

香川大学

平成 24 年度

(医学部医学科 推薦入試)

問題冊子

教 科 等	ページ数
小 論 文 I	4

試験開始の合図があるまで、問題冊子を開かないこと。

解答の書き方

1. 解答は、すべて別紙解答用紙の所定欄に、はっきりと記入すること。
2. 解答を訂正する場合は、きれいに消してから記入すること。
3. 解答用紙には、解答と受験番号のほかは、いっさい記入しないこと。

注 意 事 項

1. 試験開始の合図の後、解答用紙に受験番号を必ず書くこと。
2. 問題の内容についての質問には、いっさい応じないが、その他の用事があるときは、だまって手をあげて、監督者の指示を受けること。
3. 試験終了時には、解答用紙を机上の右側に置くこと。
4. 試験終了後、問題冊子及び下書き用紙は持ち帰ること。

問題 次の文章を読み、以下の問に答えなさい。

Electromagnetic fields and public health: mobile phones

(World Health Organization, Media centre, Fact sheet No.193 June 2011)

Mobile or cellular phones are now an integral¹⁾ part of modern telecommunications. In many countries, over half the population use mobile phones and the market is growing rapidly. At the end of 2009, there were an estimated 4.6 billion subscriptions globally. In some parts of the world, mobile phones are the most reliable or the only phones available.

Given the large number of mobile phone users, it is important to investigate, understand and monitor any potential public health impact.

Mobile phones communicate by transmitting radio waves through a network of fixed antennas called base stations. Radiofrequency²⁾ waves are electromagnetic fields, and unlike ionizing³⁾ radiation such as X-rays or gamma rays⁴⁾, can neither break chemical bonds nor cause ionization in the human body.

Exposure levels

Mobile phones are low-powered radiofrequency transmitters, operating at frequencies between 450 and 2700 MHz with peak powers in the range of 0.1 to 2 watts. The handset only transmits power when it is turned on. The power (and hence the radiofrequency exposure to a user) falls off rapidly with increasing distance from the handset. A person using a mobile phone 30–40 cm away from their body – for example when text messaging, accessing the Internet, or using a “hands free” device – will therefore have a much lower exposure to radiofrequency fields than someone holding the handset against their head.

In addition to using “hands-free” devices, which keep mobile phones away from the head and body during phone calls, exposure is also reduced by limiting the number and length of calls. Using the phone in areas of good reception also decreases exposure as it allows the phone to transmit at reduced power. The use of commercial devices for reducing radiofrequency field exposure has not been shown to be effective.

Mobile phones are often prohibited in hospitals and on airplanes, as the radiofrequency signals may interfere with certain electro-medical devices and navigation systems.

Are there any health effects?

A large number of studies have been performed over the last two decades to assess whether mobile phones pose a potential health risk. To date, no adverse⁵⁾ health effects have been established as being caused by mobile phone use.

Short-term effects

Tissue heating is the principal mechanism of interaction between radiofrequency energy and the human body. At the frequencies used by mobile phones, most of the energy is absorbed by the skin and other superficial tissues, resulting in negligible⁶⁾ temperature rise in the brain or any other organs of the body.

A number of studies have investigated the effects of radiofrequency fields on brain electrical activity, cognitive function⁷⁾, sleep, heart rate and blood pressure in volunteers. To date, research does not suggest any consistent evidence of adverse health effects from exposure to radiofrequency fields at levels below those that cause tissue heating. Further, research has not been able to provide support for a causal relationship between exposure to electromagnetic fields and self-reported symptoms⁸⁾, or “electromagnetic hypersensitivity”.

Long-term effects

Epidemiological⁹⁾ research examining potential long-term risks from radiofrequency exposure has mostly looked for an association between brain tumours¹⁰⁾ and mobile phone use. However, because many cancers are not detectable until many years after the interactions that led to the tumour, and since mobile phones were not widely used until the early 1990s, epidemiological studies at present can only assess those cancers that become evident within shorter time periods. However, results of animal studies consistently show no increased cancer risk for long-term exposure to radiofrequency fields.

Several large multinational epidemiological studies have been completed or are ongoing, including case-control studies and prospective cohort studies¹¹⁾ examining a number of health endpoints in adults. The largest retrospective case-control study¹²⁾ to date on adults, Interphone, coordinated¹³⁾ by the International Agency for Research on Cancer (IARC), was designed to determine whether there are links between use of mobile phones and head and neck cancers in adults. The international pooled analysis of data gathered from 13 participating countries found no increased risk of glioma¹⁴⁾ or meningioma¹⁵⁾ with mobile phone use of more than 10 years. There are some indications of an increased risk of glioma for those who reported the highest 10% of cumulative¹⁶⁾ hours of cell phone use, although there was no consistent trend of increasing risk with greater duration of use (A). The researchers concluded that biases and errors limit the strength of these conclusions and prevent a causal interpretation. Based largely on these data, IARC has classified radiofrequency electromagnetic fields as possibly carcinogenic¹⁷⁾ to humans (Group 2B), a category used when a causal association is considered credible¹⁸⁾, but when chance, bias or confounding¹⁹⁾ cannot be ruled out with reasonable confidence.

While an increased risk of brain tumours is not established, the increasing use of mobile phones and the lack of data for mobile phone use over time periods longer than 15 years warrant further research of mobile phone use and brain cancer risk. In particular, with the recent popularity of mobile phone use among younger people, and therefore a potentially longer lifetime of exposure, WHO has promoted further research on this group. Several studies investigating potential health effects in children and adolescents are underway.

(以下省略)

(注)

- 1) integral : 必須の
- 2) radiofrequency : 無線周波
- 3) ionizing : イオン化された
- 4) gamma rays : ガンマ線
- 5) adverse : 有害な
- 6) negligible : 無視してよい
- 7) cognitive function : 認知機能
- 8) self-reported symptoms : 自覚症状
- 9) epidemiological : 疫学の
- 10) tumours : 腫瘍
- 11) prospective cohort studies : 前向きコホート研究: 特定の要因に暴露した集団と暴露していない集団を追跡し、研究対象となる疾病の発生率を比較することで、要因と疾病発生に関連を調べる研究方法。
- 12) retrospective case-control study : 後ろ向き症例対照研究: 研究対象となる疾病に罹患した集団と罹患していない集団について、特定の要因への曝露状況を調査し比較することで、要因と疾病の関連を評価する研究手法。
- 13) coordinated : 調整する
- 14) glioma : グリオーマ: 悪性の脳腫瘍の一つ
- 15) meningioma : 髄膜腫: 良性の脳腫瘍の一つ
- 16) cumulative : 累積する
- 17) carcinogenic : 発がん性の
- 18) credible : 信頼できる
- 19) confounding : 混同する、まごつかせる

- 問1 WHO は携帯電話の使用と健康被害について現在のところどの様に考えているか、300字以内（日本語）で述べなさい。
- 問2 携帯電話の使用と健康被害との関係を研究しようとする時、どの様な要因が結論を導く妨げとなるか。この報告を参考にしてあなたの考えを箇条書きにして（日本語）で述べなさい。
- 問3 下表はこの報告のもとになった論文から抜粋したものである。下線(A)の部分はどのようなことであるか、表の数字を考慮しながら分かり易く 100字以内（日本語）で述べなさい。

表：ORs between mobile phone use and gliomas by cumulative call time

Cumulative call time (h)	Gliomas		
	Cases	Controls	OR* ¹ (95% CI* ²)
Never regular user	1042	1078	1.00
<5h	141	197	0.70 (0.52-0.94)
5 – 12.9	145	198	0.71 (0.53-0.94)
13 – 30.9	189	179	1.05 (0.79-1.38)
31 – 60.9	144	196	0.74 (0.55-0.98)
61 – 114.9	171	193	0.81 (0.61-1.08)
115 – 199.9	160	194	0.73 (0.54-0.98)
200 – 359.9	158	194	0.76 (0.57-1.01)
360 – 734.9	189	205	0.82 (0.62-1.08)
735 – 1639.9	159	184	0.71 (0.53-0.96)
≥1640	210	154	1.40 (1.03-1.89)

(International Journal of Epidemiology 2010;39:675-693 より抜粋)

*1 OR (オッズ比)：要因を持つ人の罹患率／要因を持たない人の罹患率

*2 95% CI：95%信頼区間