



CommNet

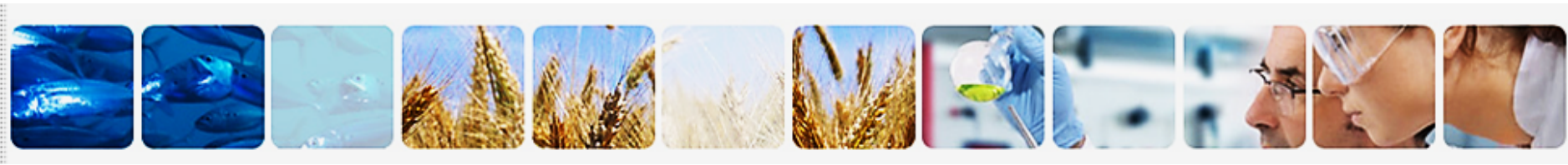


CommNet

Education

Phase 4

Food production and  
processing



## Objectives

CommNet

To be able to describe some new technologies that may impact on food production and processing.

To be able to explain the effects of food processing, food and drink fortification and cooking on the nutritional value of food and drinks.



CommNet

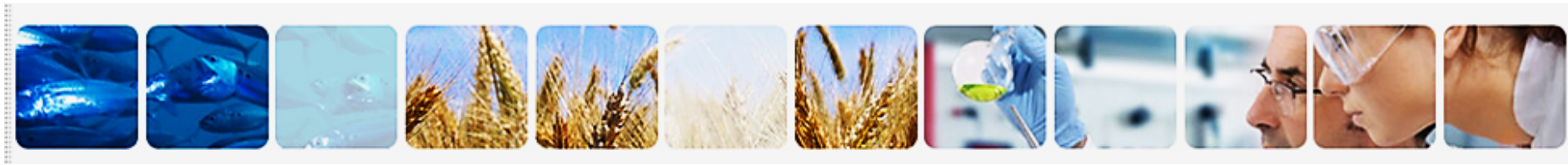
## Production and processing

New technologies in food production and processing are driven by:

- knowledge and new techniques gained from research investigations;
- attempts to increase efficiency, reduce environmental effect of production;
- competition between food companies;
- consumer demand.

Innovation in food production, processing and new product development can offer benefits for consumers and the environment.





## 1. Environmental sustainability

Fewer resources, population growth and climate change are all putting pressure on the world's food supply.

Challenges include:

- sustainable, affordable food supply and demand;
- stability in food supplies;
- achieving global access to food and ending hunger;
- reducing the impact of food production on the world's environmental systems.



CommNet

It has been shown that we need to aim to produce more food with less environmental impact. This is sometimes known as **sustainable intensification**.

New technologies and innovation may help with these challenges and help to achieve the aim.





## 2. Dietary needs

Through medical and nutritional research there is more knowledge available on nutrition and dietary needs.

This includes information about preventative nutrition and nutrition through life. This creates a demand for new products in the marketplace. New technologies can help with this



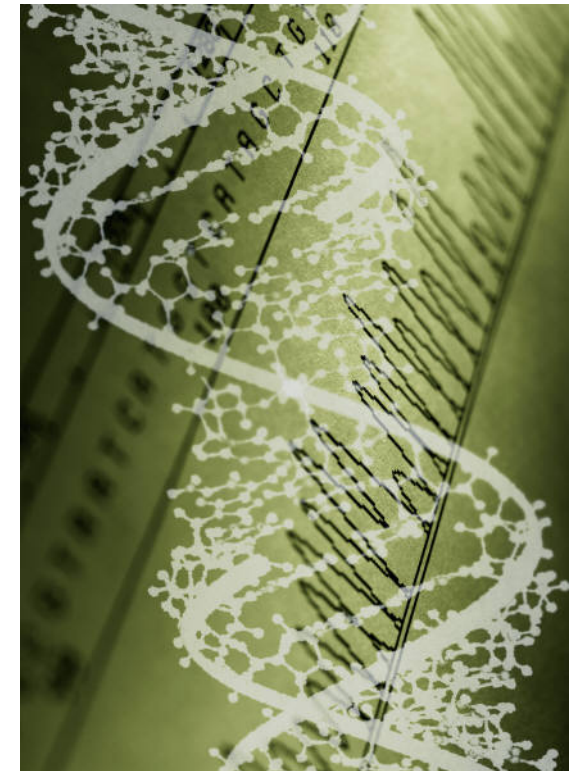


CommNet

### 3. Farming and agriculture

The availability of new techniques from biotechnology and genetic research provides opportunity to control cell metabolism and breeding.

This makes it possible for developers to meet more specific requirements e.g. to increase a specific nutrient in a food.





## New or old technology?

CommNet

We have used science and technology for thousands of years to help provide adequate food.

The progression from hunter-gatherer to agriculture led to the need to store and preserve foods.

Without some form of processing, foods deteriorate rapidly due to the action of micro-organisms and enzymes.







## What early methods of processing and preservation can you think of?



Using chemicals, e.g. acid and salt:

- pickling in vinegar;
- salting meat;
- sugar to make jam;
- storing in alcohol.

Temperature control:

- sun drying fruit;
- using ice blocks.





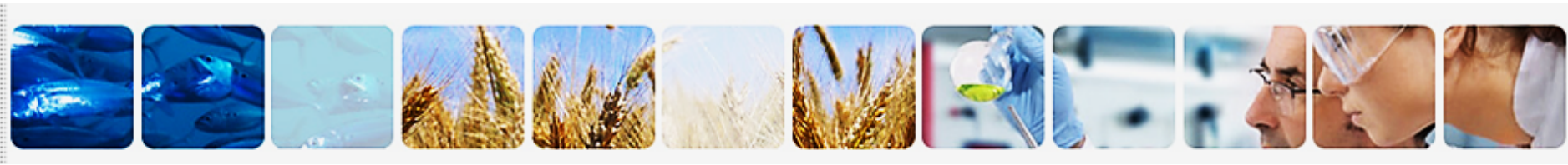
CommNet

## Advances in food technology

Food technology advanced in the early 19th century with the invention of the canning process.

Since then the range of technologies used to process and preserve foods has expanded and uses a range of physical and chemical techniques.





There have also been many technological changes in the home.

- refrigerators became widely used from the mid-1950s;
- domestic freezers in the 1970s;
- microwave ovens in the 1980s.



Frozen and microwavable food and ready meals followed these developments.





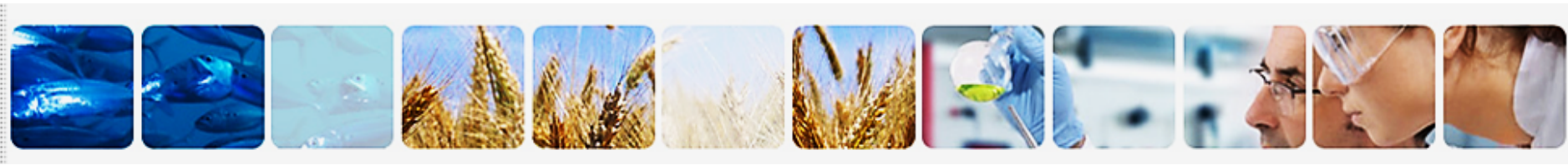
CommNet

## Advances in food technology

Some of these early methods of food processing and preservation are still used today.

New technologies have given us a greater range of methods to package and store foods. This enables the preservation of nutrients and the extension of food product shelf-life.





## Advances in food technology

CommNet

In recent years demand has increased for minimally processed foods which retain their freshness. New techniques have replaced methods that rely on heating and drying.

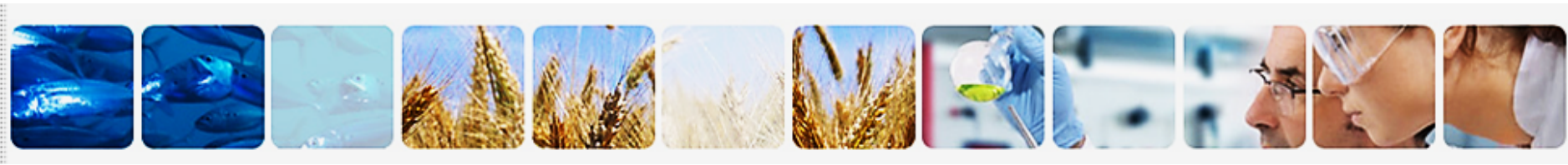
### Can you think of any examples?

Modified atmosphere packaging is a way of extending the shelf life of fresh food products. The technology substitutes the air inside a package with a protective gas mix.



The gas in the package helps ensure that the product will stay fresh for as long as





## Advances in food technology

Consumers are also concerned about the amount of food waste in the supply chain.

New packaging technologies are available and will continue to be developed to help extend the shelf life and quality of food. This aims to reduce food waste.





## Advances in food technology

CommNet

A new type of packaging is a bio-degradable and compostable film.

It is designed to significantly increase the shelf life of fresh produce, including sensitive, high respiration products like strawberries and potatoes.

This could save consumers money by significantly reducing the amount of food they throw away.

It could also save the fruit and vegetable industry large sums of money in wastage costs by extending the amount of time products stay fresh on shelves.





CommNet

## New technologies

Technological developments are fast paced and continuing every day.

Here are some examples of the ways new technology have been used in food production, processing, manufacture and retail.







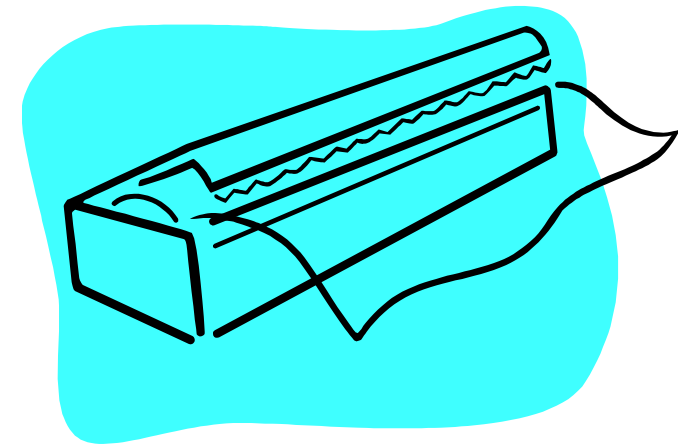
CommNet

## Using nanotechnology

Nano particles of silver have anti-bacterial properties and can be used on:

- kitchen tools and tableware;
- preparation surfaces;
- plastic food storage containers;
- plastic wrap.

It can also be used on fabrics and kitchen cloths.





## Allergen-free cows' milk

CommNet

Cows' milk allergy affects 1 in 50 babies and about 1 in 1000 older children and adults. The allergy is caused by the protein beta-lactoglobulin.

Scientists in New Zealand have bred a cow that does not produce the beta-lactoglobulin protein in its milk.

A gene has been introduced into the cow's DNA that targets and prevents the production of beta-lactoglobulin in the cows' cells.

This is still under development and currently not available to the consumer.





## Encapsulation

Encapsulation can be defined as *“a process where a continuous thin coating is formed around solid particles, liquid droplets or gas cells that are fully contained within the capsule wall”*. (King 1995)

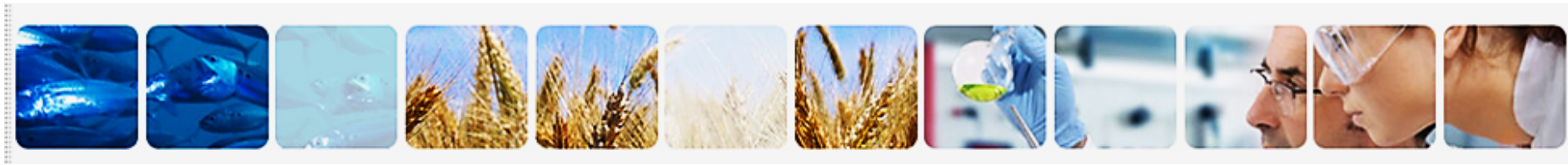
Can you think of some natural examples?



Plant seeds

Birds' egg shells





CommNet

## Encapsulation

The process has been used in the food industry for over 60 years. Using new technologies the process is developing all the time.

Encapsulation is used in food technology to protect liquid or solid ingredients from environmental and/or chemical reactions until they are needed.

The process makes things easier to handle, e.g. changes a liquid into a solid. It can enhance flavour and nutritional value.





## Applications in the food industry



These aim:

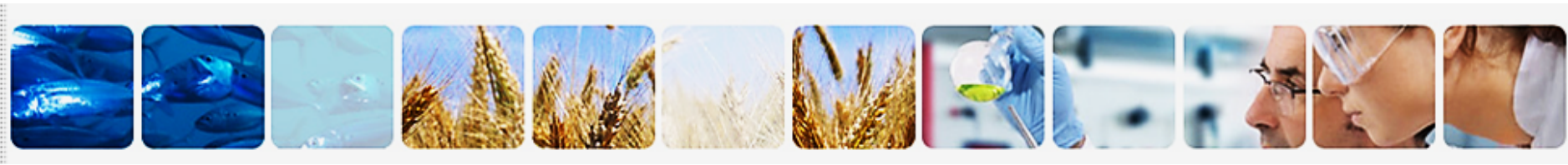
- to preserve and to increase shelf life;
- to prevent premature reactions and interactions;
- to enhance flavour, texture and quality;
- to control the release of ingredients;
- to mask taste and 'off' smells.



### Example: fortified foods

Micro-encapsulation coats small particles such as B vitamins, vitamin C, iron, omega-3 fatty acids with a thin, tasteless, edible film masking any bitter taste and off odour. Products are enhanced without changing the desired flavour.





## High Pressure Processing (HPP)



High Pressure Processing is a cold pasteurisation technique. Food, previously sealed in flexible and water-resistant packaging, is subjected to a high level of hydrostatic pressure (pressure transmitted by water) for a few seconds to a few minutes.

Used for:

Meat products

Ready to eat meals

Juices and fruit products

Salad and sandwich fillings

Avocado products

Seafood products

Dips and salsa

Dairy products





## Main advantages of High Pressure Processing (HPP) Technology

CommNet

1. Greater food quality.
2. Food safety.
3. Lower returns, improved customer satisfaction.
4. Higher quality along shelf life.
5. Clean label foods (natural/additive free).
6. Innovation and competitive advantages.
7. Environmentally friendly.

What are the advantages to the manufacturer and consumer?



## Food processing: functional foods



Functional foods deliver additional or enhanced benefits over and above their basic nutritional value. It covers a wide range of products.

For example:

- foods generated around a particular functional ingredient e.g. dairy products containing probiotic bacteria;
- everyday foods fortified with a nutrient that would not usually be present e.g. folic acid fortified bread or breakfast cereals.







## Nutrition and health claims



Within the European Union (EU), a regulation on nutrition and health claims came into force in 2007.

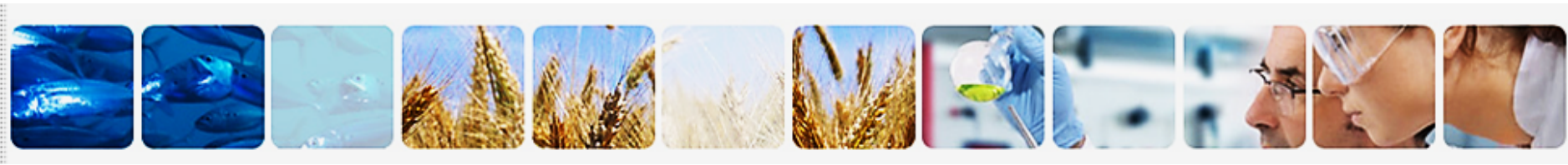
Under the regulation, health claims are subject to pre-approval, involving scientific assessment by the European Food Safety Authority (EFSA).

However, although EFSA assesses the scientific dossiers supporting potential health claims, the final decision to accept or reject a claim lies with the European Commission (EC).

A list of permitted and rejected health claims was published in November 2011 by the EC, available on

<http://ec.europa.eu/nuhclaims>





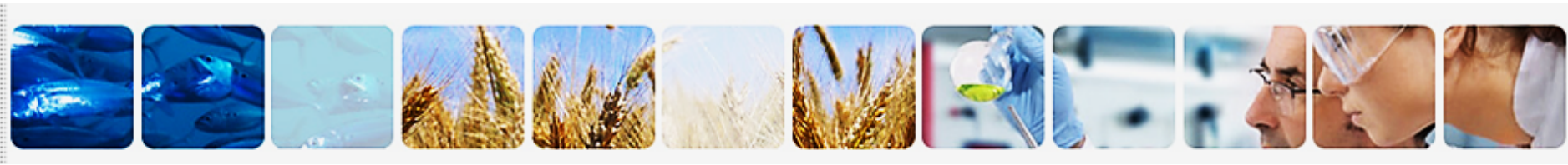
## Food fortification

CommNet

Fortification involves the addition of nutrients to foods irrespective of whether or not the nutrients were originally present in the food.

They might be added to:

- replace nutrients lost during food processing;
- nutrients are sometimes added to produce a substitute product with similar nutritive value;
- add extra nutrients that would not normally be there e.g. added fibre in yogurt, folic acid in breakfast cereals.



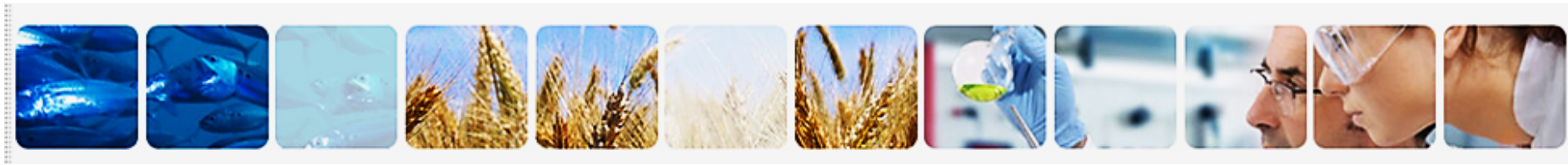
## Why fortify foods?

Adding nutrients to foods, particularly staple foods, can increase intakes among most of the population. In countries where intakes of certain nutrients are very low, fortification can help to reduce nutrient deficiency diseases.



It may also meet consumer demand for specific types of products.

There may also be some technical benefits e.g. to increase shelf life of the product.



CommNet

## The effect of cooking on the nutritional value of food

Some nutrients are lost when foods are cooked. Using different cooking methods can help to reduce the loss. For example steaming vegetables rather than boiling.

Many vitamins are sensitive to various elements and are easily destroyed when exposed to heat, air, water, or cooking oils. The exceptions are vitamin K and the B vitamin niacin, which are very stable in food.



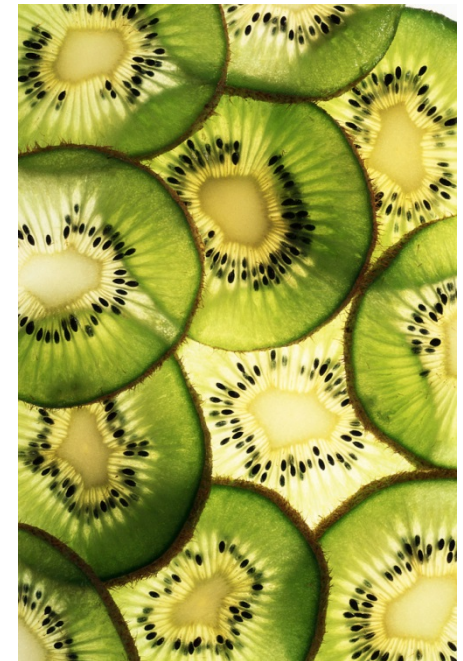


## Reducing nutrient loss

To reduce the loss of fat-soluble vitamins A and E, cook with very little oil, e.g. grilling or baking.

In order to reduce the loss of water-soluble, oxygen-sensitive vitamin C, fruits and vegetables should be cooked using minimal amount of water and cooking time as possible.

Most minerals are unaffected by heat. However, potassium can leach (release from cells of food) into cooking liquids.





## Reducing nutrient loss

CommNet



When vegetables are prepared (e.g. chopping) the cell walls are broken. An enzyme called ascorbic acid oxidase escapes, mixes with and then destroys the vitamin C. The enzyme is destroyed by heat.

### To reduce loss of vitamin C:

- use a sharp knife, keep chopping and shredding to a minimum;
- prepare vegetables just before use;
- do not store the food in water;
- use a small amount of water when cooking;
- avoid over cooking as the enzyme is destroyed quickly;
- serve immediately after cooking.



CommNet



CommNet

Education

Phase 4

Food production and  
processing