**ACTIVITY: Is all salt the same?**

**Activity idea**

In this activity, students consider, critically analyse and debate statements about different types of salt used in cooking and claims made for them.

By the end of this activity, students should be able to:

* critically analyse advertising claims in a scientific context
* explain the scientific meaning of the word ‘pure’
* debate a science issue by backing up claims with evidence
* demonstrate an understanding of salt production methods.

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**Introduction/background**

Over recent times, it has become fashionable to use ‘sea salt’ as a condiment and in cooking, rather than the conventional ‘table salt’. Advertising claims about sea salt’s purity, naturalness and health-giving properties have convinced some consumers to make the change from table salt to sea salt.

In this activity, students first find out about salt production and then make their own salt – the ‘natural’ way by evaporation of seawater and the chemical way by reacting hydrochloric acid with sodium hydroxide.

They then examine different types of sea salt and manufacturers’ claims and take part in a class debate: Is all salt the same?

The debate should in no way detract from the role that salt-derived sodium plays in the body. It is key to regulating the body’s water balance, plays a central role in electrical impulses in the nerves and assists cells to take up nutrients. On average, New Zealanders consume about 9g of sodium per day – the recommended amount is between 2.3g and 5.9g. (Note that 1g of sodium is available from 2.5g of salt.)

**What you need**

* Access to information about salt production in New Zealand – [www.teara.govt.nz/en/salt/3](http://www.teara.govt.nz/en/salt/3)
* Seawater
* 1 molL-1 hydrochloric acid; 1 molL-1 sodium hydroxide
* pH paper
* 10mL measuring cylinder; 100mL beakers; eyedroppers; glass rod
* Microscope slides
* Hot plate
* Copies of student worksheet: [Making salt](#making)
* Access to the [sodium chloride crystal model](http://www.dangthatscool.com/wp-content/uploads/2009/08/629px-sodium-chloride-3d-ionic.png)
* Samples of types of sea salt purchased locally
* Copies of student worksheet: [Advertising claims](#same)

**What to do**

1. Have students read about salt production in New Zealand – [www.teara.govt.nz/en/salt/3](http://www.teara.govt.nz/en/salt/3).
2. Hand out copies of student worksheet: [Making salt](#making) and have students work in pairs to complete the experiment. Discuss the results.
3. Show the [sodium chloride crystal model](http://www.dangthatscool.com/wp-content/uploads/2009/08/629px-sodium-chloride-3d-ionic.png) and explain its structure. (The green spheres represent chloride ions and the smaller purple spheres represent sodium ions. These ions are packed tightly together in regular pattern.) Ask students to consider, when a crystal of sodium chloride forms, do the sodium ions and chloride ions have any memory of where they have originally come from? Is there ‘natural’ sodium chloride, ‘chemical’ sodium chloride or just sodium chloride?
4. Show students samples of types of sea salt purchased locally and hand out copies of the student worksheet: [Advertising claims](#same).
5. As a class, discuss and debate the question: ‘Is all salt the same?’ using these prompts:

* Do the statements about sea salt suggest that it has a more ‘salty’ taste than ordinary table salt? Is this possible? How can a given brand claim that its salt is ‘the salt with taste’?
* Most sea salts are sold in the form of flakes or granules, which are larger than the granules of ordinary table salt. Could this affect the taste:
  + - When placed on the tongue?
    - When the salt is dissolved in water as is done when cooking vegetables?
* Can sea salt obtained by evaporation of seawater be ‘pure’? In chemistry, what is meant by the term ‘pure’?
* Manufacturing salt in New Zealand involves a process of concentrating the salt content of seawater by evaporation, then harvesting the crystallised salt. In other countries, salt is mined from underground deposits formed millions of years ago. Can both be legally sold as ‘natural’ sea salt? Is one purer than the other?
* Some advertising statements claim that the salt is ‘hand-harvested’. Does this make it any purer than machine-harvested salt?
* One brand of herbal salt claims: “This steeping process integrates the full herb and vegetable flavour into the salt crystal.” Is this possible? If so, where in the crystal structure would the flavour molecules fit?
* Why are seas salty? Is it fair to claim that ‘brand x’ sea salt is harvested from mineral-rich seawater?

**Making salt**

1. Place 20mL of seawater into a 100mL beaker and then sit the beaker on a hot plate set at ‘low’. Allow the water to evaporate off slowly until the volume has been reduced to about 5mL. Set aside and allow to cool.
2. Place 10mL of sodium hydroxide solution into a 100mL beaker. Add 10mL of hydrochloric acid and stir. Check the pH of the solution with the paper provided – it should be neutral. If not, make it neutral by adding hydrochloric acid or sodium hydroxide using an eyedropper. Sit the beaker on a hot plate set at ‘low’. Allow the water to evaporate off slowly until the volume has been reduced to about 5mL. Set aside and allow to cool.
3. Check the two beakers for the formation of solid sodium chloride (salt).
4. Note the colour, amount, and crystalline appearance of each of the solids.

**Advertising claims**

Here are some advertising claims for different types of salt:

***Maldon Sea salt*** is pure and unique made using only traditional natural methods. Ideal for seasoning with a clean fresh taste. Use in cooking or simply sprinkle or crush over food to enhance the natural flavour. Its pronounced and distinctive ‘salty’ taste means less is required – an advantage for those who wish to reduce their salt intake.

***Supreme Rock Salt*** is 200 million years old and free from additives. This natural salt is obtained from the German mine renowned for the highest degree of purity. Coarse grain salt is ideal for use in a salt mill and also for cooking purposes as it helps to enhance the full flavour of the meal.

***Sel de Mer*** – the salt with taste. This grey moist sea salt is hand harvested in the French salt marshes using an age-old method of draining and withering under the action of sun and wind to preserve the contents of magnesium, calcium and other trace elements.

***Saxa Coarse Sea Salt*** is harvested from mineral-rich seawater and is naturally evaporated to produce a pure salt, free from artificial additives and containing traces of important minerals such as calcium and magnesium.

***Herbamare*** is prepared with fresh, organically grown herbs. The fresh herbs are combined with natural sea salt and allowed to steep for up to 1 year before the moisture is removed by a special vacuum process at low temperature. This steeping process integrates the full herb and vegetable flavour into the salt crystal.]