WRITTEN TESTIMONY FOR A SUBCOMMITTEE HEARING ENTITLED: "THE HEALTH EFFECTS OF CELL PHONE USE" THE UNITED STATES SENATE

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Preface

I am greatly honored to participate in such an important forum at the United States Senate, and appreciate the invitation to present my research and the efforts made by the Israeli Ministry of Health to address the issue of cell phones and health. In this written statement, I will offer my opinion on a subject which affects a substantial and growing proportion of the world's population, and which I believe has great significance for public health.

Appended to this statement is my full resume (appendix 1). I studied medicine at the Technion Medical School in Haifa, Israel where I completed M.Sc. and M.D. degrees, and received an MPH from the School of Public Health at the Hebrew University of Jerusalem. I am also board certified in epidemiology and public health.

I currently serve as the Head of the Clinical Epidemiology Department at the Sheba Medical Center and Director of the Cancer & Radiation Epidemiology Unit at the Gertner Institute, Israel, which are affiliated to the Sackler School of Medicine at Tel-Aviv University (where I hold an appointment as a senior lecturer). I also serve as the Principal National Investigator for Tinea Capitis (ringworm) Research. These studies are conducted in abidance with a law that calls for evaluating health outcomes of treatment with ionizing radiation given for Tinea Capitis in the 1950s to about 50,000 children (most of them immigrants who came to Israel in the 1950s). The law was established in 1994, to compensate the irradiated population for late radiation outcomes. In accordance with this law, my responsibilities include advising the Ministry of Health regarding compensation for diseases which have been found to be causally related to the irradiation, and developing medical guidelines for follow-up for this unique population.

I am thus actively involved in research and in advising the Chief Director of the Ministry of Health for determining health policy concerning ionizing and non-ionizing radiation and cancer.

I am an official member of several national professional committees established to advise the Ministry of Health: these include among others the National Council for Prevention, Diagnosis and Treatment of Cancer, the National Council for Diagnostic Imaging and the Advisory Committee on Cancer Epidemiology for the Director General. In addition, I have been nominated to participate in several ad

hoc committees dealing with specific issues such as guidelines for Pap smear tests in Israel etc.

In my role as advisor, I authored **the Israeli Ministry of Health guidelines for the use of cellular phones in adults and children**, as well as the Director General's Statement concerning the Tinea Capitis Compensation Law (1994), and participated in the drafting of the Director General's Statements concerning guidelines for imaging procedures using ionizing radiation in children, and risks of radiation in cardiac imaging procedures.

Since 2005, I have been a member of the Brain Tumor Epidemiology Consortium (BTEC), an open scientific international forum organized to promote studies on brain tumors, for which I served as the European president between the years 2007-2009.

I have conducted research on both ionizing and non-ionizing radiation in children and adults with colleagues throughout the world, and am currently involved in a number of collaborative studies of brain and other cancers funded by the NIH, USAMRAA (United States Army Medical Research Acquisition Activity), the European Community and other grant institutions. About 85 peer reviewed articles have been published from these studies.

Studies on cell phone use & cancer

For more than a decade, I have been involved in studies of the possible association between the use of cell phones and the risk of malignant and benign brain tumors, tumors of the acoustic (hearing) nerve and tumors of the salivary gland. I served as the principal investigator of the Israeli part of the International collaborative "INTERPHONE" study, the largest epidemiological study conducted to date on this topic.

This study (conducted between the years 2000-2005) was coordinated in the IARC (International Agency for Research on Cancer) with the participation of 13 countries (Australia, Canada, Denmark, Finland, France, Germany, Israel, Italy, Japan, New Zealand, Norway, Sweden and the UK). Several manuscripts on the methodology of this study have been published (1-9). While the overall results of the total group have not yet been published, several reports from individual centers, as well as a pooled analysis of 5 centers, have been published, each presenting their individual results (10-17).

I am currently leading the Israeli part of another multi-national collaborative effort to investigate the risk of brain cancer from exposure to radiofrequency fields in childhood and adolescence (MOBIKIDS). This study was funded following the European Union's call for proposals within the Seventh Framework Programme (ENV.2008.1.2.1.1.). The study, with the participation of 16 centers

from several countries in Europe, Israel, Canada, Australia and New Zealand, will be conducted during the years 2009-2014. The study population will comprise individuals aged 10-24 years, among whom about 1,900 will be cases diagnosed with malignant and benign brain tumors and about 3,900, healthy controls.

It should be noted that in addition to cancer, there are other medical outcomes that also should be explored, including influence on brain activity, behavioral changes, learning patterns, emotional well-being, immunologic pathways, fertility etc. Cultural, social, and other non-medical outcomes should also be assessed.

The Israeli INTERPHONE study – country specific results

In February 2008, the Israeli results of the assessment of the association between cell phone use and risk of benign and malignant parotid gland tumors (the major salivary gland located at the anterior border of the external ear, 4-10 mm deep in the skin surface, in the area close to where phones are often held) were published in the American Journal of Epidemiology. This nationwide Israeli study followed the core protocol of the INTERPHONE study and was extended to include a larger study population. While, as reported in other studies, no increased risk of these tumors was seen for the **total** group, **consistent elevated risks were shown in complementary analyses restricted to conditions that may yield higher levels of exposure.** An elevated risk of salivary gland tumors was seen among people who used cell phones for more than 10 years, especially when the phone was usually held on the same side of the head where the tumor was found, and when use was relatively heavy (16).

Our findings of a higher risk with greater exposure (as expressed by laterality of use, more frequent use, and longer duration of use), are consistent with basic public health research criteria for what is referred to as a dose response relationship—the greater the dose or use of cell phone in our study (or exposure), the greater the response (i.e., the risk of developing a tumor). The Israeli population is characterized by exceptionally high levels of cell phone use as expressed by the cumulative number and duration of calls. This situation created an important opportunity for studying the effects of relatively high patterns of use, which did not exist in most other populations.

Methodological limitations of cell phone studies:

Our findings are in line with several other studies that demonstrated an increase in risk of developing malignant brain tumors and acoustic neurinoma (tumors on the nerve that controls hearing) associated with relatively long-term use (>10 years), and with cell phone use on the same side of the head as the tumor (12,17-21).

However, **there is a debate in the scientific community about the interpretation of these findings and whether these observations reflect a true association or stem from the numerous methodological problems**

that accompany epidemiological studies in general, and those on cell phones specifically.

Epidemiological studies have the advantage of investigating human beings in real life situations. However, considering the complexity of exposures and health conditions in the population, epidemiological studies suffer from a handful of methodological challenges that need to be resolved in order to ensure valid results.

The challenges of investigating a relatively new research topic like cell phones, and a devastating disease such as brain tumor, which can affect cognition and recall, are complex. Many articles and reports have criticized the methodology of the published studies, including that of the INTERPHONE (2, 3, 7-9, 22, 23). Unfortunately, I can not cover all of these methodological issues in this testimony; nevertheless, I would like to briefly mention some of them.

Duration of at least 10 years is the minimal time needed for solid cancer studies and, in the case of brain tumors it may reach 30-40 years. To illustrate this point, I would like to use the proven association between ionizing radiation and brain tumors that was assessed in the atomic bomb studies as an example. The A- bomb was dropped on Hiroshima and Nagasaki in August 1945. While an excess risk of leukemia among survivors was observed in the 1950's, and an increased risk of solid tumors was detected in the 1960's, no elevation in risk of brain tumors was noted among survivors for many years. The first report demonstrating brain tumors among the survivors was only published in 1994 (almost 50 years later) and the first quantitative data for all intracranial tumors, in 2002 (24, 25). Consequently, even in the mid 1970's, it was not evident to the scientific community that ionizing radiation can cause brain tumors. Since widespread cell phone use really began only in the mid 1990's, the follow up period currently available in most published studies is only a little more than 10 years, **which is insufficient to detect an effect, if one exists**. Moreover, in most studies, the "dose" of the exposure, as expressed by cumulative number of calls and duration of calls was also rather limited during the initial years of use. **As current use is characterized by greater levels of exposure** it increases the chance of finding an effect.

As exposure to Radio-Frequency from cell phones is localized (98% of the energy is absorbed in the brain hemisphere on the side where the phone is used), analysis of cell phone use in relation to location of tumor is necessary for the interpretation of results of these studies.

Valid tools for exposure measurements and assessment are crucial for accuracy of results. However, many difficulties exist in the exposure assessments of cell phones which have to account for laterality of use, period of use, patterns of

use, technological aspects of the phones and networks, other exposures to electromagnetic radiation, not to mention the constantly changing technology. Lack of precision in these measurements could lead to errors and biases in the results. The data needed for these studies is usually taken from questionnaires based on self-reporting which are subject to inaccuracies due to problems such as recall. The alternative use of billing records is also limited due to technical problems in abstracting historical records, shared SIM cards, discrepancies between owner and user of the phone, as well as the inability to determine side of use and use of hands-free devices which dramatically lowers the exposure. Novel exposure metrics developed by a multi-disciplinary expert team including epidemiologists, physicists, and industry workers who are familiar with this technology are needed to facilitate accurate measurement of this complicated exposure.

Future scientific needs

Despite these difficulties, it is of utmost importance to see that such studies continue, given the broad range of uses and exposures that exist around the world today. I believe I am correct in saying that there is a consensus that the information currently available is insufficient. Therefore, additional extensive research is necessary to clarify this issue. As the United States of America has always been a leader in conducting scientific and medical research, your choice of this topic as a high priority is needed in order to make significant progress in this field. In view of the many challenges that complicate research on cell phones, I am convinced that a multidisciplinary multinational effort conducted in various populations, and benefiting from the experience acquired in previous studies is the optimal road to clarifying the health risks.

It is important to note that the study populations of the research carried out so far were limited to adults. While at the time when cell phone use began, only adults used cell phones, since the beginning of the 21st century, increasing numbers of children have become users and even owners of cell phones. **This population requires special attention since children have been found to be more susceptible to developing cancer following exposures to known carcinogens.** Furthermore, the brain of a child is not just a smaller version of that of an adult and the radiation absorption in their head is different than adults. The observation of greater susceptibility at younger ages has been consistently shown in numerous studies and for a variety of known carcinogens. In our research as well, on the effects of ionizing radiation used to treat children with tinea capitis, the risk for malignant brain tumors 40 years after treatment was inversely related to age at time of irradiation. Children irradiated under 5 years of age exhibited a risk that was 4.5 times higher than that of children who had not undergone irradiation, while those irradiated at ages 10-15 had a risk that was 1.5 times higher than the non exposed (26).

Public health considerations

There are now 4 billion people, including children, using cell phone technology. Consequently, even if there is only a small individual risk per person, the great number of users, together with the increasing amount of use, could eventually result in considerable damage. **Therefore, until definitive answers are available, some public health measures with special emphasis for children should be instituted.** Preventive steps implemented for other technologies associated with risks, such as driving, provide a good example. We all use cars but, in order to reduce the risk of accidents, legislation has been passed concerning the use of seat belts, speed limits, minimum age requirements for driving licenses, and car tests.

Based on the findings of my work and on reports from scientists in other nations, the Israeli Ministry of Health issued a statement on cell phone use that adopted the **precautionary principle** (that briefly means: "better safe than sorry") (27). This approach rests on the important public health concept that: In case of doubt regarding the data, it is far better to prevent harm **using simple and low cost measures** than to wait for long-term results that confirm a health hazard that has already occurred. Therefore, in such cases, we must be prepared to act before scientific certainty has been achieved (using reasonable and low cost activities).

The recommendations of the Israeli Ministry of Health (28), include several simple, low cost measures that should be taken to minimize exposure, such as using speakers and earphones, hands-free devices when driving, and reducing the use of cell phones in areas where reception is weak. Special attention was given to children, who have been found to be more susceptible to developing cancer following exposures to known carcinogens. The translation of these guidelines is attached (appendix 3).

Guidelines have also been published in other countries. I will not mention all of the existing guidelines but will give some examples with special emphasis on recommendations for children. It is interesting to mention that the definition of a child varies from country to country. The French Health Ministry has published a warning against excessive use of cell phones, especially among children, and has recommended avoiding calls when reception is weak and while driving, as well as for holding the phone away from sensitive areas of the body by using speakers or hands-free devices. It is also considering the possibility of banning the sale of cell phones designed for children under the age of 6, prohibiting the advertising of mobile phones directed at children less than 12 years of age, and requiring the manufactures to develop cell phone that allow only sending and receiving messages (29, 30).
The Finnish Radiation and Nuclear Safety Authority (STUK) has recently suggested restricting the exposure of children to cell phones by encouraging the

use of text messages rather than calls and the use of hands-free devices through which the phone is kept away from the body. Additional recommendations include advising parents to limit the number and duration of calls made by their children, and avoiding calls in areas with low reception or in a moving car or train. It is important to note that STUK does not believe that banning cell phone use in children is justified, as cell phones also promote security since they facilitate easy communication with parents (31).
The Toronto Public Health Department suggested that parents should think twice before giving their children (especially pre-adolescents) cell phones. It also recommended that landlines should be used, whenever possible, while cell phones should be used only when absolutely essential. It was also suggested that the length of cell phone calls be limited, and that headsets or hands-free options be used whenever possible (32).
In India, the Health Minister has recently suggested that people should not talk on a cell phone continuously for more than one hour a day, and that hands-free technology could reduce the side effects of excessive use (33).
Recommendations have also been published in other countries such as the UK, Russia, Germany, and Belgium (34).

The issue of what constitutes appropriate policy in this regard is not, strictly speaking, a scientific matter, but one of judgment. Scientists fulfill their role by providing concrete, independent information on potential hazards, while those charged with policy development have the more difficult job of recommending what to do about the problem, as science continues to evolve.

Summary

Advances in technology have improved the quality of our lives in many ways and these changes have been especially dramatic in the area of communication. I believe that cell phone technology, which has many advantages, and can save lives in emergency situations, is here to stay. However, the question that needs to be answered is not if we should use cell phones but how we should use them?

It is my hope that the issues raised in this forum have enabled the distinguished legislators in this hall to appreciate the need to promote research that will increase our understanding of the potential adverse effects and take actions which will ensure the safe and responsible use of cell phones, while research and technology continue to evolve.

Thank you again for inviting me and for bringing attention to this important issue

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