



# **Fruit & Vegetable/ Scurvy Curriculum Activities**

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## Background Information

During William Dampier's numerous sea voyages, many of his crew became afflicted with scurvy. During one of his voyages, scurvy (and lack of water and provisions) meant that upon reaching Shark Bay he decided to turn homewards. Scurvy was later found to be caused by a lack of vitamin C and could be prevented by a diet with adequate fruit and vegetables.

Scurvy, now known to be caused by a lack of vitamin C, is one of the world's oldest and most devastating deficiency diseases. Historians have been describing scurvy since ancient times primarily because the disease so often seemed to attack invading armies, sailors on long sea voyages, explorers, and even crusaders. For example, it was scurvy, rather than savage storms or hostile natives, that killed many of the crewmen who sailed with Vasco da Gama (1469-1524) in 1498 and with Ferdinand Magellan (1480-1521) in 1519.

Scurvy begins innocently enough, usually with mild fatigue, bleeding gums, and hemorrhagic bruises on the skin. However, after several months of a diet lacking any vegetables or fruits, worsening physical condition continues, resulting in weakened bones, loose teeth which ultimately fall out, severe joint pain, profuse bleeding from a simple cut, anemia, and eventually death.

Scottish naval surgeon, James Lind (1716-1794), is generally credited with being the first to discover the cure for scurvy. Shortly after the long sea voyage of Admiral George Anson (1697-1762), from 1740 to 1744 during which more than a thousand sailors out of a crew of 1,955 died primarily from scurvy, Lind began his own investigations into the disease.

From his readings of historical accounts, Lind realized that scurvy might be due to some dietary lack. In 1747, therefore, the physician began treating stricken sailors with various foods, and soon found that citrus fruits produced the fastest and most effective cures. Although Lind published his *Treatise on the Scurvy* in 1753, it was not until 1795 that the Admiralty prescribed a daily ration of lime juice for all British sailors (Lind's cure gave British sailors their nickname--"limeys"). Scurvy promptly diminished in the British navy; however, for the most part, the rest of the civilized world continued to ignore Lind's findings and to resist the idea that scurvy might be related to a dietary deficiency. Ironically, even as late as 1912 when Robert Scott (1868-1912) explored the South Pole, he and his team succumbed not to the intense cold, but to the lack of fruits and vegetables in their diet.

In 1907, two Norwegian biochemists, Axel Holst (1861-1931) and Alfred Frohlich (1871-1953), proved conclusively that a scurvy-like condition could be produced in the guinea pig (one of the few animals unable to synthesize vitamin C from their intestinal bacteria) by restricting certain foods. Equally important, Holst and Frohlich then cured the lab animals by feeding them cabbage. The scientific community was finally convinced that the lack of a specific nutrient must be causing scurvy, and an intensive search began to find the nutrient. The antiscorbutic (or anti-scurvy) factor was not isolated until 1928, however. In that year, two teams of researchers, one headed by Albert Szent-Györgyi in Hungary, the second by Charles G. King in the United States, extracted an antiscorbutic substance from a variety of fruits. The substance was named vitamin C, or ascorbic acid which, in 1933, was synthesized by two other chemists, Norman Haworth (1883-1950) and Tadeus Reichstein. Soon afterward, vitamin C became the first vitamin to be artificially produced and, once marketed for medical purposes, marked the end of scurvy as a deadly disease.

Text from: [www.faqs.org/health/topics/51/Scurvy.html](http://www.faqs.org/health/topics/51/Scurvy.html)

# Teaching and Learning Opportunities

## Activity 1 – Preventing scurvy

Relevant Learning Areas	Relevant Strands
Health & Physical Education	<ul style="list-style-type: none"><li>• Concepts for a Healthy Lifestyle</li></ul>
English	<ul style="list-style-type: none"><li>• Reading</li><li>• Viewing</li></ul>
Science	<ul style="list-style-type: none"><li>• Science in Daily Life</li></ul>
Society & Environment	<ul style="list-style-type: none"><li>• Investigation, Communication &amp; Participation</li><li>• Time, Continuity and Change</li></ul>

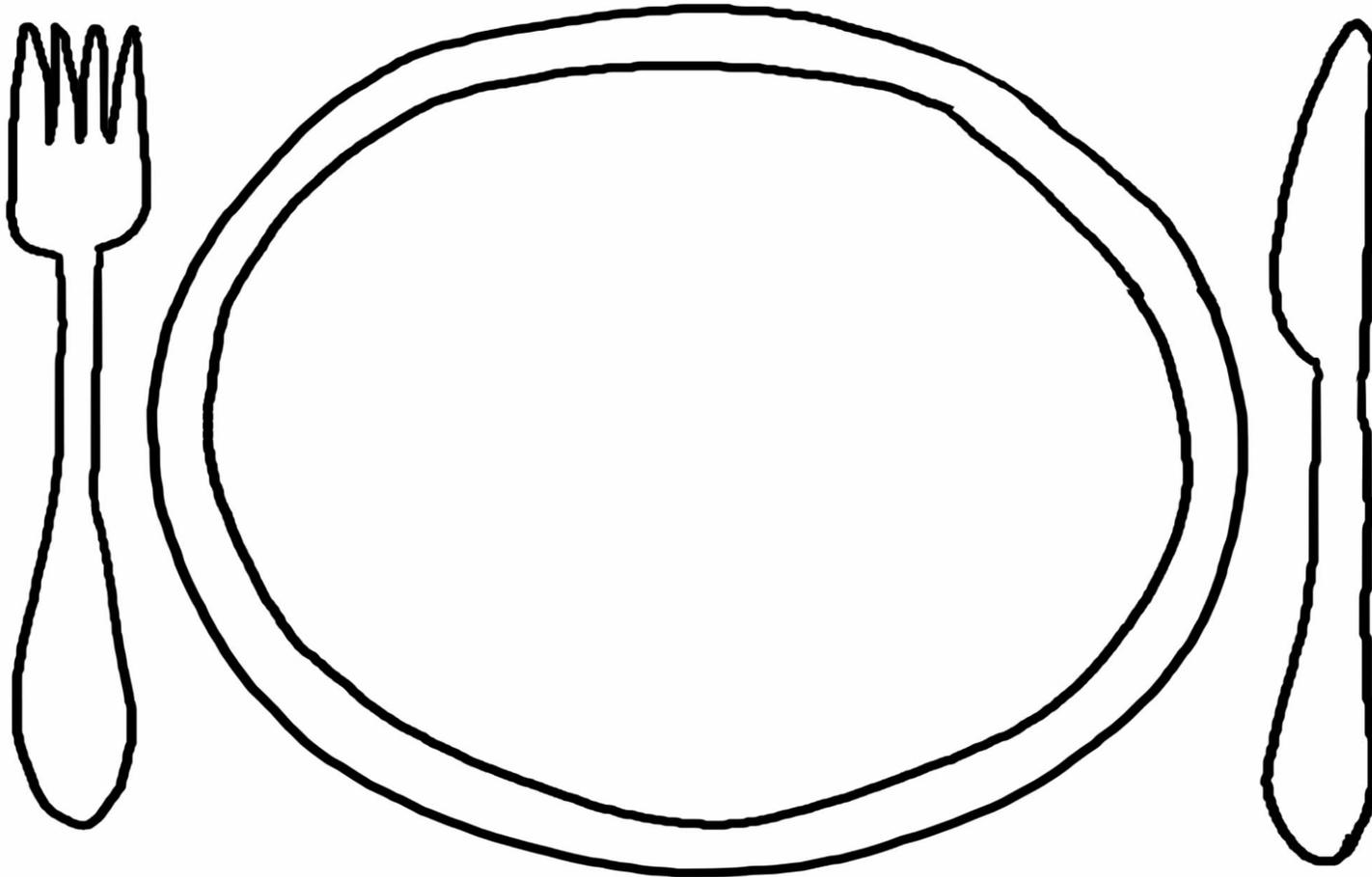
Familiarise students with scurvy and its causes, symptoms and prevention. Use the background information or useful website include:

<http://encyclopedia.kids.net.au/page/sc/Scurvy>

<http://www.nhs.uk/conditions/scurvy/Pages/Introduction.aspx>

Ask students to use the attached plate to make a 'scurvy busters' meal for sailors including lots of fruit and vegetables.

# SCURVY BUSTERS!



Design a meal for a sailor who is suffering from scurvy. These are foods that are rich in Vitamin C:  
*Capsicum, blackcurrant, Brussels sprouts, strawberry, broccoli, lemon, cauliflower, orange, tomatoes, kiwi fruit, cabbage, raspberry, potatoes, peaches.*

# Activity 2 – Scurvy Busters: Growing and Eating

Relevant Learning Areas	Relevant Strands
Health & Physical Education	<ul style="list-style-type: none"><li>• Concepts for a Healthy Lifestyle</li></ul>
English	<ul style="list-style-type: none"><li>• Reading</li><li>• Viewing</li></ul>
Science	<ul style="list-style-type: none"><li>• Investigating</li><li>• Life and Living</li></ul>

Growing: Many fruit and veg are high in vitamin C, the known cause of scurvy. Students are encouraged to plant a 'scurvy busters' garden.

Fruits and vegetables that can be grown in school gardens and are high in vitamin C are:

- Capsicum
- Parsley
- Broccoli
- Strawberries
- Cauliflower

For information on growing vegetables, go to:

[www.abc.net.au/gardening/stories/s2006057.htm](http://www.abc.net.au/gardening/stories/s2006057.htm)

[www.agric.wa.gov.au/objtwr/imported\\_assets/content/hort/veg/cp/capsicums/f06499.pdf](http://www.agric.wa.gov.au/objtwr/imported_assets/content/hort/veg/cp/capsicums/f06499.pdf)

[www.agric.wa.gov.au/objtwr/imported\\_assets/content/hort/veg/cp/healthyvegies.pdf](http://www.agric.wa.gov.au/objtwr/imported_assets/content/hort/veg/cp/healthyvegies.pdf)

[www.yates.com.au/gardening/](http://www.yates.com.au/gardening/)

Cooking and eating: In addition to those listed above, other fruit and veg high in vitamin C include:

- Citrus fruits
- Kiwi fruit
- Brussels sprouts
- Garlic

Students can find recipes that are low in salt, sugar and fat but high in vitamin C to cook. Alternatively, use the recipes listed below. More are available at [www.gofor2and5.com.au](http://www.gofor2and5.com.au)

## CITRUS MOUSSE

Citrus mousse makes a yummy dessert. It can be made in the morning and eaten at lunch or dinner.  
Makes 4 serves.

### Ingredients

2 oranges  
1 lemon  
3 teaspoons gelatine  
500 g ricotta cheese  
1 tablespoon sugar  
½ cup low-fat yogurt  
Extra orange piece



### Utensils

Lemon squeezer  
Small bowl  
Large bowl  
Microwave  
Wooden spoon  
4 dessert bowls

### Method

1. Squeeze juice from the oranges. Pour into a small bowl.
2. Squeeze juice from the lemon. Add to the orange juice.
3. Sprinkle the gelatine over the fruit juices.
4. Microwave juice on HIGH for 30 seconds to dissolve gelatine.
5. Put ricotta, sugar and yogurt into a large bowl.
6. Add juice/gelatine and mix until smooth.
7. Divide mixture into 4 bowls. Place in fridge until set.
8. Serve decorated with slices of orange.

## FRITTATA

This recipe is a great way for you to use up leftover vegetables such as potato, onion, tomato, peas, broccoli, capsicum, pumpkin. If you don't have leftovers simply chop some of your favourite vegetables into small pieces and steam or microwave them first. Makes 4-5 serves.

### Ingredients

4 eggs  
1 tablespoon margarine  
2 cups cooked vegetables

### Utensils

Small mixing bowl  
Fork  
Large frypan  
Spatula  
Measuring cups and spoons



### Method

1. Chop vegetables into small pieces.
2. Use a fork to beat the eggs.
3. Turn stove on. Put the margarine in a pan and melt over MEDIUM heat.
4. Stir in vegetables.
5. Add the beaten eggs. Turn down the heat.
6. Cook gently over low heat until the egg mixture is firm.

## STRAWBERRY SURPRISE

This drink is so thick and frothy it could be eaten as a dessert or snack. Choose very red strawberries for the best flavour. You should drink your 'surprise' straight away. Makes 1 cup.

### Ingredients

¾ cup low-fat milk  
½ cup low-fat strawberry yogurt  
½ punnet strawberries  
pinch cinnamon

### Utensils

Chopping board and knife  
Measuring cups  
Blender or food processor  
Glasses to serve

### Method

1. Pour milk into a blender or food processor.
2. Wash strawberries and remove stalks.
3. Put the strawberries into a blender.
4. Add the strawberry yogurt.
5. Put the lid on the blender. Blend well until thick and frothy.
6. Pour into two glasses and sprinkle with cinnamon.



## UNIVERSAL STIR-FRY

Makes 4 serves.

### Ingredients

500 g chicken breast  
1 tablespoon soy sauce  
1 tablespoon fresh ginger, grated or crushed  
1 bunch broccoli  
1 cup fresh mushrooms  
1 red capsicum  
1 teaspoon cornflour  
½ cup of water  
1 tablespoon oil (optional)



### Utensils

Chopping board and knife, Wok or larger frypan, Cup, Mixing bowls, Measuring cups and spoons

### Method

1. Cut skin off chicken. Cut into thin slices or small chunks.
2. Put in a bowl. Add soy sauce and ginger.
3. Chop broccoli into small pieces (florets), slice the mushrooms and cut the capsicums into thin strips.
4. Put chopped broccoli, capsicum and mushrooms into another bowl.
5. Use a spoon to blend cornflour and water until smooth.
6. Turn on stove. Put oil in wok or frying pan and heat on the stove.
7. Add chicken and sauce mixture to pan. Stir chicken until almost cooked (5 minutes).
8. Turn up heat. Add all the vegetables. Stir for 2-3 minutes.
9. Pour cornflour mixture into vegetables and stir until sauce thickens. Serve hot.

# Activity 3 – Be a Scurvy Health Advocate

Relevant Learning Areas	Relevant Strands
Health & Physical Education	<ul style="list-style-type: none"><li>• Concepts for a Healthy Lifestyle</li></ul>
English	<ul style="list-style-type: none"><li>• Reading</li><li>• Viewing</li><li>• Writing</li></ul>
Science	<ul style="list-style-type: none"><li>• Communicating Scientifically</li></ul>
Society & Environment	<ul style="list-style-type: none"><li>• Investigation, Communication &amp; Participation</li><li>• Time, Continuity and Change</li></ul>

James Lind's work on the cure of scurvy had a major impact on the health of sailors (see background information). However, despite making his discovery in 1747, the British Navy did not adopt his innovation until 1795, when scurvy was immediately wiped out. It wasn't until 1865 that the British Board of Trade adopted a similar policy in the merchant marine.

Students imagine they are Lind and are trying to persuade the government/navy of the day to improve the diet of sailors.

1. Students can use the two texts below for information on Lind's discovery. Alternatively, students can conduct their own research into the work of Lind.
2. Decide on a text type to persuade the relevant authorities to implement healthy diets high in vitamin C for sailors. This could be a newspaper article, letter, exposition etc.
3. Ensure students' work contains details on: the causes and consequences of scurvy, evidence that fruit and vegetables are a cure for scurvy, solutions for storage or sources of fresh fruit and vegetables on long journeys.

## ***A cure for scurvy in 1753***

In the 18th century, scurvy was killing thousands of people every year. More sailors in the British Royal Navy were dying of it than from enemy action. James Lind published his *Treatise of the scurvy* in 1753. It has been called one of the earliest accounts of a prospective clinical trial, comparing six commonly used treatments of scurvy. It also includes a systematic review of what had previously been published on the diagnosis, prevention and treatment of scurvy.

While serving as a naval surgeon in the Channel Fleet in 1747, Lind selected 12 sailors who were all at a similar stage of scurvy, had the same basic diet and were accommodated in the same part of the ship. To two each he allocated one of six of the many different treatments for scurvy then in use:

- a quart of cider a day;
- 25 drops of elixir vitriol three times a day;
- two spoonfuls of vinegar three times a day;
- half a pint of sea water a day;
- a concoction of nutmeg, mustard and garlic three times a day;
- and two oranges and a lemon a day.

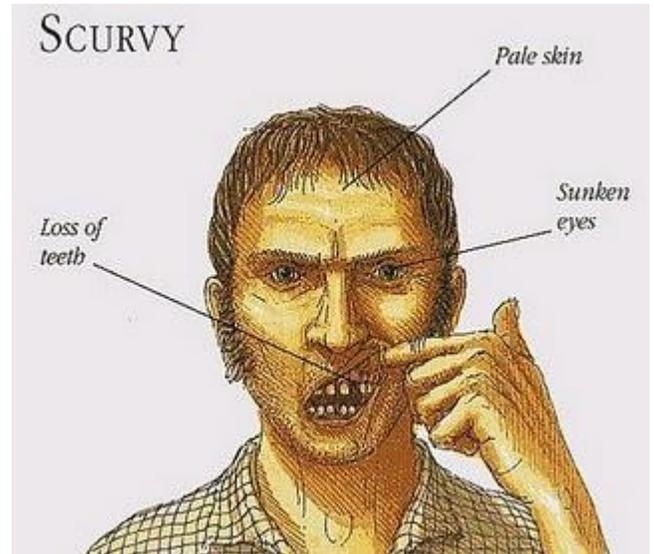
Lind reported: "The most sudden and visible good effects were perceived from the use of oranges and lemons; one of those who had taken them being at the end of six days fit for duty... The other was the best recovered of any in his condition; and being now deemed pretty well, was appointed nurse to the rest of the sick."

Lind left the Navy after that voyage and returned to Edinburgh University, where he reviewed the literature on scurvy. He identified 54 books on it worthy of critical appraisal, and wrote an abstract of each of them. The evidence that fresh fruit and vegetables both prevented and cured scurvy was overwhelming.

During the following years, Lind's 450-page treatise was published and republished, in English, French, Italian and German. Enlightened individuals like Captain Cook were strict about taking in fresh fruit and vegetables at every opportunity and making sure that every man on board ate them. As a result, the mortality rate for his voyages was outstandingly low. But it was only a year after Lind's death, in 1794, that the Admiralty provided lemon juice for its sailors on a large scale. The effect was dramatic. Within two years, scurvy more or less disappeared from the Navy.

The necessary information and knowledge was there for all to see, but it took the British naval authorities 40 years to get around to applying it.

Barnes, D. E. 2004. Health challenges for research in the 21st century. Global Health Lecture. <http://www.who.int/dg/lee/speeches/2004/barneslecture/en/> (accessed 11 April 2011).



Text two – from the writings of James Lind

On the 20th May, 1747, I took twelve patients in the scurvy on board the Salisbury at sea. Their cases were as similar as I could have them. They all in general had putrid gums, the spots and lassitude, with weakness of their knees. They lay together in one place, being a proper apartment for the sick in the fore-hold; and had one diet in common to all, viz., water gruel sweetened with sugar in the morning; fresh mutton broth often times for dinner; at other times puddings, boiled biscuit with sugar etc.; and for supper barley, raisins, rice and currants, sago and wine, or the like. Two of these were ordered each a quart of cyder a day. Two others took twenty five gutts of elixir vitriol three times a day upon an empty stomach, using a gargle strongly acidulated with it for their mouths. Two others took two spoonfuls of vinegar three times a day upon an empty stomach, having their gruels and their other food well acidulated with it, as also the gargle for the mouth. Two of the worst patients, with the tendons in the ham rigid (a symptom none the rest had) were put under a course of sea water. Of this they drank half a pint every day and sometimes more or less as it operated by way of gentle physick. Two others had each two oranges and one lemon given them every day. These they eat with greediness at different times upon an empty stomach. They continued but six days under this course, having consumed the quantity that could be spared. The two remaining patients took the bigness of a nutmeg three times a day of an electuary recommended by an hospital surgeon made of garlic, mustard seed, rad. raphan., balsam of Peru and gum myrrh, using for common drink narley water well acidulated with tamarinds, by a decoction of wick, with the addition of cremor tartar, they were gently purged three or four times during the course.



The consequence was that the most sudden and visible good effects were perceived from the use of the oranges and lemons; one of those who had taken them being at the end of six days fit for duty. The spots were not indeed at that time quite off his body, nor his gums sound; but without any other medicine than a gargarism or elixir of vitriol he became quite healthy before we came into Plymouth, which was on the 16th June. The other was the best recovered of any in his condition, and being now deemed pretty well was appointed nurse to the rest of the sick ...

As I shall have occasion elsewhere to take notice of the effects of other medicines in this disease, I shall here only observe that the result of all my experiments was that oranges and lemons were the most effectual remedies for this distemper at sea. I am apt to think oranges preferable to lemons, though it was principally oranges which so speedily and surprisingly recovered Lord Anson's people at the Island of Tinian, of which that noble, brave and experienced commander was so sensible that before he left the island one man was ordered on shore from each mess to lay in a stock of them for their future security. ... Perhaps one history more may suffice to put this out of doubt.

Lind, J. 1753. *A Treatise of the Scurvy in Three Parts*. Millar. London. <http://www.fatefulvoyage.com/masts/scurvy.html> (accessed 11 April 2011).

# Other Scurvy Busting Curriculum Ideas

## Technology & Enterprise

The Kakadu plum has the highest concentration of vitamin C of any fruit or vegetable but is not commonly available. Create a new product using the plums and produce a marketing plan to increase its appeal.

## Science

Test the amount of Vitamin C in orange juice using an experiment from CSIRO.

<http://www.csiro.au/helix/sciencemail/activities/Titration.html>

Find out how two New Zealand school girls used this method with Ribena

<http://www.guardian.co.uk/world/2007/mar/27/schoolsworldwide.foodanddrink>

## Health

- Students monitor their food intake to determine if they are eating the recommended serves of fruit and vegetables and set goals to increase consumption.
- Research the effect other vitamin deficiencies can have on the body.

## Music

- Write and perform a sea shanty to encourage sailors to eat more fruit and vegetables.
- Sing 'We've Got Scurvy' by Pink  
<http://www.youtube.com/watch?v=H75EGFeHZI>

## English

Students imagine they are a sailor on one of William Dampier's voyages and is afflicted with scurvy. Write a diary entry describing the condition.

## For adults....

Have a look at the 'Limestrong' (International Scurvy Awareness Day) website [www.limestrong.com](http://www.limestrong.com) for a laugh!