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Phones and health

Do mobile phones increase the risk of cancer?

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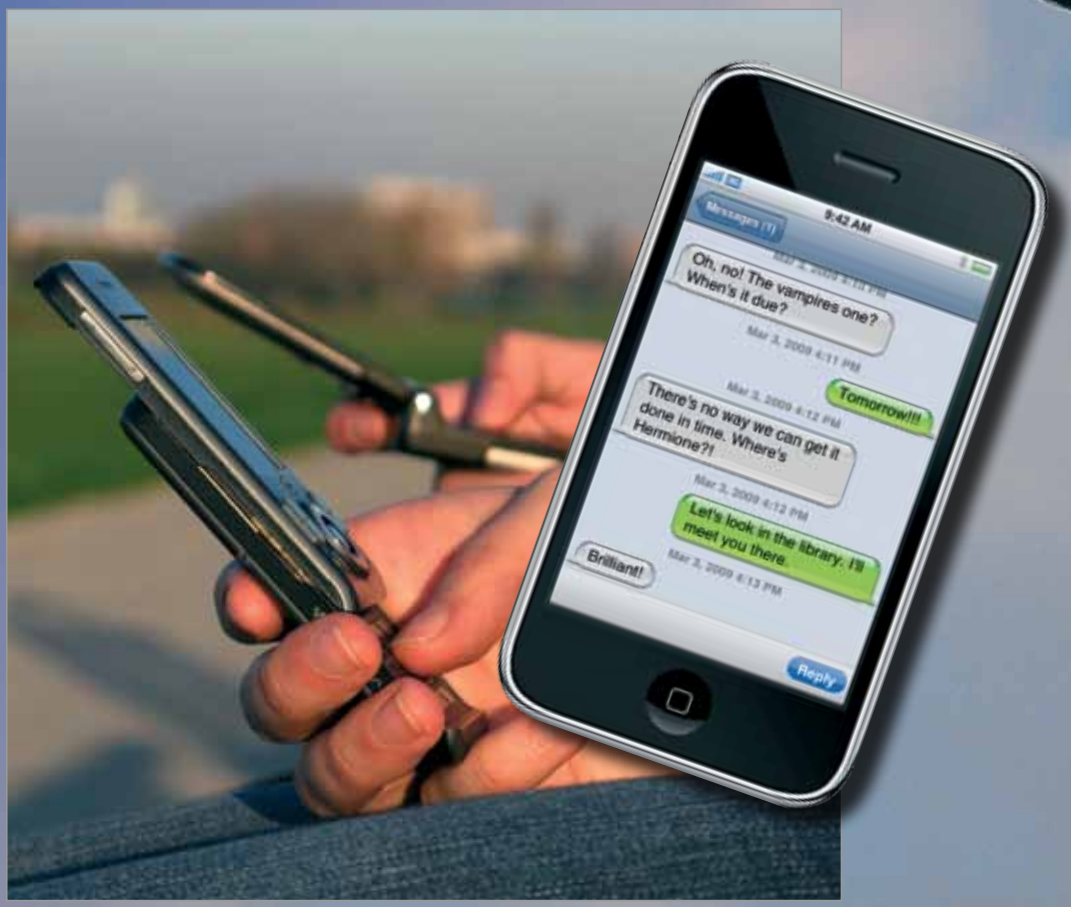
Will using a mobile phone increase your risk of brain cancer? A new study from Denmark says no – or rather, probably not. In this article, we look at how scientists try to answer this difficult question.

Brains and radiation

When you use a mobile phone, you are exposing your brain to radiation. Mobile phones use radio waves to communicate with the masts (aerials) that send out and receive the signals which carry the messages which make up a phone conversation. There is a small aerial inside each handset and, by holding the phone close to your ear, you expose your head to the radio waves coming from this aerial. Some of the radio waves are absorbed by your head, causing a slight warming of the skull and brain tissue. This doesn't appear to be harmful, but could there be other, more damaging, effects from irradiating your brain?



When texting, less radiation reaches the user's head.

Radio waves are part of the electromagnetic spectrum. Those used for mobile phone signals have frequencies around 1800 MHz, so their wavelength in air is about 17 cm. Although radio waves can be classed as electromagnetic radiation, they are not a form of ionising radiation (unlike ultraviolet, X-rays and gamma rays, which are at the other end of the spectrum).

Ionising radiations are known to cause cancer, so we try to minimise our exposure to these. If radio waves are found to cause cancer, it will not be because they ionise the molecules they interact with; there would have to be a different mechanism.

Retrospective studies

We don't know how radio waves from mobile phones could cause cancer, but we can still try to find out if there is a link between using mobile phones and cancer of the brain. One way is to study people who do suffer from brain tumours and to ask the question: how much use have they made of mobile phones? Medical statisticians have identified large numbers of people who have died from cancers of the central nervous system (the brain and spinal cord). They have then asked their relatives how much they used a mobile phone.

At the same time, they identify a control group of people who have not suffered brain cancers. How much have they used mobile phones? Does there seem to be a correlation between the amount of phone use and the chance of getting brain cancer?

So far, such studies have not shown a link. There is a problem with these studies. They are described as retrospective; that is, they are looking backwards in time. People who have died of brain cancer are identified, and then questions are asked about their mobile phone use. This information is likely to be unreliable. How accurately can you state how much a relative has used a mobile phone over the last 10 years?

This farmer uses traditional cultivation techniques but he can communicate directly from his fields using his mobile phone.

Population studies

No-one has been able to show that people who get brain cancer are people who use their mobile phones more. However, it still might be true that using a mobile phone increases the risk of brain cancer by a small amount. To find out about a small increase in risk, we need to look at a large number of people.

That's what the new Danish study has done. They started by identifying mobile phone users and non-users. Then they looked at how many of each had developed brain tumours.

Mobile phone companies can supply information about subscribers. The scientists carrying out the study asked for details of all those who had subscriptions between 1990 and 2007. This gave a population of about 360 000 individuals with an average of just over 10 years of phone use each.

There are 5 billion mobile phone contracts worldwide in 2011; the world population has just reached 7 billion.

At the same time, a much larger number of non-subscribers could be identified. Together, the phone users and non-users make up the cohort of the study.

Denmark is a helpful country for this type of study. Each citizen is registered and so has a unique identification number. Lots of information is stored in different databases which can then be linked together to search for patterns.

In particular, there is a medical database listing every cancer patient in Denmark, together with the type of cancer they have suffered from. The scientists linked each person in the cohort they were studying to the cancer database and found out whether they had suffered a cancer of the central nervous system at any time between 1990 and 2007.

For a study of this kind, it is essential that the cohort is carefully defined. The researchers had to exclude anyone for whom the data was uncertain. For example, they excluded anyone who had a company phone subscription – they could not be sure that the person whose name was on the phone contract was the main user of the phone.

Results

Comparing users of mobile phones with non-users, the researchers found that there was no significant difference in the rates of brain cancer between the two groups.

The word 'significant' has a special meaning here. The rates of cancer among users and non-users were slightly different. However, the difference was no more than you might expect by chance – they used statistical calculations to show this.

More radiation, more cancer?

Some of the phone users in the study had had phone contracts for over 13 years; others had used phones for only a year or two. The researchers compared cancer rates between users who had used phones for different lengths of time. They were looking for a dose-response relationship; that is, did people who had received a greater 'dose' of radiation have a greater chance of getting cancer? Again, the answer was no.

Some people worry that there might be a long time interval between exposure to radiation and the appearance of a tumour. This study suggests that this is unlikely, unless the induction period is very long.

Limitations of the study

The authors of the study were careful to take account of the fact that some groups in society use mobile phones more than others. For example, in Denmark in the period studied, more men than women had mobile phone subscriptions, so the researchers considered these groups separately. They also standardised the groups of users and non-users to take account of differences in age, education and disposable income. They still found no difference in the risk of cancer between users and non-users.

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The results of the Danish study were published in the *British Medical Journal*, a prestigious scientific journal. When the paper is re-used, its original publication serial number must be given (*BMJ* 2011;343:d6387) so that anyone can find the original by looking on the web.

Many of the articles in the *BMJ* are only available to subscribers. However, the Danish paper was published under an Open Access licence.

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