Lesson 4: Science In The Media Case Study: Nanotechnology (A)

Lesson	Format
Lesson 4 – Science In The Media Case Study: Nanotechnology (A) By now the students will have interacted directly with the scientists. In this lesson, students will consider how they and other members of the public may receive scientific information in their daily lives: indirectly via the media. Nanotechnology is used as the example.	***Starter: 25 minutes (or more if required)*** What is nanotechnology? Review previous learning on nanotechnology, or watch the You Tube clip (see Resources) as an introduction to nanotechnology. Please note it is not critical for students (or teachers) to have a detailed understanding of nanotechnology in order for lessons 4 and 5 to be of value. Key concepts that may be considered include: 1. Nanotechnology involves controlling the shape and size of materials at a very small scale: the nanometre scale (which includes the atomic, molecular and macromolecular scales); 2. The properties of materials are different at the nanoscale as compared to larger scales; and 3. Nanotechnology is a relatively new area of science, and as a consequence is still being characterized in terms of implications for regulation and control. ***Main Activity: up to 25 minutes*** Split the class into groups. Consider the 4 articles provided, and select some or all of the articles for your students. Ask the groups to read the article(s) provided, and perform the following tasks as time allows: • Summarise in 1-2 sentences what is being said in each article. Is the person being quoted for/against nanotechnology? • Make a list of which points in the articles are FACTS and which are OPINIONS. Is it difficult to tell the difference between the two? • Decide who would benefit the most if the points of view/opinions put forward in the article were accepted by the reader or the public. Does that mean that the person(s) quoted would also benefit? • Decide whether you think the people being quoted in the article have been able to tell the whole story or whether the journalist/reporter has edited out information to suit a particular angle for the news story. For example, is the person being quoted telling the whole story, part of the story or putting forward a point of view? How can you tell what is missing? ***Suggested Homework:*** Complete the tasks above relating to the news articles. Prepare to discuss your conclusions with the class at the next lesson.
Learning Objectives: Assist students to critically analyse and assess scientific information in the media. Encourage students to develop skills in critical thinking.	
Curriculum points covered: This lesson links with a consideration of the treatment of science in the media, as well as encouraging the development of information literacy i.e analysing and synthesising information relating to the sciences.	
Resources: YouTube clip: What's the big deal about nanotechnology? It's all about being really small. Big things are coming from the tiny world of nanotechnology. See the YouTube link 'Introduction to Nanotechnology' uploaded by OMSIVideo on 27 August 2009 (timed at 3:10): http://www.youtube.com/watch?v=8BTGzVScBso 4 articles written for this exercise (pages 11-14 of this booklet and via download on the I'm a Scientist website).	

Suggested adaptations

Support:
Ask the scientists how they feel about their research being presented in the media.

Alternative:
Lessons 4 and 5 can be substituted by the Debate Kit on Drugs in Sport included available online at: http://imascientist.org.au/teachers/teaching-resources-2/

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Article 1

Nanotechnology and sunscreen

Headline: Is sunscreen safe for you or not?

Sunscreen is essential to prevent sunburn, but does it cause problems for users later on?

Sunscreens help to filter out ultra violet (UV) radiation by using a combination of two types of active ingredients. Inorganic particles, such as zinc oxide or titanium dioxide, form a barrier which reflects UV waves. Meanwhile organic components absorb UV rays and release their energy as heat. Early sunscreens containing light-reflecting inorganic compounds looked almost like white paint.

Nanotechnology has made it possible to produce clear sunscreens (translucent) which cannot be seen when applied. Many modern sunscreens contain nanoparticles that make the sunscreen undetectable; it impossible to tell if a person is wearing any sunscreen. The nanoparticles in the sunscreen make the lotion invisible to the eye, which can be attractive for the consumer.

But according to the group Friends of the Earth, wearing translucent sunscreen is a poor consumer choice to make. The organisation says that the nanoparticles contained within the sunscreen might enter a person's blood stream by being absorbed through the layers of skin, and translucent nano-based sunscreens should not be sold.

However, a spokesperson for the regulatory body, the Therapeutic Goods Administration (TGA) says that all sunscreen ingredients used in Australia meet the regulatory standards for use. Jane Dodds, a scientist from the CSIRO, says that sunscreen users can safely use translucent sunscreens. She says the most recent clinical tests conducted in Australia into nanoparticles and sunscreens do not prove that nanoparticles enter the blood stream by being applied in a cosmetic sunscreen. "These sunscreens with nanoparticles for translucent properties are safe to use," she said.

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Article 2

Nanoparticles to deliver drugs

Headline: Blood bubbles fizz up to deliver drugs

Scientists have discovered that nanoparticles and tiny bubbles can be used to more effectively deliver drugs into the blood stream. The effect of the drugs in the blood can be enhanced by adding magnetic nanosized particles to micro bubbles as part of a medical therapy.

This is a potent discovery that could lead to new treatments for diseases of the body or the brain. It also silences the critics of nanotechnology that nanoparticles are something unsafe to use on humans.

According to Eleanor AlterStride at Kings College at the University of London in the United Kingdom, the principle of bubbles to the body or the brain using nanotechnology is relatively simple. "An ultrasound is applied to the body to create micro bubbles in the blood causing them to oscillate, which boosts the uptake of drugs into nearby cells," she says.

"The bubbles created by the ultrasound are stimulating natural uptake mechanisms in the body which improves the efficacy of the drugs." Dr AlterStride says that magnetic nanoparticles help to further the effect of the drug by extending the life of the micro bubbles.

"Micro bubbles which oscillate can also be useful in drug administration for stroke therapy," said Dr Christina Slade at the University of Toronto. Dr Slade and her colleagues have developed different types of bubbles to treat stroke in rats. In the laboratory, they use nanoparticles and bubbles as part of their scientific research process on various diseases in rodents.

Dr Slade said: "Most importantly, the bubbles can be useful in cases where destruction is the goal. By turning up the intensity of the ultrasound energy, with the nanoparticles, the bubbles oscillate much more energetically and for longer, and can break down blood clots, tumours and kidney stones."

Dr Slade says that three days after an experiment to kill certain cancer cells, those rats that had received drugs via micro bubbles enhanced with nanoparticles had responded far better to the therapy than those without the nano-enhanced micro bubble therapy.

"The nanoparticles working with the micro bubbles have the potential to transform medical applications in a cost effective way with maximum impact on patients," Dr Slade said.

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Article 3

Nanotechnology, regulation and the environment

Headline: UK report raises nanotechnology concerns

Australian regulators are being urged to investigate concerns about the use of nanomaterials in clothes and cosmetics after a British review claimed that the tiny particles had the potential to be as dangerous as asbestos particles.

A two-year study by the Royal Commission on Environmental Pollution (RCEP) in the United Kingdom has called for immediate testing to see if a range of household products such as cosmetics and deodorised socks which contain nanoparticles are safe.

The RCEP report claims that these items have similar properties to asbestos which can cause cancer. "While there was no direct evidence that the products were dangerous, there were major gaps between their increasing use and the reliable data available on their safety," the report said.

In Australia, the organisation Friends of the Earth (FOE) has said the British findings reinforced FOE concerns that some products sold in supermarkets had not been tested properly. According to FOE the British report alerts the public to the potential toxic risks of carbon fullerenes or 'bucky balls', which the FOE identified in several cosmetics on sale in Australia.

FOE has said that it is not just in Britain but also in Australia that we need to worry about nanoparticles and their effects on our health and environment. They have also said that the Royal Commission has warned that carbon fullerenes, which are tiny, soccer ball-shaped nanoparticles, pose high toxic risks, and their use in shaving cream, cosmetics and face creams is concerning.

The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) said that all products used in Australia must first meet the regulatory standards for use before becoming available in the market.

A NICNAS spokesperson said yesterday: "It's not true what the critics say about the use of nanotechnology in products. If we thought there was a problem with these items, then they would be recalled from the shops immediately. Product recalls are not that common with items containing nanoparticles or nanomaterials. We carefully check all items before releasing them into the market place. What the British Commission's report and the Friends of the Earth say is just wrong," the NICNAS spokesperson said.

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Article 4

Nanotechnology and the health of the market

Headline: Is the nanotech boom at a risk to worker health?

The global nanotechnology market is growing rapidly with estimates that it will be worth $US27 billion by 2013. The Australian Business Council has said that the nanotechnology market in Australia has grown at a compound annual growth rate of 10 per cent each year for the past seven years. It is expected to continue to grow at this annual rate for the foreseeable future.

Some commentators in Australia claim that the speed at which nanotechnology markets are developing globally requires the Government to provide more details on its response the regulation of nanoscience. Of primary concern to them is whether the speed of development and economic benefits of nanotechnology are at odds with Australian health and safety policies and practices. Similar questions were raised at the annual international nanotechnology conference, held in Sydney earlier this year, which relate to the growth and impact of nanotechnology. The questions raised were: "Do the public understand the risks and rewards of nano materials?" and "Who should be regulating nanotechnology in Australia?"

The 2010 report The Government's approach to the Responsible Management of Nanotechnology has made a number of recommendations in relation to addressing human health and safety and environment risks with nanotechnology. One of the Report recommendations concerned the regulation of nanotechnology. This recommendation is linked with the public's expectation of the Government to regulate the health and safety effects of working with nanotechnology.

Consulting toxicologist Dr Tony Bruschi says, "The current global push appears to be to commercialize as quickly as possible. Unfortunately, the industry's approach to the 'precautionary principle' for hazard and exposure reduction appears to be lip service only" he said. Dr Bruschi said he thinks most Australians are considerate of the health, safety and environmental impacts of new technologies and concerned about these technologies' effect on worker health. He said he supported the Government's initiatives to implement measures to regulate nanotechnology because of the need to balance the risks of nanotechnology with any potential rewards.

A Victorian Trades Council representative said most people know little about nanotechnology but are generally supportive of it. "They trust scientists and expect that the Government will look after regulatory matters. However, if there is a problem, the public expects the Government will provide them with the necessary information to make a proper assessment of their own situation," she said.