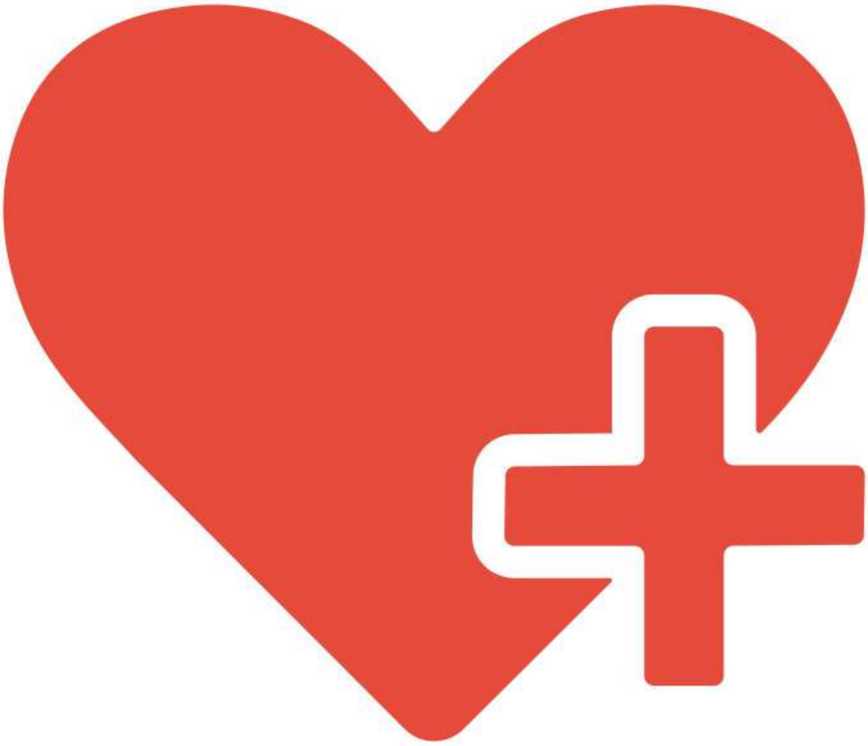

IODINE INITIATIVE

Teacher's guide

Practical ACTION

Secondary Upd8s provide relevant contexts and creative hooks for your science lessons.

According to recent reports young people in the UK are deficient in iodine*. Iodine deficiency causes goitre and brain damage, and may reduce IQ.

In this activity pupils discover how a Tanzanian initiative reduced iodine deficiency diseases, and looks at lessons the UK can learn from the example.

Learning objectives

In this lesson students will:
- recognise the symptoms of iodine deficiency.
- apply knowledge about elements and compounds.
- evaluate evidence to decide whether UK salt should be iodised.

Curriculum links

England National Curriculum KS3:
- Working Scientifically: Analysis and evaluation, evaluate data
- Biology: Nutrition and digestion, the consequences of imbalances in the diet, including obesity, starvation and deficiency diseases
- Chemistry: Atoms, elements and compounds, differences between atoms, elements and compounds

Teaching materials

The PowerPoint (PPT) presentation outlines the lesson structure. **PPT slides 9-12** are pupil activity sheets. These include scientific evidence to evaluate, a role play, and a practical activity.

Resources

Pupil activity sheets

- *Scientists in Tanzania* (1 per pair of pupils)
- *Role play cards* (1 per group of 6)
- *Role play preparation* (1 per pupil)
- *Salt mystery* (1 per pair of pupils)

Equipment (per group)
- 6 test tubes in a test tube rack
- 1 spatula
- Distilled water, up to 100 cm3
- Distilled water, up to 100 cm3
- Solid potassium iodide, half small spatula measure
- Solid sodium chloride, half small spatula measure
- 0.1 mol/dm3 silver nitrate solution, up to 5 cm3
- Sample of sodium chloride, labelled X
- Second sample of sodium chloride, labelled Y
- Sample of sodium chloride mixed with an equal volume of potassium chloride, labelled Z

Starter

Discover the consequences of iodine deficiency (15 min)

Display **PPT slide 3** and, if possible, show pupils a sample of iodine (*Please take care – iodine is harmful. Pupils must not touch the iodine.*)

Display **PPT slide 4** and point out that studies have shown that iodine deficiency in pregnancy can result in children with lower IQ values than normal, as well as causing more serious conditions such as brain damage and goitre. Iodine is a constituent element of two important hormones, which are made in the thyroid gland.

Display **PPT slide 5** (or give pupils a print out of this slide) and ask them to estimate their daily iodine intake. Emphasize that when iodine is in food it is present as part of a compound, not as the element.

Display **PPT slide 6** to introduce the big question. Should the UK add iodine compounds to salt? Point out that salt is the food to which iodine compounds are usually added, which is why this is the focus of the activity.

Core task 1

Evaluate a Tanzanian study about the impact on health of salt iodisation (30 min)

Display **PPT slide 7**. This describes a study to evaluate the effectiveness of a Tanzanian initiative to reduce the incidences of iodine deficiency diseases. The initiative involved adding an iodine compound to table salt, sodium chloride. The study is described in a 2009 research article in BMC Public Health by Vincent Assey et al
biomedcentral.com/1471-2458/9/319#B1

Divide pupils into pairs an hand out the *Scientists in Tanzania* activity sheet. Allow time for them to discuss and reach a conclusion in their pair. They are likely to conclude that salt iodisation improved health since the incidence of goitre decreased. More sophisticated scientists might point out that the correlation observed does not necessarily indicate a causal relationship.

Discuss the impact of salt iodisation on the health of Tanzanians. Do students feel the initiative was worthwhile?

Core task 2

Evaluate evidence to decide whether UK salt should be iodised (30–45 min)

This activity focuses mainly on the biological implications of iodising salt. Organise pupils into groups of 6. Within each group, give each student one card cut from the *Role play cards*. If you wish, give pupils time to research further information in support of their role for a homework activity. Give each pupil a copy of the *Role play preparation* sheet for this.

Role play cards

Global Learning

Role 1 – health minister

I am here to listen, learn and chair the discussion.

In the end I must make a decision – should we make salt iodisation compulsory in the UK?

Role 2 – UK dietician

I am here to give advice on health, nutrition and diet.

- A balanced diet can provide enough iodine.
- Iodine-rich foods include fish and dairy products. Milk is rich in iodine because farmers supplement cows' food with iodine compounds.
- Salt iodisation might encourage people to eat more salt. Too much salt can cause high blood pressure and heart problems.
- Iodine supplements could be harmful, because too much iodine causes health problems.

Role 3 – Tanzanian scientist

I am here to tell the UK health minister about the impact of salt iodisation in Tanzania.

I do not know whether salt iodisation is necessary in the UK, since our diets are very different.

This is what my 14 year old son eats on a normal school day:

Breakfast – maize porridge
Lunch – rice and kidney beans
Tea – a dish made from cooked green bananas and kidney beans, with spinach.

Role 4 – Chinese scientist

I am here to tell the health minister about my research.

I studied the effects of iodine on the development of over 12 000 children in China.

Children whose mothers did not have enough iodine during pregnancy had lower intelligence scores.

Role 5 – UK marketing agency

I am here to explain how we can persuade individuals to make sure they have enough iodine.

It is up to individuals to take responsibility for getting enough iodine, not the government.

We have successfully persuaded people to decide to give up smoking, so we can also persuade people to have enough iodine.

Role 6 – UK food supplement manufacturer

I want to tell the health minister that salt iodisation is unnecessary.

We make iodine tablets that people can take if they are worried about not getting enough iodine.

Iodising salt might encourage people to eat more salt, causing heart problems.

10 PUPIL SHEET 2

In class allow time for students to discuss in role the question: **Should the UK introduce salt iodisation?**

During this activity you might like to emphasise that excessive salt consumption – and excessive iodine consumption – can both be harmful to health. Emphasise, too, the importance of considering diet before making a decision – a typical Tanzanian diet is less rich in iodine than a typical dairy-rich UK diet. Of course those Tanzanians who consume large quantities of fish or dairy products are unlikely to suffer the consequences of iodine deficiency. Students might also like to consider who should be responsible for health – the individual or the government?

Plenary

Make a decision on whether the UK should add iodine to food (15 min)

Explain to pupils that at present there is no compulsory salt iodisation in the UK; current advice is that a balanced diet provides sufficient iodine. However there is already a law that iron, calcium carbonate and vitamin B1 must be added to bread. In some areas fluoride compounds are added to water.

Ask the pupils, out of role, to write two lists:
- the benefits of salt iodisation in the UK.
- the disadvantages of adding iodine compounds to salt.

Pupils then make and justify a decision: Should the UK introduce salt iodisation?

Extension: Salt mystery

Use a practical test to work out which salt has been iodised. (25 min)

Adding silver nitrate to a solution of a chloride salt makes a white precipitate of silver chloride. Adding silver nitrate to a solution of an iodide salt makes a yellow precipitate of silver iodide.

Pupils can find out which salt has been iodised by observing which sample produces a yellow precipitate on the addition of silver nitrate. Divide class into pairs. Hand out a copy of *Salt Mystery* and equipment required to each pair. Explain that in the study scientists used a more sophisticated test to identify the small amounts of iodine added to salt in the programme.

Health and Safety

Please refer to ASE's Be Safe publication for advice on risk assessments in science. Also refer to:
CLEAPSS Hazcards 54
CLEAPPS Student Safety sheet 56

Acknowledgments

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*https://www.thelancet.com/journals/lancet/article/PIIS0140-6736(11)60693-4/fulltext