

Processing: changing the properties of food

Adaptable for children in Years 1 to 9 (5 to 12 years of age).

In this lesson, ākonga explore what food processing is and how food processing can change kai.

Objectives

1. Explore how different types of processing change kai.
2. Begin to think critically about what has been added and removed during the processing and why.

How to talk to ākonga about kai

These activities are designed to be enjoyable and to spark curiosity and excitement in ākonga about exploring kai. Building positive connections with kai during childhood can shape healthy eating habits that last a lifetime.

- Avoid labelling kais as 'good/bad', 'junk/treat', 'everyday/sometimes' – instead call the kai by their names, e.g. chocolate or bananas.
- Avoid discussing diets, body weight and size, and making comparisons like healthy vs. unhealthy kai with or in front of ākonga.
- All kai can be part of a healthy way of eating – it's all about balance and variety.
- Focus on the functions that kai helps the body to do, e.g. enabling learning, running fast, growing tall, and feeling full.
- Avoid using kai as a reward – stick with non-kai rewards. Using kai as a reward may send the message that these kai are more appealing than others.

Learning outcomes

Ākonga can:

- identify kai that can be transformed or changed from its natural form through processing - changes in the appearance, taste, texture and nutritional value
- critically think about what has been added or removed during processing and how that affects what the kai does for the body, its nutritional value and its storage/shelf life.
- recognise that processing kai can be important for food safety, national and global availability, seasonal access and convenience.

Lesson

Food processing includes any process that changes kai from its natural form. This can be as simple as chopping or freezing, or more complex methods like cooking, drying, milling grains into flour, fermenting and adding ingredients. These processes change kai by adding or removing ingredients and nutrients such as salt, sugar, oil, fibre, vitamins, and minerals.

Say to ākonga (Years 1 to 4)

“Processing is anything we do to change kai from how it looks when it is grown or caught – like washing, chopping, cooking, freezing or adding other ingredients.”

Say to ākonga (Years 5 to 8)

“Processing means changing kai from its natural form. It can be simple, like chopping or freezing, or more complicated, like cooking, drying, grinding grains into flour, or adding things like salt, sugar or oil.”

Introductory learning activities

Before beginning ‘Processing: changing the properties of food’, activities take time to revisit and discuss the [Food groups activity](#). This will refresh ākonga’s understanding of the four food groups and whole kai. If you are teaching Year 4 and above, you may also wish to revisit key ideas from [Connecting with kai – Lesson 8 food processing](#), where ākonga begin to understand that kai can be transformed or changed from its natural form.

Food properties

The properties of kai are the different characteristics that affect how it looks, tastes, feels, and behaves when we cook or store it.

There are three main types:

- Nutritional properties - what the kai contains, like proteins, fats, carbohydrates, vitamins and minerals, which give us energy and help our bodies grow and stay healthy.
 - **Say to ākonga** (Years 1 to 4): “Nutritional properties mean what is inside the kai that helps our body - things that give us energy, help us grow strong and keep us well.”
 - **Say to ākonga** (Years 5 to 8): “Nutritional properties are the helpful parts inside kai, like protein, fats and carbohydrates, that give us energy and help our bodies grow and stay healthy.”
- Functional properties - how kai acts during cooking or preparation, such as thickening (viscosity), forming foam (beating egg whites), or mixing oil and water (emulsification).
 - **Say to ākonga** (Years 1 to 4): “Functional properties are about what kai does when we cook it - like an egg going from runny to hard, or water turning into ice.”
 - **Say to ākonga** (Years 5 to 8): “Functional properties are how kai behaves when we prepare or cook it - like a sauce getting thicker when it simmers, or milk going frothy when we whisk it.”
- Sensory properties - how kai is experienced by our senses, including its colour, texture, smell, and taste.

These properties are important because they affect the quality, safety, and how much people enjoy the kai.

Say to ākonga

“These properties matter because they help us notice if kai is safe, if it tastes good, and if it gives our body what it needs.”

Processing changes the properties of food

Processing can change a food's sensory, nutritional and functional properties. For example, cooking can soften texture and change flavour, drying can make kai last longer but remove water, and fortifying can add vitamins or minerals.

Food processing methods can sometimes be considered essential to:

- improved **shelf life**: processing (like canning, drying, or freezing) helps kai last longer, reduces kai waste by slowing down spoilage and preventing bacterial growth
- enhanced **safety**: it can kill harmful microorganisms (e.g., through pasteurisation of milk), making kai safer to eat
- **convenience**: processed kai are often quicker and easier to prepare, saving time in the kitchen (e.g., ready-to-eat meals, pre-cut vegetables)
- **access and availability**: kai can be transported and stored more easily, making seasonal or regional kai available year-round
- **enhancing taste and appearance**: processing can improve flavours, colours, and textures through cooking, fermenting and/or adding ingredients like salt and sugar to make kai more appealing
- improved **nutrition**: some processed kai are fortified with extra nutrients (like the addition of vitamins and minerals) to improve health benefits and replace nutrients lost in processing.

Kai that has undergone relatively small amounts of processing (such as washing, chopping, freezing or plain yoghurt) can still contain high amounts of nutrients and low amounts of fat, sugar, and salt. However, once kai or a drink starts to look less like how it is found in nature, then this is when we want to find out more about what is in the kai.

Say to ākonga

“Some kai are very close to how they grow or are caught. Some have been changed a little. Some have changed a lot. When kai looks very different from how it started, we can be curious and ask: ‘What changed?’”

The reality is that a large proportion of our kai is pre-packaged and has undergone food processing. Most of us will buy pre-packaged kai for a range of reasons, such as cost, convenience, taste, and longer shelf life. The following activities help ākonga explore why we make those choices and whether they are nourishing for our bodies.

Class questions and discussion prompts

Use these questions to guide class or small-group discussions about how processing affects different aspects of kai. Choose and adapt questions based on your class's age.

Class questions and discussion on how processing affects:	Discussion prompts
Taste, flavour and texture What kai can be eaten raw? What kai needs to be cooked? Why? What types of cooking/processing change the flavour and texture of kai? What kind of ingredients are commonly added to kai to change the flavour and texture? Why?	Creates edible kai, as not all whole kai/kai found in nature can be eaten raw. Frying, boiling, grilling, roasting, mashing, blending (soup dips), pickling, fermenting and jellies. Flavour – herbs, spices, sugar, salt, fat, lemon juice. Texture – sugar (syrup, crunchie, hard), fat (fried, crisp), salt (pickling, fermenting, preserving), water (smooth, runny).
Shelf life and food safety Where is kai kept at home/supermarket? What kind of kai is stored there and why is it stored there? How long can it stay there? What happens if it stays there too long? What kind of processing has occurred for the kai to be able to be stored in the pantry and freezer? How long has the processing extended the shelf life from its form found in nature (whole food)? Introduce and discuss best-before and use-by dates.	Storage places – fridge, pantry, freezer. Fridge (milk, eggs, fish, meat, fruit and vegetables, etc.). Pantry (potatoes, onions, bananas, kūmara). Spoilage of kai causes changes in flavour and texture (soft, mouldy, smelly, taste unpleasant). Cooking (crackers, muesli bars, breakfast cereals). Canning (tuna, vegetables, baked beans, fruit). Drying (dried fruit, soup, lollies). Vacuum packing (noodles). Freezing (any kai that has been cooked, some have better results than others).

Nutritional value How do different types of processing affect the nutritional value of kai? What has been added or removed from the kai? Why?	Drying reduces moisture, and boiling reduces water-soluble vitamins. Canning and preserving adds salt, sugar, flavours, vinegar. During processing, kai is modified from its natural state by the addition or removal of ingredients and nutrients, including salt, sugar, oil, fibre, water, vitamins, and minerals. Processing (like canning, drying, or freezing) helps kai last longer, reduces kai waste by slowing down spoilage and preventing bacterial and fungal growth.
Cost, convenience, sustainability/ environmental When is whole food cheaper or more expensive than processed food? Why? How does processing change the cost of kai? How does processing create convenient kai?	Seasonality, grown locally, oranges in Gisborne, swedes in Southland, etc. Journey of kai from whenua to plate - cost of transport, manufacturing, packaging, marketing. Kai not produced in NZ – imported pineapples, bananas, almonds, tomatoes (some canned tomatoes come from other countries), etc. All year round availability, consistent product, transportable, reduced preparation time, shelf stable and safe to eat.
Seasonality, access and availability What kai is produced in summer, winter, autumn and spring? What kai is available year-round? What kinds of things make kai available and accessible year-round? Discuss your local food supply – what is grown and produced locally?	Seasonal fruit and vegetables. Animal products, fish, eggs, cheese, bananas, etc. Preserving (jams, chutney, sauce, pickling vegetables), canning, bottling, drying (milk powder, soup), freezing (fruit, vegetables). Imported food, e.g., pineapples, bananas, nuts, dried fruit and tomatoes.

Resources and materials

Processing changes properties of food activity cards:

Kai cards have 82 cards total, including:

- 72 kai picture cards
- 10 category cards

The kai cards can be used individually or used as a series of kai cards that feature the same main ingredient, which have had different processing. E.g. chicken, soybeans, wheat, dairy, pineapple, potato, rice, corn. tomato, fish, cabbage, grapes, berries (see page 10).

Supporting resource

Food group activity: Kete Kai has 76 cards, including 60 food picture cards.

Processing changes in food activities

Adaptable for children ages 5 to 12.

In groups or as a class discuss using the picture cards and their headings.

Up to Year 8	Activity 1: What's in season and available? Using the kai cards and/or Food Group kete kai cards , ask the ākonga what kai is produced in summer, winter, autumn, spring and all year round? Then discuss why kai is available all year round? What sort of things make kai available and accessible all year round?	Which group of kai cards. Use all cards or a selection of cards.
Focus concepts	Processing, importing kai, cooking and preserving. Activity 2: Is it a whole or processed food? Divide ākonga into groups and give each group a variety of kai cards. Ask each group to decide whether the kai are whole kai like they are found in nature or have they been processed or changed. For the kai that have been identified as whole kai, discuss how many can be eaten raw and if not, why? For the kai that have been identified as processed, discuss what kinds of processing have happened and why. Have any ingredients been removed or added during processing?	Use all cards or a selection of cards.
Focus concepts	Food safety, shelf life, taste, flavour, texture, and cooking.	

Up to Year 8 Focus concepts	Activity 1: Where do we store kai? Divide the class into groups, using the kai cards, and ask the ākonga where each kai is stored – fridge, pantry or freezer. Then discuss why each kai is stored in those places and how long each can be stored. Introduce food safety, food labelling, best-before and use-by dates. Ask the ākonga what kind of processing has occurred to those kai for them to be able to be stored there? Activity 2: What kind of processing occurred? Discuss how long different types of processing can extend the shelf life of their form found in nature (whole food), e.g. milk, ice cream, yoghurt, cheese, milk powder? Shelf life, food safety, taste, flavour, texture, seasonality, availability, cost and convenience.	Use all cards or a selection of cards.
Year 3 upwards Focus concepts	Activity 2: How do the nutritional properties of food change during processing? Working in groups, give each group three or four kai cards that identify as processed kai. Ask each group to investigate how the kai is made. Then discuss: - What is the purpose of processing? - What has been added or removed from the kai and for what reason? - How do different types of processing affect the nutritional value of kai? Bring the class together to share each group's findings. Focus on what has been added to or removed from each kai, and how these changes affect the nutrients the kai provides our bodies. Seasonality, nutrition, cooking, preserving, shelf life, food safety, cost and convenience.	Use a selection of cards representing different processing methods, e.g., cooking, freezing, drying and preserving.

Years 7-9 Focus concepts	Activity 1: How do cost, convenience and sustainability affect kai choice? Divide ākonga into groups and give each group a variety of kai cards. Ask each group to sort the cards from the most to the least based on • convenience • cost • environmental / sustainability. Then in their groups discuss: - When is whole food cheaper or more expensive than processed food? - How does processing change the cost of kai? - How does processing create convenient kai? Then as a group or a class, discuss how convenience, cost, sustainability/environmental factors affect kai choices. Seasonality, nutrition, cooking, preserving, import and export, convenience, cost, and sustainability.	Use all cards or a selection of cards. Or use a series of kai cards that feature the same main ingredient.
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Extension activities

- **Food origins:** Divide the class into five groups and ask each group to investigate a different kai from the card deck. Discuss where these kai come from (e.g. country, sea/farm/garden), how they are grown or sourced, how they can be processed, and what nutrients have been added and what has been lost during different processing.
- **Unpacking food processing:** Discuss the history of food processing (food safety and preservation) and ask ākonga to carry out an inquiry into a selected method of food processing. Some examples of food processing include refrigeration, canning, pickling, curing, smoking, drying, cooking, and fermenting.
- **Fermenting fun:** Fermenting is a form of food processing that has been used for hundreds of years to preserve kai, so that it can be eaten throughout the year. As a class, work through the [fermenting activity](#) to make your own fermented kai!

Processing changes food activity cards

Kai picture cards

The kai cards can be used individually or used as a series of kai cards that feature the same main ingredient, which have had different processing. E.g. chicken, soybeans, wheat, dairy, pineapple, potato, rice, corn. tomato, fish, cabbage, grapes, berries

- **Chicken**, chicken whole, chicken mince, chicken drumstick, chicken nuggets, chicken luncheon, egg, boiled egg.
- **Soybeans**, edamame beans, tofu, soy milk, soybean oil, soy sauce.
- **Cabbage**, coleslaw, sauerkraut.
- **Grapes**, raisins.

- **Wheat**, wheat flour, biscuit, wholemeal bread, pasta, roti, wheat biscuits, instant noodles.
- **Cow**, fruit yoghurt, cheese, blue vein cheese, milk powder, milk, chocolate dairy food, ice cream, yoghurt.
- **Corn**, frozen corn, cornflakes, corn chips, popcorn.
- **Potato**, boiled potato, French fries, hash browns, potato chips.
- **Pineapple**, pineapple juice, canned pineapple, crystallised pineapple, pineapple jelly, pineapple pieces.
- **Rice**, vermicelli, rice crackers, rice flour, cereal snack bar.
- **Tomato**, tomato sauce, tomato relish, sundried tomatoes, baked beans.
- **Fish**, canned tuna, fried fish, fish fingers, savoury canned tuna.
- **Berries**, frozen berries, berry roll ups, jam.

Category cards

- Fridge, pantry, freezer.
- Winter, autumn, summer, spring, all year.
- Whole kai, processed foods.

Glossary

Calcium: a mineral that helps us build strong bones and teeth.

Convenience: refers to the quality of being easy to use, accessible, or suitable, designed to save time and reduce physical or mental effort.

Cost: the value of money that has been used up to produce something or deliver a service.

Food environment: is the intersection between an individual and the wider kai system, such as neighbourhoods, workplaces, and stores. Spaces and places that influence what people eat by determining the availability, affordability, convenience, and promotion of kai.

Fat: a macronutrient for which there are two types:

- saturated fat mainly from animal sources such as butter, cream, white fat on meat, skin on chicken and coconut fat
- unsaturated fat from plant sources such as olive oil, nuts, seeds, avocado and oily fish such as salmon.

Fibre: often labelled as dietary fibre and is only found in plant kai. Fibre is beneficial for good digestion, keeping us regular and helps us to feel full for longer.

Food safety: is the practice of handling, preparing, storing, and cooking kai to prevent contamination and foodborne illnesses. Learn more – mpi.govt.nz/dmsdocument/3662-FoodSafety-at-Home

Four food groups:

- vegetables and fruit
- grain foods
- legumes, nuts, seeds, fish and other seafood, eggs, poultry, and red meat with fat removed
- milk and milk alternatives.

These include a variety of everyday kai that provide all the nutrients our body needs to function properly.

Nutritional value: Nutritional value defines the composition of kai, including kilojoules/calories, proteins, fats, carbohydrates (macronutrients), vitamins, and minerals (micronutrients)

Nutrients: are compounds found in kai and drink that the body needs to function properly. Nutrients can be divided into two groups: macronutrients (protein, carbohydrates and fats) and micronutrients (vitamins and minerals).

Processing food: activities undertaken during the preparation of kai that change it from its natural form – this can happen either in the home or in a factory. This can include: pickling, frying, freezing, drying, packaging and adding ingredients. Food processing has been practised for centuries and is often needed to make kai tasty and safe to eat. However, food processing can also add large amounts of sugar, oil/fat, salt, and minimal amounts of fibre, vitamins, minerals and protein to kai.

Protein: a macronutrient that provides the building blocks for our bodies and is needed to make muscles, organs, blood, skin, hair, etc.

Salt: also referred to as ‘sodium’, which is not good for our bodies in large amounts. Many processed and convenience kai are high in sodium because it acts as a good preservative.

Seasonality: refers to consuming fruits, vegetables, and other produce during their natural, local harvest times, when they are at peak flavour, nutrition, and abundance.

Shelf life: is the recommended duration a kai product remains safe, functional, and of high quality under specified storage conditions. It defines the period from manufacturing until the product potentially loses quality (taste, texture, nutrients) or becomes unsafe due to microbial growth or chemical degradation, usually indicated by a "best-before" or "use-by" date.

Sugar: a carbohydrate, found naturally in fruits, vegetables, milk and milk products. Also can be added to kai during food processing.

Sustainability: Sustainability means meeting our own needs without compromising the ability of future generations to meet their own needs.

Vitamins and minerals: also known as micronutrients, these compounds are needed in very small amounts by the body and play a very important role in maintaining good health. Each vitamin and mineral has a different function in our body. For example, vitamin C helps us fight infections while calcium helps to build strong bones.

Whole foods: are natural, unprocessed, or minimally processed kai—such as fresh produce, whole grains, nuts, and unprocessed meats—that retain their original nutrients, fibre, and vitamins.

Links to other supporting nutrition resources

Healthify – He Puna Waiaora, food groups: More information about food groups, nutrients, macro- and micronutrients: healthify.nz/hauora-wellbeing/f/food-groups/

Heart Foundation – Connecting with kai lesson 8 food processing:
heartfoundation.org.nz/educators/edu-resources/lesson-8-food-processing

Food for thought – Empowering healthier futures: www.foodforthought.co.nz/