

Do Mobile Phones Cure Alzheimer's Disease?

Comments by Andrew Goldsworthy on a widely publicised paper by Arendash and co-workers that suggests that mobile phone radiation may cure Alzheimer's disease.

I have looked at the original Arendash et al. paper and things are not quite as reported in the press.

The radiation was not modulated

The first point I should make is that they used radiation at 918MHz (similar to a GSM mobile phone in this respect) but it was neither pulsed nor modulated, so it cannot be regarded in any way as being equivalent to real mobile phone or Wifi radiation.

Unmodulated radiation is less biologically active

The non-thermal effects of unmodulated radio frequency radiation are normally much weaker than modulated radiation and could even produce the opposite effect (this is called radiation hormesis, which has been studied mostly in relation to ionizing radiation, but it probably also applies to non-ionizing radiation).

Radiation hormesis

It is argued that living cells and organisms perceive the damaging effects of the radiation and put themselves into "repair mode". This includes boosting enzymes needed for cellular growth and regeneration and also triggering inflammation to increase the blood supply to the affected region. Provided these measures are successful, there may be no observable adverse effects. However, some of these mechanisms are generic and may also affect other illnesses, so that very weak radiation may have net beneficial effects, even on systems that are not directly affected by it. This may be what we are seeing here; mild inflammation of the brain would increase its blood supply and could stave off the degeneration normally associated with Alzheimer's disease.

Amplitude modulated waves can weaken cell membranes and cause illnesses

Amplitude modulated radio waves (such as those used by mobile phones), where the strength of the carrier wave rises and falls in time with the modulating waveform, give greater biological effects. This is perhaps because they are more effective in jerking structurally-important calcium ions free from cell membranes, which makes them more inclined to leak. The effects of this can be harmful in many cases (see <http://tinyurl.com/5ru6e6> for a proposed mechanism and some of the consequences).

Amplitude modulation can also affect cryptochrome to increase the risk of cancer

When a carrier wave is modulated in this way, it generates a range of other frequencies on either side of the carrier (called sidebands), which contain the information. Digital transmissions have particularly wide sidebands that encompass many other biologically active frequencies, including those that interfere with the activity of *cryptochrome*, which some animals use to sense magnetic fields for navigation (Ritz et al. Nature, Vol. 429, 13 May 2004). Cryptochrome also occurs in most animal and plant cells, where it is an essential part of the "body clock" that controls their natural circadian rhythms. It is effects on cryptochrome that probably account for the sleep disturbances experienced by people living near base stations. It may also explain their apparent increased risk of getting cancer since the immune system, which normally disposes of aberrant cells before they become cancerous, is controlled by the body clock. This is to make the most efficient use of limited bodily resources, which are switched from physical activity during the day to the immune system at night. If our natural body rhythms are disrupted or reduced in amplitude by the radiation, it means that at no time can the immune system function at maximum strength and we are therefore more likely to develop cancer.

The take-home story

To sum up, it is perfectly possible that unmodulated microwaves could mitigate the effects of

Alzheimer's disease, but modulated microwaves are likely to do more harm than good. So now may not be the time to buy granny a mobile phone, but we should nevertheless look more carefully at the effects of **unmodulated** radiation. It may really help, but we still need to proceed with great caution.

Andrew Goldsworthy BSc PhD
Lecturer in Biology (retired)
Imperial College London