Mobile phones and your health

Estimates suggest there are around 1.6 billion mobile phone users throughout the world - and numbers are increasing. Since the use of mobile phone technology is so widespread, medical researchers are concerned that any associated health risks, even small ones, could cause significant public health problems.

Heat is the main concern

Mobile phones communicate with base stations using radiofrequency (RF) radiation. RF radiation at a significant level has a thermal effect, which means it raises body temperature. There are concerns that the low levels of RF radiation emitted by mobile phones could cause health problems such as headaches or brain tumours.

No conclusive evidence

Intensive international research hasn't found conclusive or convincing evidence that mobile phones are damaging to health in the short or long term. On the other hand, there are still unanswered questions regarding their complete safety. Research is ongoing.

Radiation explained

Radiation is a combination of electrical and magnetic energy that travels through space at the speed of light. It is also referred to as electromagnetic radiation (EMR). Radiation is classified into two broad groups:

- **Ionising radiation (IR)** - capable of causing characteristic changes in atoms or molecules in the body which can result in tissue damage such as cancer. Examples of IR include x-rays and gamma rays.
- **Non-ionising radiation (NIR)** - doesn't cause these characteristic changes, but can prompt molecules to vibrate. This can lead to temperature rises, among other effects. Examples of NIR include ultraviolet radiation in sunlight, visible light, light bulbs, infrared radiation, microwave energy and radiofrequency energy.

Mobile phone system explained

The mobile phone system works like a two-way radio and includes the individual handset and the base stations. Base stations have their antennae mounted high off the ground (on a tower or roof) to get the widest coverage. A mobile phone has a radio receiver and a transmitter.

When you make a call, your phone uses radiofrequency (RF) radiation via its antenna to 'talk' to a nearby base station. Once the base station has received your signal, your call is routed through the landline phone system.

Mobile phone base stations emit relatively constant levels of RF radiation. The handsets emit levels of RF radiation that vary depending on three things:

- How long you use the phone
- How close you hold the phone to your body
- Whereabouts you are in relation to the base station. If the link to the base station is weak, the handset increases its radiation level to compensate.

The levels of RF radiation from the handset, to which the user's head is exposed, are around 100 to 1,000 times more intense than exposure from base stations.

Australian mobile phone system regulations

It is estimated that the RF radiation from a mobile phone held against the ear will heat a localised area of the user's face and, to a lesser extent, the brain by a fraction of a degree. This is less than the heating caused by, for example, exercise. However, high levels of RF radiation overheat body tissues and cause damage.

The Australian exposure limits for RF radiation from mobile phones is set far below the level at which any meaningful heating occurs. All mobile phones in Australia must meet the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Standard RPS 3.

The location of base stations and the RF radiation output levels from base station antennae are also regulated. There is currently scientific debate on whether or not RF radiation has any other damaging effects apart from raising body temperature - for example, causing changes to cellular membranes. Because there is not enough evidence about any other possible effects apart from heat, the Australian Standard doesn't include them.

Research results are inconsistent

There have been many studies throughout the world on RF radiation and its effects on the body. There is, of course, a big difference between a biological effect - an effect on the body - and a health effect. For example, RF radiation from a mobile phone has the biological effect of raising the temperature in a localised area of the brain by a fraction of a degree. This biological effect doesn't automatically carry any health risks.

In our example of raised temperature, the human body is equipped to deal with much wider variations in temperature without experiencing harm. Most studies show that RF radiation doesn't cause adverse health effects, but a few studies have suggested that RF radiation exposure could be harmful by, for example, altering how efficiently we can memorise things. Of those studies that indicated possible adverse health effects, follow-up studies haven't been able to confirm the results.

Mobile phone use and cancer - animal research

RF radiation doesn't cause cancer because it is a form of non-ionising radiation, and there is no other known biological way that RF radiation could be carcinogenic.

Most animal studies haven't found any link between RF radiation and cancer, but a few have. In one study, carried out in Adelaide, mice that were genetically modified to be predisposed to cancer experienced faster tumour development after their whole body was exposed to RF radiation during their lifetime.

However, a follow-up study performed in the same location and using larger numbers of animals failed to show any effects of RF radiation. The relevance of the type of tumours in these animal studies to mobile phone users is unclear.

Mobile phone use and cancer - population studies

Population studies (studies of large groups of people) have been limited for a number of reasons:

- It isn't possible for science to determine, beyond a shadow of a doubt, the exact cause or causes of any cancer.
- Cancer can take many years, even decades, to develop and population studies so far have only monitored the health effects following a few years of mobile phone use.
- The scientific medical community believes that studies that are intended to show the long term effects need to be done over at least 10 years.
- Population studies have included imperfect measures of RF radiation exposure levels.
- RF radiation exposure depends on many factors working in combination, such as the model of mobile phone used, the length of the call, how often calls are made and the way the phone is held against the head. These factors make RF radiation exposure difficult to measure.

Population studies completed to date have not shown any consistent association between phone use and cancer. Long term studies that will determine whether mobile phone users have a higher incidence of brain cancer than non-mobile phone users are still ongoing. The current international consensus is that mobile phones don't cause cancer or promote the accelerated growth of existing tumours.

Mobile phones and other health effects

Research is ongoing into whether or not mobile phone use causes health problems apart from cancer. Other suspected health effects under investigation include:

- **Non-specific symptoms** - such as headache, insomnia and dizziness. One theory suggests that RF radiation interferes with the balance system of the middle ear. However, there is no evidence that the RF radiation from a mobile phone is causing these non-specific symptoms.
- **Cognitive functions** - RF radiation has been found to change brain activity during sleep. However, this isn't considered an adverse reaction, since the same sorts of changes can be caused by hormones and caffeine, for example. Changes in memory and reaction time in some studies are slight and temporary and, once again, don't suggest any health implications.
- **Cardiovascular system** - there is no evidence to suggest that mobile phones cause any changes to the cardiovascular system, including heart beat and blood pressure.
- **Hormones** - there is no evidence to suggest that mobile phones alter natural hormone levels.

Other effects from mobile phones

Mobile phone use can also have other indirect health effects. For example:

- **Electronic equipment** - it is possible for RF radiation to interfere with medical electronic equipment if the equipment is vulnerable to the field. Handsets should be turned off in hospital buildings.
- **Road accidents -** studies show that using a mobile phone while driving significantly increases the risk of traffic accidents. This risk can be substantially reduced by using a hands-free model, as research suggests that these types of phones have less effect on driver concentration. Talking on a hand-held mobile phone while driving is illegal in all States and Territories of Australia.

Precautions to reduce exposure

Evidence so far suggests that mobile phones aren't harmful, but long term risks and consequences are yet to be clarified. If you are concerned, you can reduce your exposure to RF radiation in the following ways:

- Choose a mobile phone model that has a low specific absorption rate (SAR), which refers to the amount of RF radiation absorbed by body tissues.
- Use a landline phone if one is available.
- Keep your mobile phone calls short.
- Use a hands-free kit.
- Don't carry your mobile phone close to your body when it is switched on.
- In your car, choose the type of mobile phone that has its antenna mounted on the roof of the vehicle.
- Be wary of claims that protective devices or 'shields' can reduce your exposure to RF radiation - there is no evidence to suggest these devices work. In fact, they can increase RF radiation because the phone will automatically increase its RF output to combat the effects of the shield and to ensure optimal communication.

Cordless phones

Mobile phones emit a signal that can span to about 20km. By comparison, cordless phones are extremely low powered because they only need to transmit their signal a short distance away: for example, within the house or office. There is no evidence to suggest that cordless phone use has harmful health effects.

Where to get help

- Your doctor
- Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) Tel. (03) 9433 2211
- Department of Human Services, Radiation Safety Program Tel. 1300 767 469
- Australian Mobile Telecommunications Association (AMTA) Tel. (02) 6230 6055

Things to remember

- The current international consensus is that mobile phones don't cause cancer or promote the accelerated growth of existing tumours.
- Cancer can take many years, even decades, to develop. Population studies so far have only monitored the health effects following a few years of mobile phone use.
- Using a mobile phone while driving significantly increases the risk of traffic accidents - talking on a hand-held mobile phone while driving is illegal in all States and Territories of Australia.

This page has been produced in consultation with, and approved by:

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