disease, and other conditions.

The Synthesising and Absorption of Vitamins

The microorganisms in the large intestine enable humans to produce vitamins, such as Vitamin K and Vitamin B12.

Helps Control Blood Sugar Levels and Diabetes

Some studies have found that increased production of short-chain fatty acids has helped regulate blood glucose levels and improve insulin resistance.

Promote Digestive Health

Short-chain fatty acids can also increase the number of good bacteria that protect the gastrointestinal tract from disease-causing bacteria and help prevent constipation.

Watch this overview of the benefits of a healthy microbiome: https://youtu.be/AsyzqhFKLoI

Gut Microbiota and Mental Health

The gut is often referred to as the body's second brain. This is because millions of neurons can be found in the walls of the small and large intestine (gut). These neurons make up what is called the enteric nervous system. The enteric nervous system works with the vagus nerve, which runs from the brain to the intestines, and the central nervous system. The vagus nerve and the central nervous system communicate with the brain. This makes for a strong link between the gut and the brain. Because of this link, any disruption or imbalance to the gut microbiota can negatively impact a person's mental wellbeing.

In 2004, two groups of mice were used in a study of gut microbiota. One group of mice had the bacteria in their stomachs removed, while the other had the bacteria left intact. Both groups of mice were exposed to the same stressful situation. The mice without the bacteria in their stomach did not cope as well as those with the bacteria. This indicated that bacteria play a significant role in the management of anxiety, depression and stress. People who do not cope with stressful situations are encouraged to increase the diversity of their gut biome by consuming foods that contain a variety of prebiotics and probiotics.

Another link between the gut and mental health relates to the production of hormones, particularly the 'feel-good' hormones serotonin and dopamine. Research suggests that the gut microbiota make chemicals such as serotonin and dopamine in much larger quantities than the brain can make. Serotonin is a chemical messenger that is believed to assist with mood stabilisation and dopamine plays a role in pleasure, motivation, and learning. Serotonin and dopamine levels in the body are likely to increase if various foods containing probiotics and prebiotics are consumed.

The relationship between mental health and gut microbiota is a relatively new area of study. Research in this area is constantly evolving. Studies are finding that the more diverse a person's microbiome is, the less likely they will experience mental health conditions such as Alzheimer's disease and other clinical mental health conditions.

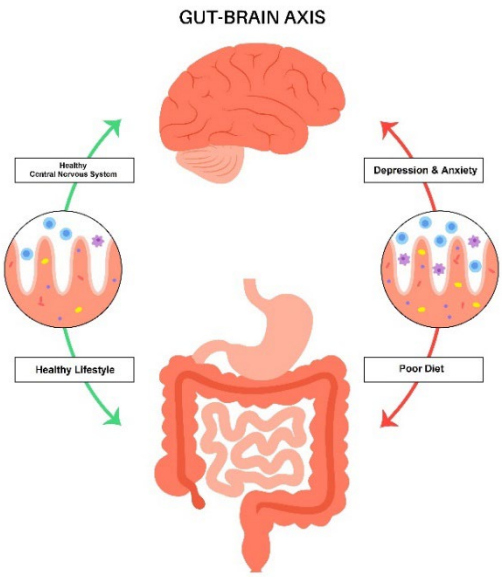
The Role of the Diet in Influencing Gut Microbiota

When people eat, they feed the microbiota in their gut. Diets high in processed foods, sugar, red meat, and fast food feed the harmful bacteria in the gut. Healthier food choices feed the good bacteria in the gut.

It is essential to eat a variety of plant foods in our diets because this increases the amount of beneficial microbiota in our diets. Eating a diverse diet increases the range of microbiota in the gut, whereas a lack of diversity will decrease it.

To have a healthy microbiome, people need to consume foods that contain prebiotics and probiotics.

Watch this video about how the food people eat impacts gut health: https://youtu.be/harBdPfeqcQ



Prebiotics

Prebiotics are not bacteria. Prebiotics are fibre compounds that come from plant sources. They promote the growth and health of the microbiota.

Resistant starch and pectins are excellent sources of prebiotics that help promote the growth of good microbiota in the gut. Resistant starch is found in various foods, including undercooked pasta, under-ripe bananas, cooked and cold potatoes, and rice. Pectin also acts as a prebiotic. Apples, apricots, and berries are excellent sources of pectin as they contain various short-chain fatty acids.

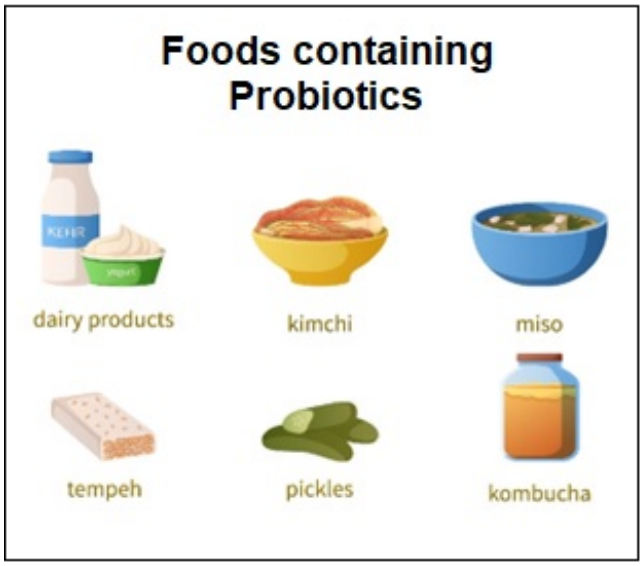
Resistant starch and pectins are non-digestible carbohydrates; they resist digestion in the small intestine and ferment in the large intestine, where bacteria change them into short-chain fatty acids.

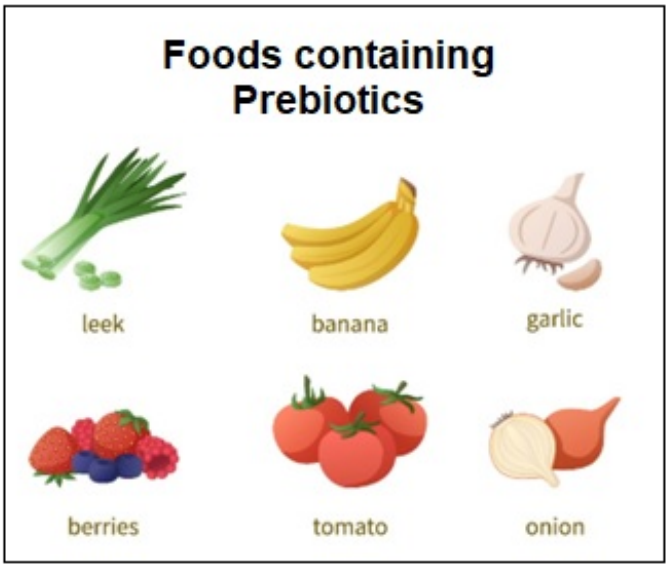
Watch this video to find out more about the role resistant starch has in the microbiome: https://youtu.be/NI3KtR3LoqM

Probiotics

Probiotic foods contain microorganisms that are alive and beneficial to health. Many fermented foods such as kefir, kimchi, kombucha, and sauerkraut contain probiotics. Probiotics add variety to the existing microbiota in the gut.

Watch this video to find out more about prebiotics and probiotics: https://youtu.be/QSDmkubNh_0





Written Activity One

What's Up with Your Gut Microbiome?

Watch the video to find out more about your gut microbiome: https://youtu.be/eVTkqnMNuQ0

Answer the following questions:

1. What does the term 'gut microbiome' refer to?

2. How many microbes do Scientists estimate we have in our bodies and where do they exist?

3. Why is it essential that we have microbes in our bodies?

4. Where do our microbiome come from?

5. How do microbes interact with each other in the gut?

6. Fecal transplants are one way to improve the range of good gut microbiota.
   Research some foods that help to improve your gut microbiome.

Original Source: https://www.calacademy.org/educators/whats-up-with-your-gut-microbiome

Written Activity Two

Gut Microbiome

Watch the video at this link: https://youtu.be/GV2Kug24Gic

Key Terms, Phrases, Statistics	Record notes, use concise sentences and abbreviations and include lists.
Summary – List the main ideas from most important to least important.	

How the food you eat affects your brain?

Watch the video at this link: https://youtu.be/3c9sgzCya6E

Key Terms, Phrases, Statistics	Record notes, use concise sentences and abbreviations and include lists.
Summary – List the main ideas from most important to least important.	

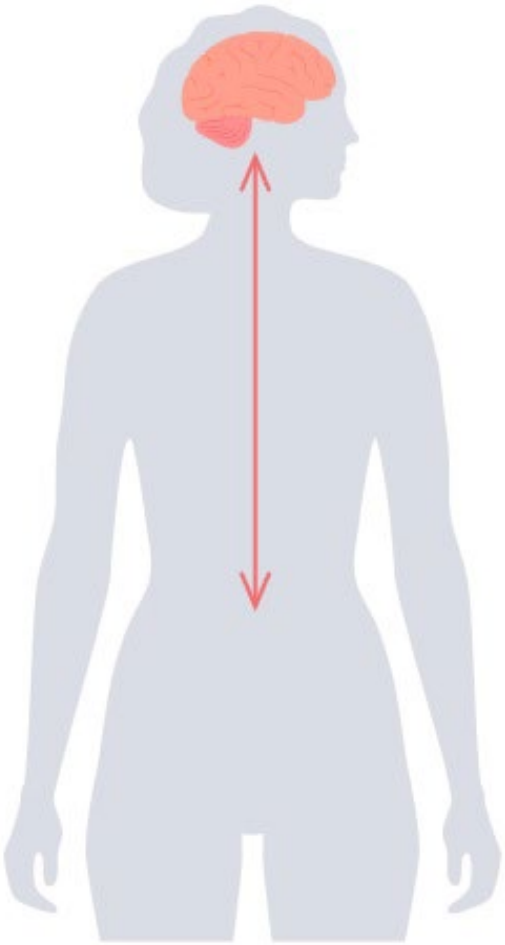
Written Activity Three

The Relationship between Gut Microbiota and Physical and Mental Health

In small groups, annotate the diagram below to explain:

- The relationship between the gut and physical and mental health.
- The role of the diet and gut bacteria for health.

Include as much detail as you can.



Written Activity Four

Gut Health

Watch this video: https://youtu.be/mu6GaK8JfFQ

Use the template below to make notes about the key terms and ideas in the video.

Summarise the video in the lower section.

Answer the quiz in the video.

Key Terms and Ideas	Notes

Summary

Summary Activity

What is the main idea about the key knowledge & key skills?
Define the term 'gut microbiota.'
Draw a diagram that shows what happens to the non-digestible carbohydrate in the gut. Annotate your diagram.
List and outline the role of the gut microbiota in physical health.

Write notes about each of the key words listed below and its relationship with mental health.		
Central nervous system and vagus nerve		
Short chain fatty acids		
Serotonin and dopamine		
Mental health conditions		
Write notes about the role of each of the following and identify the foods they are found in.		
Insoluble Fibre		
Soluble Fibre		
Resistant Starch		
Prebiotics		
Probiotics		

Exam Preparation

Section A - Multiple Choice Questions (5 marks)

Question 1

Which of the following best describes the term microbiota?

a. A group of microorganisms that live on or in us.

b. Microorganisms that inhabit the large intestine only.

c. The microorganisms that feed the good bacteria in the gut.

d. Foods that contain microorganisms.

Question 2

Where does most microbiota live in the human body?

a. The mouth.

b. The small intestine.

c. The large intestine.

d. The stomach.

Question 3

During microbial fermentation, resistant starch is broken down into:

a. Soluble fibre.

b. Insoluble fibre

c. Prebiotics and probiotics.

d. Short-chain fatty acids.

Question 4

Which of the following foods promote the growth and health of the microbiota?

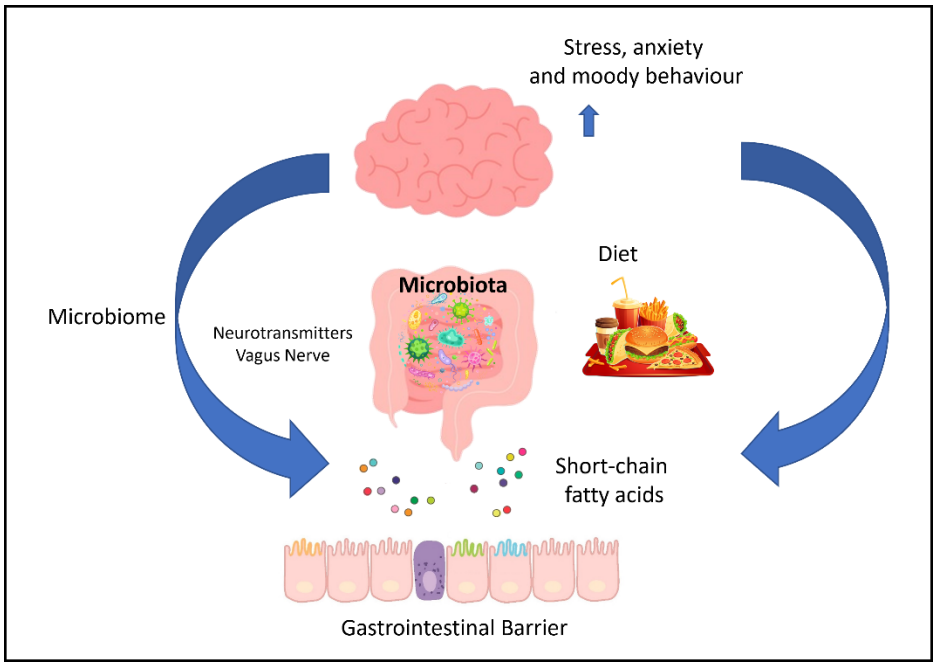
a. Berries, bananas, dairy products, and onion flavoured chips.

b. Garlic, dairy foods, kombucha, store-bought sauerkraut.

c. Unripe bananas, garlic and cold potatoes.

d. All of the above.

Question 5



Which one of the statements is best supported by the diagram above?

a. The gastrointestinal tract does not influence the psychological response to fast food.

b. There is a complex relationship between food intake, microbiota in the gut and mental health.

c. Neurotransmitters found in fast food impact behaviour.

d. A healthy microbiome improves mental health.

Section B – Short Answer Responses (17 marks)

Question 1 (8 marks)

There has been a recent increase in demand for prebiotic and probiotic food products in Australia due to people wanting to improve their physical health.

a. Explain the difference between the roles of prebiotics and probiotics in the body. 2 marks

b. In response to the information above, describe two reasons that could explain the increase in demand for probiotic food products in Australia. 4 marks

Reason One

Reason Two

c. The Australian Guide to Healthy Eating (part of the 'Eat for Health' program) recommends eating a wide variety of different types and coloured foods.
Explain why eating a variety of plant foods will help support gut microbiota. 2 marks

Question 2 (4 marks)

A magazine has advertised this recipe as a suitable picnic option for people seeking to improve their gut health.

Cannellini Bean, Potato and Zucchini Fritatta Slice	
Ingredients:	**Method:**
1 small zucchini, grated ½ onion, grated 1 small potato, 1cm cubes ½ x 310g can cannellini beans, drained & rinsed 25 grams tasty cheese, grated ½ cup self-raising flour 3 eggs, lightly beaten 2 tablespoons olive oil ¼ teaspoon salt 1 tablespoon Greek Yoghurt Pinch of sweet paprika	1. Collect and prepare ingredients. 2. Grease and line a 17 x 27 slice tin. 3. Preheat the oven to 180°C. 4. Place zucchini, onion, potato, cheese and flour in a large bowl. Mix well. 5. Combine eggs, oil and salt. 6. Stir into the zucchini mixture. 7. Pour the mixture into the prepared tin. 8. Bake in the oven for 30 minutes or until firm and golden in colour. 9. Remove from the oven and set aside for 15 minutes. 10. Refrigerate until cold. 11. Cut into 16 triangles and serve cold with a dollop of plain Greek Yoghurt sprinkled with sweet paprika.

Identify two ingredients in this slice that may help someone improve their gut health and explain why these foods might improve gut health.

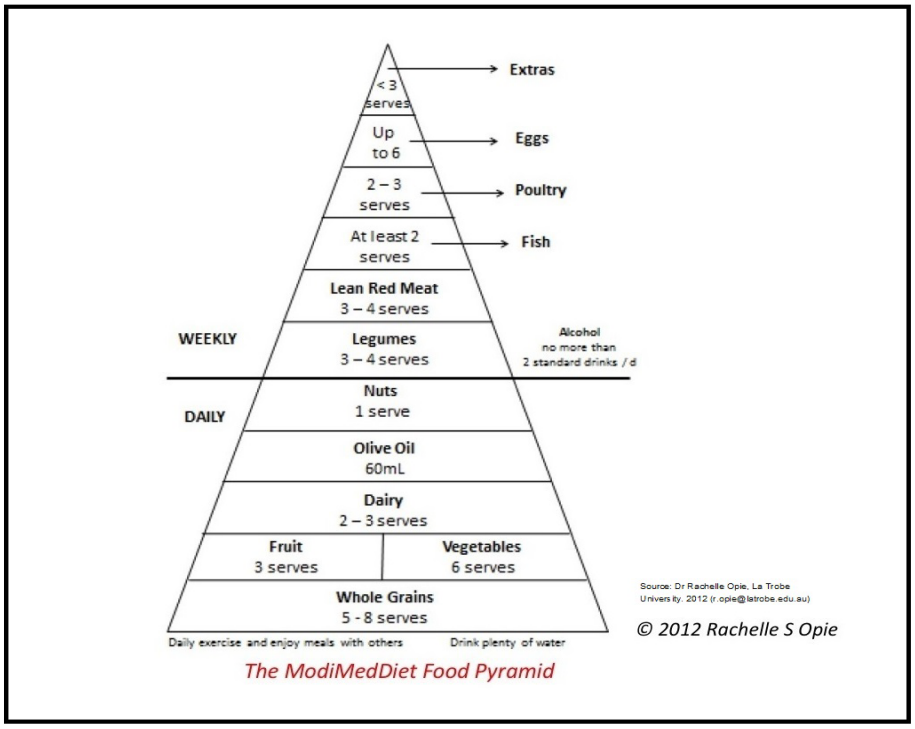
Ingredient	**Explanation/ Assessment**

Question 3 (5 marks)

In 2012, Deakin University conducted the first randomised controlled trial investigating the relationship between diet and mental health. It confirmed that a healthy diet could effectively improve the mental health of people with depression. Participants in the program were divided into two groups. Half of the participants attended a social support group to assist with their depression. The other group received the dietary intervention. The study concluded in 2015.

The diagram below shows the dietary model used by the group following the dietary intervention.

Source: https://www.deakin.edu.au/research/impact-stories/improving-mood-with-food#:~:text=Deakin%20University's%20SMILES%20trial%20(Supporting,health%20of%20people%20with%20clinical



Referring to the information and diagram above, explain why researchers who conducted the study concluded that eating a healthy diet could improve a person's mental wellbeing.

Exam Preparation

Section A - Multiple Choice Questions (5 marks)

Question 1

Which of the following best describes the term microbiota?

a. A group of microorganisms that live on or in us.

b. Microorganisms that inhabit the large intestine only.

c. The microorganisms that feed the good bacteria in the gut.

d. Foods that contain microorganisms.

> The answer is A; microbiota are microorganisms; they live on or in us.
>
> The answer is not B; microbiota refers to a group of microorganisms that are found just about everywhere on the human body.
>
> The answer is not C; prebiotics feed the good bacteria in the gut.
>
> The answer is not D; they are microorganisms.

Question 2

Where does most microbiota live in the human body?

a. The mouth.

b. The small intestine.

c. The large intestine.

d. The stomach.

> The answer is C; microbiota can be found in all the areas listed, however, significant amounts can be found in the large intestine.

Question 3

During microbial fermentation, resistant starch is broken down into:

a. Soluble fibre.

b. Insoluble fibre

c. Prebiotics and probiotics.

d. Short-chain fatty acids.

> The answer is not A or B; soluble and insoluble fibre are broken down (fermented) by microbiota in the large intestine into short-chain fatty acids.
>
> The answer is not C; resistant starch is an excellent source of prebiotics.
>
> The answer is D; due to fermentation, resistant starch is broken down into short-chain fatty acids.

Question 4

Which of the following foods promote the growth and heallth of the microbiota?

a. Berries, bananas, dairy products, and onion flavoured chips.

b. Garlic, dairy foods, kombucha, store-bought sauerkraut.

c. Unripe bananas, garlic and cold potatoes.

d. All of the above.

The foods that promote the growth and health of the microbiota are prebiotics.

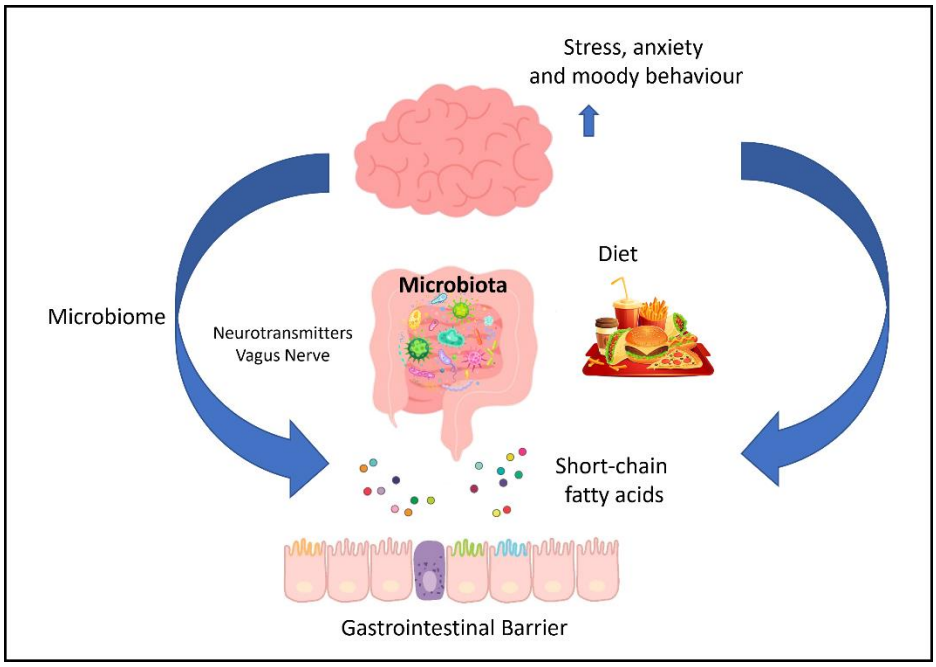
The answer is not A. Berries and unripe bananas are good sources of prebiotics. Dairy products are sources of probiotics. Store-bought flavoured chips are unlikely to provide either prebiotics or probiotics.

The answer is not B. Garlic is a source of prebiotics. Dairy foods and kombucha are sources of probiotics. Store-bought sauerkraut is unlikely to provide probiotics.

The answer is C; unripe bananas, garlic and cold potatoes are all sources of prebiotics.

The answer is not D.

Question 5



Which one of the statements is supported by the diagram above?

a. The gastrointestinal tract does not influence the psychological response to fast food.

b. There is a complex relationship between food intake, microbiota in the gut and mental health.

c. Neurotransmitters found in fast food impact behaviour.

d. A healthy microbiome improves mental health.

The answer is not A; fast food does influence a psychological response.

The answer is B; the relationship between food intake, microbiota, the gut and mental health are all represented in the diagram above.

The answer is not C; the diagram indicates that neurotransmitters, along with the vagus nerve, play a role in the microbiome. There is no indication that they are found in food.

The answer is not D; the diagram indicates that stress, anxiety and moody behaviour are increased, not decreased. The diagram focuses on the negative impact that fast food has on mental health.

Section B – Short Answer Responses (17 marks)

Question 1 (8 marks)

There has been a recent increase in demand for prebiotic and probiotic food products in Australia due to people wanting to improve their physical health.

a. Explain the difference between the roles of prebiotics and probiotics in the body. 2 marks

For full marks, the student needed to compare the differences between the roles of prebiotics and probiotics in the body. Using the term 'whereas' or a similar word when comparing prebiotics and probiotics was preferred.

For two marks, the student needed to explain differences between prebiotics and probiotics.

They only needed to state one role for prebiotics and one thing for probiotics.

Explanations where students stated that prebiotics were non-living and probiotics were living things or bacteria did not relate/ answer the question.

Prebiotics are food substances that promote the growth and health of the microbiota, whereas probiotics are bacteria add variety to the existing microbiota in the gut.

b. In response to the information above, describe two reasons that could explain the increase in demand for probiotic food products in Australia. 4 marks

Reason One

For full marks, the student needed to respond to the information above by explaining why prebiotic foods improve physical health. Reasons relating to mental health were not accepted because mental health was not mentioned in the stimuli.

For full marks, both reasons must have been related to probiotics.

One of the following responses about probiotics could include:

- Probiotics increase the variety and quantity of microbiota in the gut and can help the body to fight disease-causing pathogens like viruses.
- Probiotics help to reduce inflammation in the body.
- Probiotics can assist in disease prevention.
- Probiotics can assist in synthesising and absorbing vitamins.
- Probiotics can help control blood sugar levels and diabetes.
- Probiotics can assist with digestive health and help prevent constipation and diarrohea.

Reason Two

See above responses.

c. The Australian Guide to Healthy Eating (part of the 'Eat for Health' program) recommends eating a wide variety of different types and coloured foods.
Explain why eating a variety of plant foods will help support gut microbiota. 2 marks

For two marks, students needed to explain why consuming a wide variety of different coloured and types of plant foods was important.

Any one of the following answers was acceptable.

Different coloured and types of fruits and vegetables will improve gut health by encouraging the growth of different microorganisms.

Different coloured and types of fruits and vegetables contain lots of fibre which feed some bacteria in the gut and stimulate their growth.

Different coloured and types of fruits and vegetables contain different types of bacteria. This adds variety to the gut bacteria in a persons gut.

Question 2 (4 marks)

A magazine has advertised this recipe as a suitable picnic option for people seeking to improve their gut health.

Cannellini Bean, Potato and Zucchini Fritatta Slice	
Ingredients:	**Method:**
1 small zucchini, grated ½ onion, grated 1 small potato, 1cm cubes ½ x 310g can cannellini beans, drained & rinsed 25 grams tasty cheese, grated ½ cup self-raising flour 3 eggs, lightly beaten 2 tablespoons olive oil ¼ teaspoon salt 1 tablespoon Greek Yoghurt Pinch of sweet paprika	1. Collect and prepare ingredients. 2. Grease and line a 17 x 27 slice tin. 3. Preheat the oven to 180°C. 4. Place zucchini, onion, potato, cheese and flour in a large bowl. Mix well. 5. Combine eggs, oil and salt. 6. Stir into the zucchini mixture. 7. Pour the mixture into the prepared tin. 8. Bake in the oven for 30 minutes or until firm and golden in colour. 9. Remove from the oven and set aside for 15 minutes. 10. Refrigerate until cold. 11. Cut into 16 triangles and serve cold with a dollop of plain Greek Yoghurt sprinkled with sweet paprika.

Identify two ingredients in this slice that may help someone improve their gut health and explain why these foods might improve gut health.

Students needed to show an understanding of the foods that contain prebiotics, probiotics and dietary fibre.

They needed to identify two foods that contained prebiotics, probiotics and dietary fibre. (2 marks)

They needed to explain why these foods would help improve gut health.(2 marks)

Any of the two ingredients and explanations below were accepted.

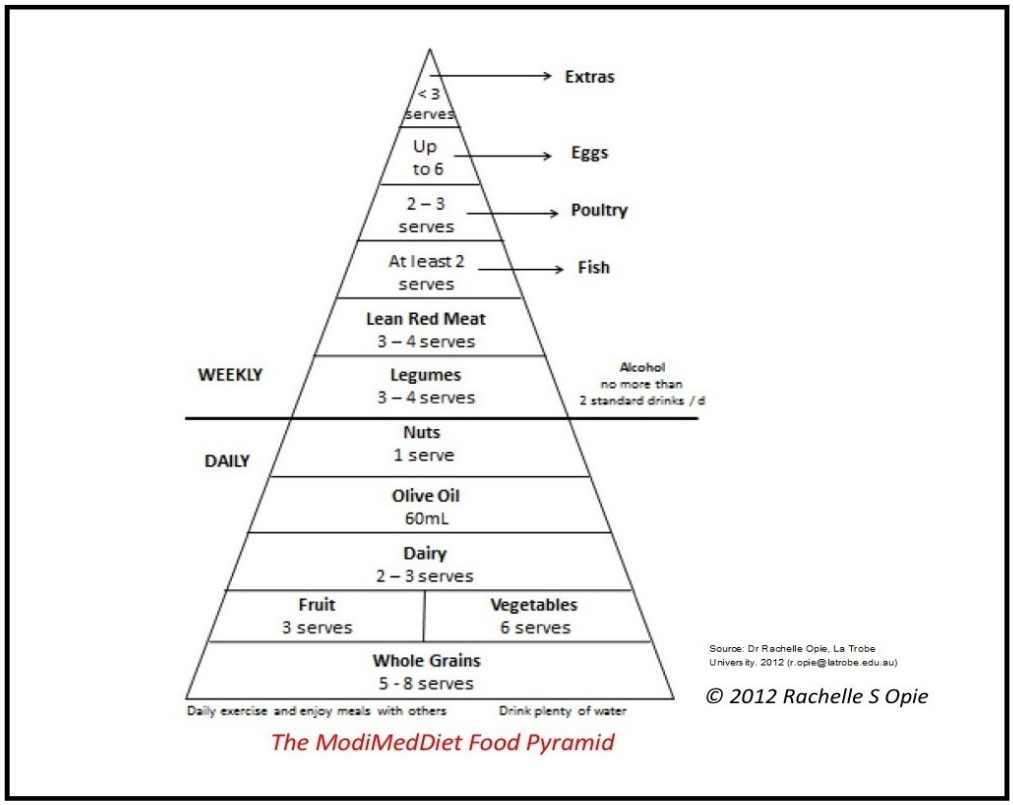
Ingredient	**Explanation/ Assessment**
Cold potato	A cold potato contains more resistant starch compared to a hot potato.
Yoghurt	Plain Greek yoghurt contains probiotics.
Cannellini beans	Cannellini beans are an excellent source of resistant starch.
Zucchini	Many vegetables, such as zucchini contain resistant starch.

Question 3 (5 marks)

In 2012, Deakin University conducted the first randomised controlled trial investigating the relationship between diet and mental health. It confirmed that a healthy diet could effectively improve the mental health of people with depression. Participants in the program were divided into two groups. Half of the participants attended a social support group to assist with their depression. The other group received the dietary intervention. The study concluded in 2015.

The diagram below shows the dietary model used by the group following the dietary intervention.

Source: https://www.deakin.edu.au/research/impact-stories/improving-mood-with-food#:~:text=Deakin%20University's%20SMILES%20trial%20(Supporting,health%20of%20people%20with%20clinical



Referring to the information and diagram above, explain why researchers who conducted the study concluded that eating a healthy diet could improve a person's mental wellbeing.

In the study conducted by researchers at Deakin University, some participants were asked to follow a healthy eating program that involved eating a set number of serves of foods each day or each week. Other participants were required to participate in a social group counselling session. The participants who followed the eating recommendations noticed an improvement in their depression compared to the group that participated in the counselling sessions.

The people on the healthy eating program were likely required to eat 5 to 8 serves of whole grains, three serves of fruit and six serves of vegetables per day. They were also asked to consume 3 to 4 serves of legumes per week. These foods contain different types of dietary fibre, which include soluble fibre, insoluble fibre and resistant starch. This dietary fibre contains indigestible carbohydrates. The good bacteria in the large intestine break down or ferments the indigestible carbohydrates into short-chain fatty acids. The short-chain fatty acids produced by the fermentation of dietary fibre feed the gut microbiota, resulting in a healthier gut microbiome.

Millions of neurons can be found in the intestinal walls of the gut; these neurons link the gut to the nervous system and vagus nerve. Any disruption or imbalance in the gut's microbiota may cause problems with the nervous system and the messages the vagus nerve sends to the brain. This may influence mental health.

In addition, there is a possible link between the 'feel-good' hormones, serotonin and dopamine, with the gut. The gut microbiota can make these hormones in much larger quantities than the brain. The healthier the gut microbiome is, the more likely these hormones will be produced. In addition to this, short-chain fatty acids,

created when fermenting dietary fibre, help to release serotonin. By consuming a nutritious diet, a person is more likely to produce hormones that positively impact mental health.

Marks for this question were based on the rubric below:

Mark	Criteria
5 marks	The student: – Referred to the information and diagram in their response. – Gave a clear accurate explanation that showed a thorough understanding about the role of dietary fibre in the gut health. – Gave a clear explanation that showed a thorough about how the gut and brain were linked and how this impact mental wellbeing.
4 marks	The student: – Referred to the information and diagram in their response. – Gave a clear accurate explanation that showed a good understanding about the role of dietary fibre in the gut health. – Gave a clear explanation that showed a good about how the gut and brain were linked and how this impact mental wellbeing.
3 marks	The student: – Referred to the information or diagram in their response. – Gave a clear accurate explanation that showed an adequate understanding about the role of dietary fibre in the gut health. – Gave a clear explanation that showed an adequate understanding about how the gut and brain were linked and how this impact mental wellbeing.
2 marks Limited	The student: – Referred to the information or diagram in their response. – Gave a basic explanation that showed some understanding of the role of dietary fibre in the gut health. – Gave a basic explanation that showed some underestanding about how the gut and brain were linked.
1 mark Very Limited	The student: – Made no reference to the information or diagram in their response. – Gave a very limited response that showed very little understanding of the role of dietary fibre in the gut health. Or – Gave a very limited response that showed very little underestanding about how the gut and brain were linked.
0 marks	Response was irrelevant or did not answer the question.

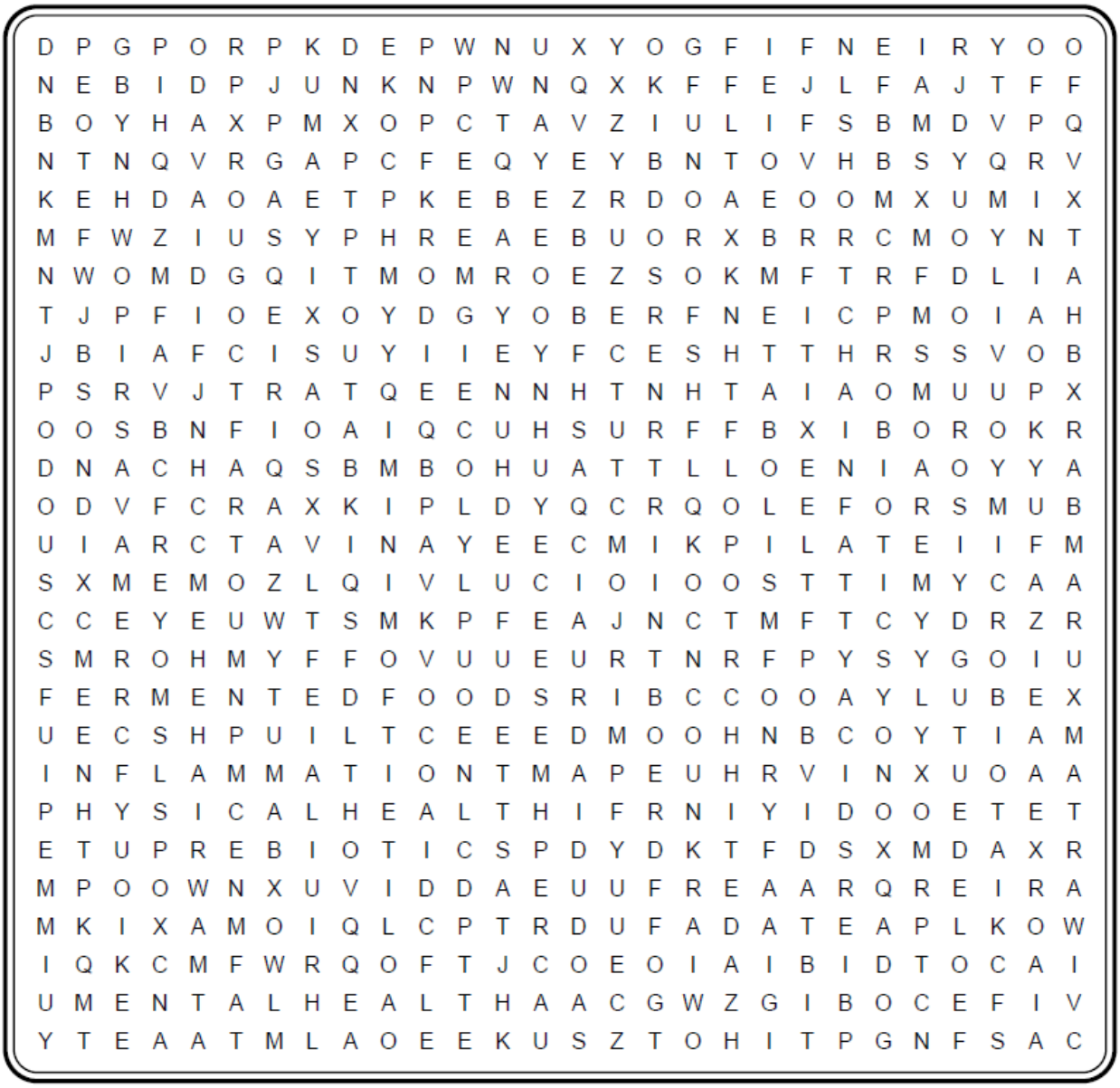
Starter Activity One

Assess your understanding of the key terms for this key knowledge and key skill by completing the self-assessment below:

Key Term	I have never seen this word before.	I have seen this word before.	I am a bit unsure of the meaning of this word.	I know this word and I can use it in a sentence.
Fermented foods				
Gut				
Inflammation				
Non-digestible carbohydrates				
Metabolism				
Mental health				
Microbial fermentation				
Microbiome				
Microbiota				
Pathogens				
Physical health				
Prebiotics				
Probiotics				
Short-chain fatty acids				

Starter Activity Two

Find the key terms related to this topic in the wordfind below:



☐ Fermented foods	☐ Microbiome
☐ Gut	☐ Microbiota
☐ Inflammation	☐ Pathogens
☐ Non-digestible carbohydrates	☐ Physical health
☐ Metabolism	☐ Prebiotics
☐ Mental health	☐ Probiotics
☐ Microbial fermentation	☐ Short-chain fatty acids

Wordsearch Answers