

Tuesday 14 May 2013 – Morning

LEVEL 2 CAMBRIDGE NATIONAL IN SCIENCE

R072/02/I

How scientific ideas have developed

INSERT

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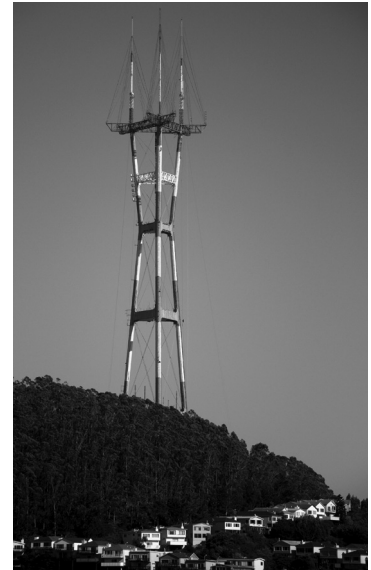
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Cancer in children around Sutro Tower, San Francisco

Sutro Tower is a radio mast in a residential area of San Francisco. The tower is about 300 m high. It emits radio waves and microwaves.

People living near the tower were worried after some of their children developed cancer. A fifteen year scientific study investigated childhood cancers in an 8 km circle around the tower.



The hypothesis of the Sutro Tower study

The hypothesis put forward in the study was that ...

'Exposure to radio and microwave radiation causes cancer in children living near the tower.'

Results from the Sutro Tower study

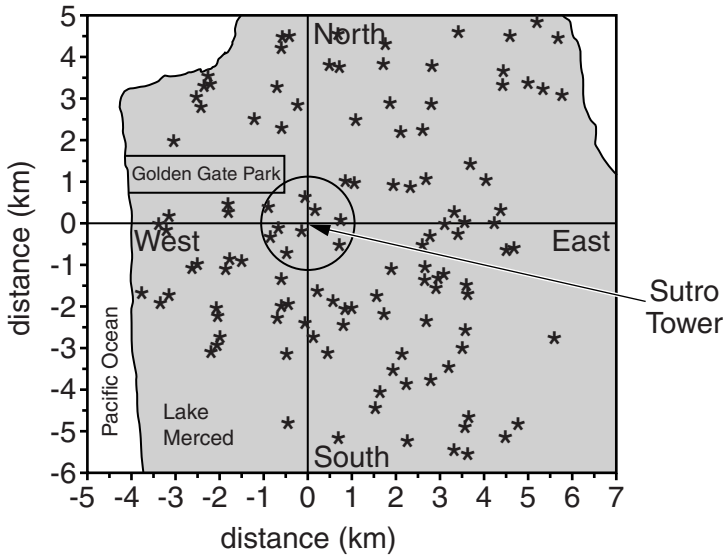
The study compared the population and the number of cancer cases near the tower to a control group who lived between 4.8 km and 8 km away from the tower. They used this data to calculate a 'Relative Risk' (RR) which is a measure of the risk of developing cancer compared to the control group. The RR is based on calculations about the percentages of children who develop cancer compared to the number of children who live in each area.

Table 1: Number of children developing cancer who lived within 500 m of the tower compared to the control group.

| Distance children lived from tower | Number of children | Number of children who developed cancer |
|------------------------------------|--------------------|---|
| within 500 m | 144 | 2 |
| 4.8 – 8 km (control group) | 27 500 | 19 |

Further results of the Sutro Tower study

Map 1:



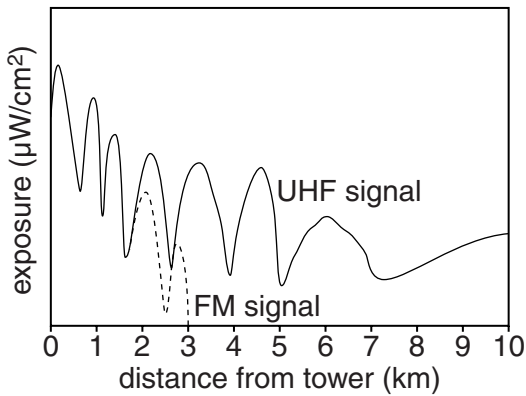
* shows where children who developed cancers during the study lived.

The ring is a 1 km circle around the tower.

Table 2: Childhood cancer cases within 1 km of the tower.

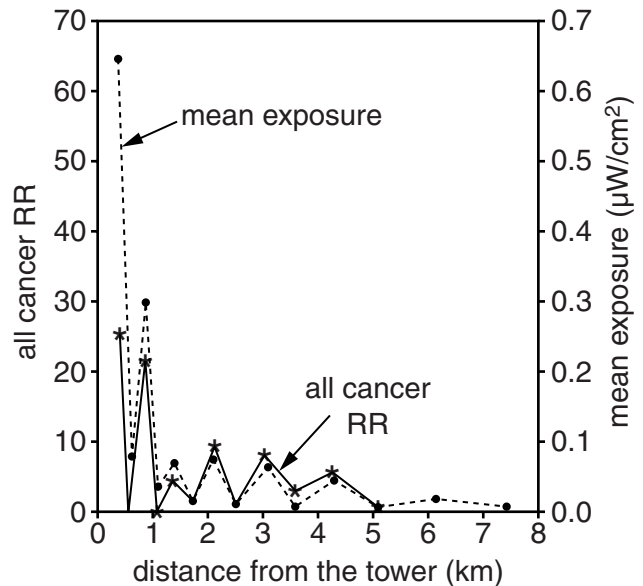
| Type of cancer | Number of cases |
|-------------------|-----------------|
| brain | 5 |
| leukaemia (blood) | 2 |
| others | 2 |

Graph 1: Exposure to radio waves around the tower



The graph shows two types of radio waves (FM and UHF). Notice that the strength of the signal varies with distance from the tower.

Graph 2: Relative Risk (RR) and Mean Exposure



The graph shows how the Relative Risk (RR) of developing cancer and the mean exposure change with distance from the Sutro Tower.

Other studies and opinions

The evidence in the Sutro Tower study seems to strongly support the hypothesis. However, other scientists do not agree that there is any link between childhood cancers and exposure to radio and microwave radiation from similar towers. Some scientists say that the number of cases of cancer is still too low to see definite patterns. Others have said that some of the data is confusing and does not strongly support the hypothesis.

Children and adults living in residential areas use many appliances such as mobile phones or other devices that also use radio or microwaves, sometimes at higher exposure levels. Also, people are exposed to many other factors that may cause cancer.

Sutro Tower is owned by a media company. A spokesman for the media company is quoted as saying ...

“There are 40,000 Americans who believe they have been kidnapped by aliens. There will always be somebody who has a new and original perspective, but no national or international standard-setting organization has found credible scientific evidence that exposure to low levels of radio frequency causes cancer.”

Another study looked at cancer cases in both adults and children around a similar tower in the UK. The results appeared to show higher cases of brain, blood, breast and bladder cancer for people who lived within 2 km of the tower.

Other laboratory studies claim that radio and microwave radiation can be ‘genotoxic’ even at low exposures. Genotoxins disrupt protein synthesis in the body. Some studies have found evidence that DNA can be damaged by radiation. Other studies appear to show no change to DNA or that damaged DNA can repair itself.



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