Brown Goo

Commentary

The key idea for the teacher to get students to engage with is how we can use science, both the procedure and the concepts, to investigate and evaluate claims made by product manufacturers. This provides students with an opportunity to apply their understanding and also to reflect on the implications for society of products being sold in this way. The particular context used here is that of detoxification, which some students may initially find convincing − the body produces waste materials that have to be disposed of. But the students go on to use concepts and processes from their school science to examine further and evaluate the claims.

Students are likely to find the marketing techniques derisory, but nothing more than rather expensive and ultimately harmless. However, there is a more serious point here. These approaches are dangerous, not because they're harmful but because they're a distraction. People who want to live longer, healthier lives could focus on some basic (and well known) advice on not smoking, limiting alcohol intake, eating fresh fruit and vegetables, and getting regular exercise and sleep, but over the course of a whole lifetime. An unnecessary and ineffective focus on 'detoxing' implies an alternative (and easier) way to a healthier life.

Before this lesson student should have knowledge of the process of excretion but this could be used as a starting point for a more detailed treatment. This lesson could also provide an introduction to electrolysis.

Resources

ear candling video clip (search for 'ear candling' on YouTube) • ear candles • foot spa advertisement video clip (search for 'detox foot spa' on YouTube) • bs_goo_worksheet_01 'Ear Candling' • bs_goo_worksheet_02 'Collins Detox Foot Bath' • access to reference materials on excretion and electrolysis (not supplied) • model foot bath: see bs_goo_technician

Learning objectives

- To use primary and secondary evidence to investigate scientific claims
- To apply scientific concepts to evaluate 'health products'
- To explore the implications of evaluations of claims

Learning Outcomes

By the end of the lesson students will have:

- examined evidence and drawn valid conclusions
- applied concepts such as excretion and electrolysis to evaluate applications of ideas and claims being made
- considered their responses to the ways in which science is used or abused to sell products

Key vocabulary

electrolysis • excretion

Obstacles to learning

Students may hold misconceptions relating to:

- the purpose of 'waste products' such as ear wax
- the nature of excretion

Lesson 1

Starter

Start by asking if anyone has heard of, or tried, ear candling. If possible show a short video clip from YouTube or use the photo shown on bs_goo_worksheet_01.

Explain that this is a technique that is claimed by some people to remove toxins by drawing them out through the ear in ear wax. The candle is actually a cone of waxed cloth. After use the cone can be cut open and the wax displayed.

Ask students to work in small groups to consider and give feedback on these questions:

- Why might such a technique be thought to draw out ear wax?
- Where might the wax in the used candle have come from?
- How could a simple experiment be set up to see if ear candling does remove ear wax?

The technique doesn't work; there is no force acting on the ear wax, and any wax in the used candle has come from the candle itself.

Furthermore, the technique may be dangerous due to the proximity of hot wax to the ear and the side of the head. It should not be demonstrated and it should be made clear that it may be hazardous as well as being ineffective.

Main activity

Draw out from students how they propose to investigate the claim. This is likely to centre upon two distinct approaches:

- Seeing if the candle can produce any drop in pressure to force the wax out.
- Seeing if the wax in the candle is produced even when not used in an ear.

It should be possible to demonstrate the first approach by burning an ear candle in the proximity of some suitable medium, such as chalk powder or smoke from a splint. The force is minimal and certainly not enough to lift wax out of an ear canal.

The second approach can also be demonstrated by burning an ear candle (but not in an ear), cutting open the candle afterwards and displaying the contents. Some students may object, saying that even if the candle produces wax on the inside, that there could be more wax or a different type, if used in the ear. Refer back to the first demonstration. Some students may propose analysing the wax in a used candle and comparing it with ear wax but it is unlikely that this will be feasible.

There are two research tasks that need to be undertaken at this point. Depending upon the facilities available and the students involved, students could all undertake both tasks or some groups do one and some the other.

- Some suppliers of ear candles claim that this is a traditional cleansing technique that originated with the Hopi Indians. Find out if this is true.
- Wax production is a natural process in the body. Find out what its purpose is.

Gather students' findings. Point out that ear candling has nothing to do with the Hopi tribe of America, who have requested to be dissociated from it, and emphasise that wax is produced by the ears for a good reason − it helps to clean the ear and provides some protection against bacteria. General hygiene including the washing of the outer ear is all that most people require. Impacted wax can reduce hearing efficiency but can't be treated by candling (or anything poked in the ear canal).

Plenary

Ask students to discuss what they now think about ear candling; explore with them their feelings about such treatments being marketed. Ask them to consider these points of view:

- 'Some people are convinced it works for them and swear that they feel better afterwards. Just because science can't explain it doesn't mean it doesn't work.'
- 'Ear candling is dangerous and should be discouraged. Every year hospital A&E departments have to deal with wax burns from ear candles.'
- 'In a free society people should be able to do what they want as long as it doesn't affect others.'
- Strange detox rituals like ear candling may do harm, because they can distract people from the real determinants of health, such as diet, lifestyle and income.

Lesson 2

Starter

Start the lesson by inviting students to recall and recount the activities and outcomes from the previous lesson. Briefly revisit the ways that they explored ear candling and their attitudes towards the technique.

Main activity

Introduce the main part of the lesson by explaining that another detox technique is going to be explored. Say that this is the foot spa, in which the patient puts their feet. Salt (or some other electrolyte) is added and a current made to flow using electrodes and a power supply. A good way of showing how this is promoted is by showing a video clip from YouTube.

Ask students to look at sample promotional materials for the detox foot spa (bs_goo_worksheet_01) and to consider:

- What claims are being made?
- What makes these claims seem plausible?
- Why might you be suspicious of these claims?
- How could you test them out?

Explain that promoters using bad science often use scientific terms to sound more convincing. Superficially the device may seem convincing, because:

- the body has to be able to dispose of toxins
- people's feet sweat and sweating is a form of excretion
- the water gradually changes colour

The next part of the lesson involves students working in groups, each of which has a particular job:

- Groups A need to research excretion and produce a summary of how the body disposes of waste materials.
- Groups B need to research electrolysis and produce a summary of what happens when current flows through an electrolyte.
- Groups C need to model the detox process using a model foot bath with electrodes and a low voltage power supply (see bs_goo_technician). If desired, a doll can represent the person. The changes in the water should be observed.

In the discussion following, these points should be drawn out:

- Human metabolism is complex, with the building blocks of molecules constantly being shaped into new arrangements. Sometimes there are waste products, but at different times the same molecule can be a valued ingredient or a waste product. There is no such thing as a ‘detox system’ in any medical textbook.
- Electrolysis occurs when current flows through water with an electrolyte; the electrolyte separates out and may (depending on the chemicals involved) result in a precipitate in the water and often bubbles and froth on top.
- The water changes colour even if no human feet are present.

Plenary

- Reflect on the way that claims are presented using theatrical techniques, and why the claims may be superficially plausible.
- Discuss why some people believe that these ‘cures’ work for them.
- Debate whether and how such products should be marketed.

Brown goo technician sheet

Technician notes for model detox foot bath

You will need:

- Plastic bowl
- Iron electrodes (different electrodes
- Low voltage power supply
- Leads
- Warm water
- Salt
- Barbie™ (optional)

Set the equipment up as you would any electrolysis practical – with water in the bowl and the electrodes submerged and secured so that they cannot come in contact with each other but are connected to the terminals of the power supply by the leads.

Add salt and stir into the water so that it dissolves.

Switch on the power. The water should gradually change colour.

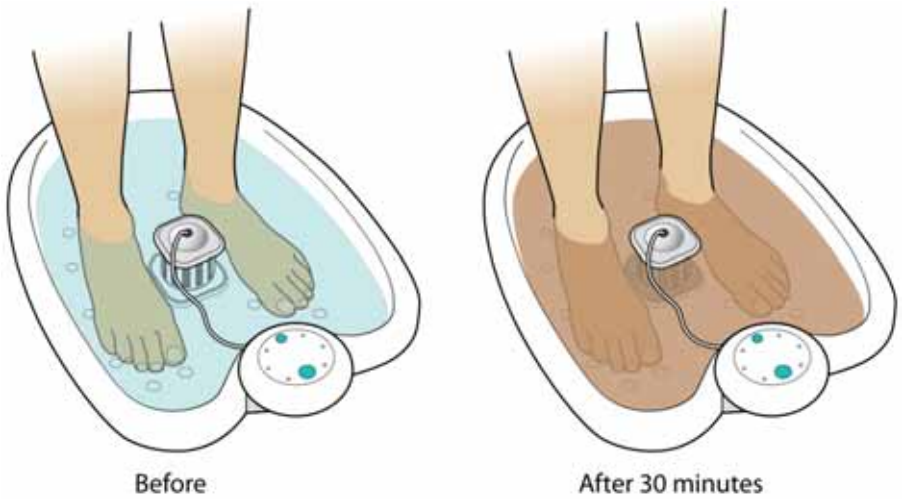
You can use this to investigate if the water changes colour even with no source of toxins (i.e. with plastic feet rather than human feet). Also note that different electrodes (or nails) will produce different colours in the water.

Brown goo worksheet 01

Ear candling

Brown goo worksheet 02

Collins Detox Foot Bath



The patent Collins foot detox bath stimulates the active release of tingling ions that surge back and forth around your feet generating a flow of both negative and positive energy. This refreshes and renews the tissues, cleansing your body of accumulated toxins, readjusting the balance of energy at a bio-cellular level and removing excretory residues.

The centrally located micro-voltaic electrodes cause the flow of bi-polar ions producing an energy field that carries essential nutrients and life-giving oxygen. The release of toxins takes places through the myriad of microscopic pores in the soles of your feet. Graduated colour changes in the water present conclusive evidence of the beneficial effects.

The many enthusiastic users report a range of exhilarating effects including a heightened sense of awareness, improved circulation and relief of arthritic pain. The results are personal to each user as their toxin levels and combinations vary, but all report positive outcomes. One recent example of enthusiastic feedback said “The colour of the water shocked me in the realisation of what had accumulated in my body but the lightness I felt lasted for days!”