Docket Control
Arizona Corporation Commission
1200 W. Washington Street
Phoenix, AZ 85007

Docket E-00000C-11-0328 Smart Meters
Docket E-01345A-13-0069 APS opt-out proposal

BEFORE THE ARIZONA CORPORATION COMMISSION

Arizona Public Service (APS) submitted an opt-out proposal on March 22, 2013, which was added to the newly created docket listed above.

We are pleased that APS accepts the need for an opt-out of these very controversial devices. However, we have several concerns regarding APS' assumptions, assertions and proposal.

Health concerns are not "unfounded"

APS claims that the health concerns regarding smart meters "have proven unfounded". This is not correct. There is no such proof. In fact, research that demonstrates there are biological effects is steadily accumulating.

APS cites the opinions of Dr. Leeka Kheifets, who is a paid consultant for APS as well as other special interests in this area. Her opinions are not universally shared among researchers in this field, and especially not among researchers who are not funded by special interests.

The outcome of a study is closely associated with the source of funding for the study. This is an effect that has been very well documented across many sectors of biomedical research.

In Exhibit A, we have patched together the most pertinent information from a large review of this issue, encompassing 1,140 studies. It was published in the Journal of the American Medical Association (JAMA), one of the most prestigious medical journals.

In Exhibit B, we present the full version of an article looking at the same funding effect for studies of health effects from cellular telephones. It shows (Exhibit B,

Table 2) that 82% of independently funded research found biological effects, while only 33% of industry-funded research did. This article was published in the Environmental Health Perspectives, a peer-reviewed journal published by the U.S. National Institutes of Health.

For several additional articles and books on this subject, please see the two lists provided in Exhibit C.

Also, special interests have directly blocked independent research. When two Swedish scientists wanted to correlate the introduction of cell phone service in Swedish counties with the health system billing records, the cell tower operator refused to cooperate, and the study could not be done.[1]

Much research has been done which demonstrates biological effects of electromagnetic radiation at levels far below currently set limits.

A group of researchers with high credentials in the field has put together a comprehensive overview of current research. This group is independent of industry influence, and their conclusions are also different from the industry-promoted idea that there are no health effects from electromagnetic radiation. The latest edition was released about three months ago, and is available at http://www.bioinitiative.org.

An open letter protesting smart meter radiation was organized by David O. Carpenter, M.D. and signed by forty scientists in the field. Dr. Carpenter is the founding dean of the School of Public Health at the State University of New York at Albany. The letter can be viewed at:
http://maisonsaine.ca/smart-meters-correcting-the-gross-misinformation/

The American Academy of Environmental Medicine, a society of practicing physicians, has also officially protested smart meters. Their January 19, 2012 letter to the PUC of California can be viewed on:
http://www.aaemonline.org

We do remind the Commission that many products and substances were once generally considered safe, but turned out not to be. Common examples include X-rays, asbestos, leaded gasoline, tobacco and several drugs.

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[1] Ljusglimten 2008/4

Whenever phase-out of unsafe products has posed a threat to powerful special interests, well-funded resistance to the truth has persisted for decades. We are seeing a repeat of this pattern with the denial of health effects from wireless devices.

Research into acute effects on people who are electrohypersensitive is still in its infancy. Few studies have been done, most with very serious design flaws. Unfortunately, very little funding is available to do further studies.

It is standard for a new medical syndrome to be controversial for several years, with the sufferers not only having to live with the illness, but also being subjected to suspicion and sometimes ridicule. It was only a few decades ago that doctors commonly told people with asthma or an ulcer, that they just needed to learn to relax, and workers with asbestos lungs were labeled as malingerers.

The APS opt-out program should be evaluated based on the fact that some people have no other choice

The official stance of APS is that there are no health effects of any kind. As stated before, this is without merit, though few corporations ever admit that they cause any harm. History is full of such examples, including hexavalent chromium, beryllium, artificial butter flavor, asbestos, tobacco, several drugs, etc.[2]

We remind the Commission that those needing to opt-out do not really have a choice. There are no other vendors available; APS is a monopoly supplier of electricity. Taking the house off the electrical grid is not feasible for most people, both for technical and financial reasons.

We thus ask the Commission to look at the proposed APS opt-out schedule in the light that some people have no choice, and should not be punished for a legitimate need, whether it is an actual disability or a wish to avoid possible long-term health effects or invasion of privacy.

People of limited income are unreasonably penalized

APS' Schedule 17 proposal (4.2) specifically does not allow for any service fee discounts to people on a limited income.

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[2] *Doubt is Their Product*, David Michaels, Oxford University Press, 2008

This is punitive to a very vulnerable population. People who need the opt-out the most tend to also have a low income. We are aware of one elderly, disabled APS customer who has requested an opt-out and whose total monthly income is $730. Her first month's cost would be $75+$30 = $105, which is 14.4% of her income. For all following months, she would have to pay a fee of $30, which is 4.1% of her income. In perpetuity. This is in addition to her existing utility bill.

This is punitive for people on a low income who need to opt out to stay safe from an unwanted technology imposed on them.

A high-income earner may be able to shoulder a sudden 4.1% tax on being safe (even the $4,100 per year that would mean for someone earning $100,000 a year), but people on a low income simply do not have extra money available.

APS points out their significant operational savings from their smart meter program. It is reasonable that a very small portion of these large savings are directed to help people who have a legitimate need to not participate in their new program.

People who qualify as low income should not be burdened by any fee.

The monthly fee is unreasonably high

APS' Schedule 17 proposes a monthly fee of $30, to cover the Company's anticipated cost of maintaining the electromechanical meters, including monthly readings.

APS has chosen the most costly opt-out program, with monthly on-site readings. The Company could have chosen lower-cost options, such as:

- quarterly readings
- self-reported readings

These have been used successfully for many years by other utilities. The opt-out ratepayers should not be penalized for the company's inflexibility towards a small subset of their rate base.

APS also stands to make more money per kilowatt-hour from the customers with analog meters, as they may have to pay the highest overall rate.

Customers, with a TOU rate, who find their cost goes up, have the option of switching to another rate schedule. People who opt-out do not have this choice.

Besides the direct monetary gains from a high fee, APS has another incentive: a high fee discourages or forces some people to forego the opt-out. With a deflated number of opt-outs, APS can then claim their cost per person is higher than anticipated, and further increase the fee, creating a vicious cycle with fewer people having to shoulder increasing fees.

Finally, consider that people who do opt out, do so for very good reasons. Some do so because of a disability. Others wish to keep their families safe from intrusions into their privacy. And others wish to avoid the possibility of long-term health effects.

With the substantial operational efficiencies realized by APS from their smart meter program, a small part of those gains can comfortably fund the opt-out program. It can simply be considered an expense of doing business.

Charging a monthly fee of $30 is simply unreasonable.

The APS opt-out plan should provide discounts for adjacent meters

People who live in apartments, duplexes or on small city lots may need an adjacent neighbor to opt out as well. In such an arrangement, the full cost of the neighbor's opt-out is likely carried by the same person, who may be disabled and on reduced income.

As the extra cost of reading an additional meter in the same location is very small, it is reasonable that a very substantial discount is available for such a situation.

It is unreasonable to charge a full up-front fee where the existing analog meter is left in place

Where there is already an existing analog meter on a customer's premises, there is no need to refurbish an old meter and then dispatch a technician to install the meter on site. This makes the $75 fee an unreasonable burden which does not reflect the actual cost for this situation.

The opt-out should not be limited to wireless meters

APS' Schedule 17 Definitions (1.1 and 1.4) only covers wireless meters. According to these definitions, meters using PLC communications could qualify as a "non-automated meter".

As we have pointed out in several earlier filings, in Docket E-00000C-11-0328, PLC meters have similar health and privacy issues as wireless meters. PLC is not an acceptable substitute for wireless.

APS apparently does not use PLC technology at the moment, but it may do so in the future.

The Definitions 1.1 and 1.4 must be reworded to allow customers to opt out of PLC meters not just wireless models.

PLC meters use one-way or two-way communication. Some can report the electrical usage every 15 minutes. Some models transmit continuously. PLC meters are de facto Automated Meters. The Definitions must be reworded to reflect this reality.

Opt-out customers should have the same legal rights as all other APS customers

In Provision 9.1, APS requires their opt-out customers to waive various rights. Opt-out customers should have the same legal rights as all other APS customers.

APS must inform customers that switching to a new Rate Schedule requires the installation of a smart meter.

In Provision 8.4, APS locks a customer into using a smart meter for 12 months, if they voluntarily switch to one.

We have found that many customers are not aware that any time-of-use or other non-flat-rate plans require a digital meter. Some APS customers have been surprised that they ended up with a new meter after they signed up for another plan.

APS must make a good effort to inform people who opted out that their meter will be changed if they try to switch to another rate schedule.

Respectfully submitted,

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Exhibit A

Scope and Impact of Financial Conflicts of Interest in Biomedical Research

A Systematic Review

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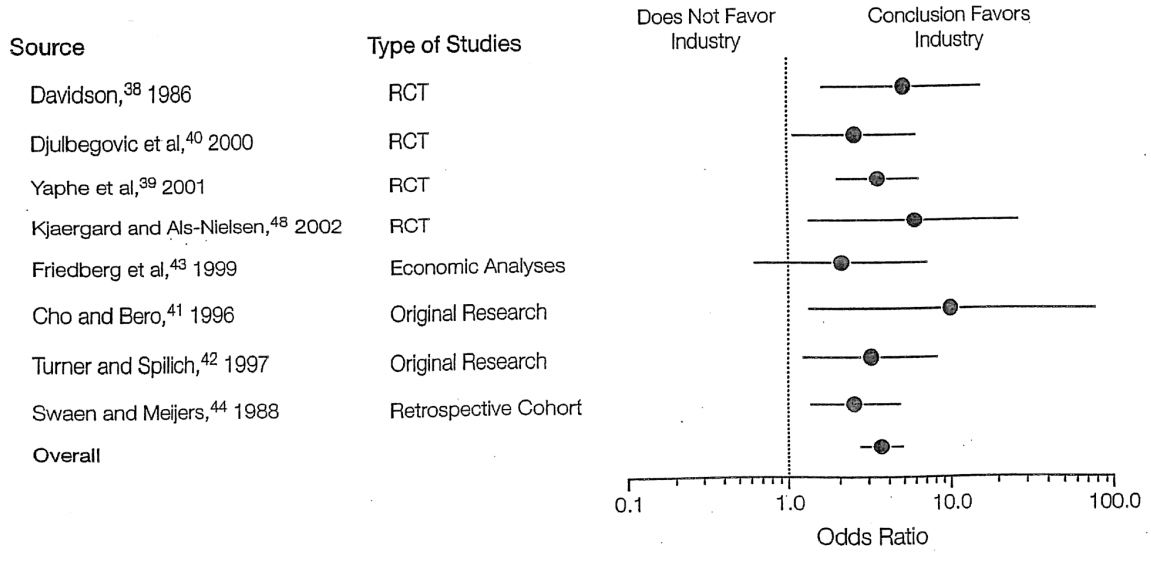
Yan Li, MPhil
Cary P. Gross, MD

454 JAMA, January 22/29, 2003—Vol 289, No. 4

Strong and consistent evidence shows that industry-sponsored research tends to draw pro-industry conclusions. By combining data from articles examining 1140 studies, we found that industry-sponsored studies were significantly more likely to reach conclusions that were favorable to the sponsor than were nonindustry studies.

Figure. Relation Between Industry Sponsorship and Study Outcome in Original Research Studies



RCT indicates randomized controlled trial. Error bars indicate 95% confidence intervals.

Exhibit B

Review

Source of Funding and Results of Studies of Health Effects of Mobile Phone Use: Systematic Review of Experimental Studies

Anke Huss,[1] Matthias Egger,[1,2] Kerstin Hug,[3] Karin Huwiler-Müntener,[1] and Martin Röösli[1]

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OBJECTIVES: There is concern regarding the possible health effects of cellular telephone use. We examined whether the source of funding of studies of the effects of low-level radiofrequency radiation is associated with the results of studies. We conducted a systematic review of studies of controlled exposure to radiofrequency radiation with health-related outcomes (electroencephalogram, cognitive or cardiovascular function, hormone levels, symptoms, and subjective well-being).

DATA SOURCES: We searched EMBASE, Medline, and a specialist database in February 2005 and scrutinized reference lists from relevant publications.

DATA EXTRACTION: Data on the source of funding, study design, methodologic quality, and other study characteristics were extracted. The primary outcome was the reporting of at least one statistically significant association between the exposure and a health-related outcome. Data were analyzed using logistic regression models.

DATA SYNTHESIS: Of 59 studies, 12 (20%) were funded exclusively by the telecommunications industry, 11 (19%) were funded by public agencies or charities, 14 (24%) had mixed funding (including industry), and in 22 (37%) the source of funding was not reported. Studies funded exclusively by industry reported the largest number of outcomes, but were least likely to report a statistically significant result: The odds ratio was 0.11 (95% confidence interval, 0.02–0.78), compared with studies funded by public agencies or charities. This finding was not materially altered in analyses adjusted for the number of outcomes reported, study quality, and other factors.

CONCLUSIONS: The interpretation of results from studies of health effects of radiofrequency radiation should take sponsorship into account.

KEY WORDS: electromagnetic fields, financial conflicts of interest, human laboratory studies, mobile phones. *Environ Health Perspect* 115:1–4 (2007). doi:10.1289/ehp.9149 available via *http://dx.doi.org/* [Online 15 September 2006]

The use of mobile telephones has increased rapidly in recent years. The emission of low-level radiofrequency electromagnetic fields leading to the absorption of radiation by the brain in users of handheld mobile phones has raised concerns regarding potential effects on health (Rothman 2000). However, the studies examining this issue have produced conflicting results, and there is ongoing debate on this issue (Ahlbom et al. 2004; Feychting et al. 2005). Many of the relevant studies have been funded by the telecommunications industry, and thus may have resulted in conflicts of interest (Thompson 1993). Recent systematic reviews of the influence of financial interests in medical research concluded that there is a strong association between industry sponsorship and pro-industry conclusions (Bekelman et al. 2003; Yaphe et al. 2001). This association has not been examined in the context of the studies of potential adverse effects of mobile phone use. We performed a systematic review and analysis of the literature to examine whether industry involvement is associated with the results and methodologic quality of studies.

Methods

We searched EMBASE (http://www.embase.com) and Medline (http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?DB=pubmed) in February 2005. Key and free text words included "cell(ular)," "mobile," "(tele)phone(s)" in connection with "attention," "auditory," "bioelectric," "brain physiology," "cardiovascular," "cerebral," "circulatory," "cognitive," "EEG," "health complaint(s)," "hearing," "heart rate," "hormone(s)," "learning," "melatonin," "memory," "neural," "neurological," "nervous system," "reaction," "visual," "symptom(s)," or "well-being." The search was complemented with references from a specialist database (ELMAR 2005) and by scrutinizing reference lists from the relevant publications. Articles published in English, German, or French were considered.

We included original articles that reported studies of the effect of controlled exposure with radiofrequency radiation on health-related outcomes ["human laboratory studies" in World Health Organization (WHO) terminology (Repacholi 1998)]. Health-related outcomes included electroencephalogram (EEG) recordings, assessments of cognitive or cardiovascular function, hormone levels, and subjective well-being and symptoms. We excluded studies of the risk of using mobile phones when driving a motor vehicle or operating machinery as well as studies on electromagnetic field (EMF) incompatibilities (e.g., pacemakers or hearing aids). Three of us (A.H., K.H., M.R.) independently extracted data on the source of funding (industry, public or charity, mixed, not reported) and potential confounding factors, including study design (crossover, parallel, other), exposure (frequency band, duration, field intensity, and location of antenna), and methodologic and reporting quality. Four dimensions of quality were assessed (Jüni et al. 2001; Repacholi 1998): *a*) randomized, concealed allocation of study participants in parallel or crossover trials; *b*) blinding of participants and investigators to allocation group; *c*) reporting of the specific absorption rate (SAR; watts per kilogram tissue) from direct measurement using a phantom head or three-dimensional dosimetric calculations ("appropriate exposure setting"); *d*) appropriate statistical analysis. For each item, studies were classified as adequate or inadequate/unclear.

The primary outcome was the reporting of at least one statistically significant ($p < 0.05$) association between radiofrequency exposure and a health-related outcome. The message in the title was also assessed. We distinguished among neutral titles [e.g., "Human brain activity during exposure to radiofrequency fields emitted by cellular phones" (Hietanen et al. 2000)], titles indicating an effect of radiation [e.g., "Exposure to pulsed high-frequency electromagnetic field during waking affects human sleep EEG" (Huber et al. 2000)], and titles stating that no effect was shown [e.g., "No effect on cognitive function from daily mobile phone use" (Besset et al. 2005)]. Finally, authors' declaration of conflicts of interest (present, absent) and affiliations (industry, other) were recorded. Differences in data extracted by A.H., K.H., and M.R. were resolved in the group, with the senior epidemiologist (M.R.) acting as the arbiter. In addition, two of us (K.H.M., M.E.), who were kept blind to funding

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Supplemental Material is available online at http://www.ehponline.org/members/2006/9149/supplemental.pdf

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The authors declare they have no competing financial interests.

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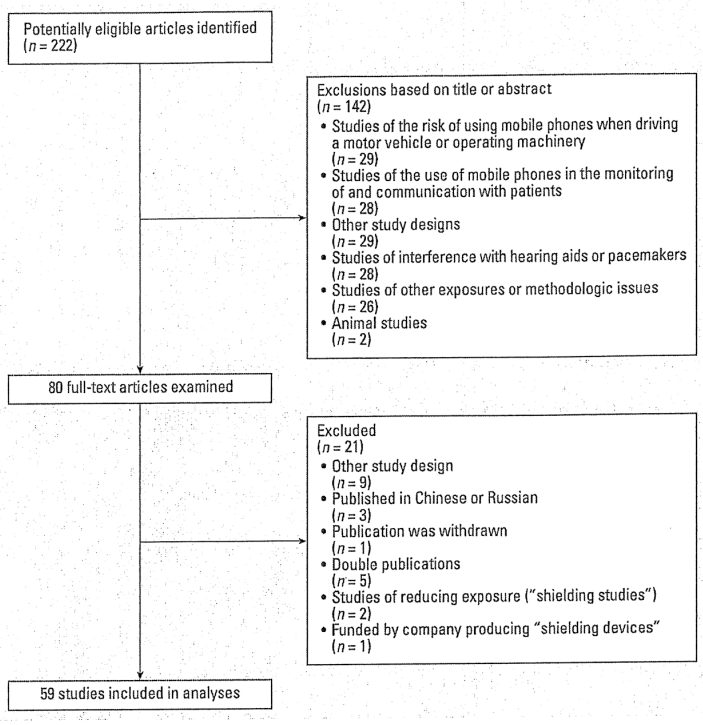

Figure 1. Identification of eligible studies.

Table 1. Characteristics of 59 experimental studies of the effects of exposure to low-level radiofrequency electromagnetic fields.

Study characteristic	Source of funding: Industry (n = 12)	Public or charity (n = 11)	Mixed (n = 14)	Not reported (n = 22)
Study design [no. (%)]				
Crossover trial	10 (83.3)	7 (63.6)	12 (85.7)	11 (50)
Parallel group trial	0 (0)	2 (18.2)	1 (7.1)	2 (9.1)
Other, unclear	2 (16.7)	2 (18.2)	1 (7.1)	9 (40.9)
Exposure [no. (%)]				
Location of antenna				
Next to ear	4 (33.3)	8 (72.7)	11 (78.6)	14 (63.6)
Other/unclear	8 (66.7)	3 (27.3)	3 (21.4)	8 (36.4)
Frequency band[a]				
900 MHz	11 (91.7)	8 (72.7)	13 (92.9)	14 (63.6)
Other frequencies	2 (16.7)	7 (63.6)	0 (0)	5 (22.7)
Unclear	0 (0)	0 (0)	1 (7.1)	5 (22.7)
Median duration of exposure (range)	180 (3–480)	20 (5–35)	45 (30–240)	30 (4–480)
Outcomes assessed [no. (%)][a]				
Electroencephalogram	7 (58.3)	5 (45.5)	8 (57.1)	12 (54.5)
Cognitive function tests	0 (0)	3 (27.3)	8 (57.1)	8 (36.4)
Hormone levels	5 (41.7)	0 (0)	0 (0)	2 (9.1)
Cardiovascular function	2 (16.7)	1 (9.1)	0 (0)	2 (9.1)
Well-being or symptoms	1 (8.3)	1 (9.1)	1 (7.1)	0 (0)
Other	4 (33.3)	3 (27.3)	1 (7.1)	3 (13.6)
Study quality [no. (%)][a]				
Randomization adequate	10 (83.3)	7 (63.6)	13 (92.9)	9 (40.9)
Participants and assessors blinded	1 (8.3)	3 (27.3)	8 (57.1)	3 (13.6)
SAR determined	4 (33.3)	4 (36.4)	8 (57.1)	2 (9.1)
Statistical analysis adequate	3 (25)	3 (27.3)	7 (50)	1 (4.5)
Median study size (range)	21 (8–38)	24 (13–100)	20 (13–96)	20 (8–78)

Percentages are column percentages.
[a]The same study could be listed in more than one category.

source, authors, and institutions, repeated extraction of data from abstracts and assessments of titles. Differences in data extracted by K.H.M. and M.E. were resolved with the senior epidemiologist (M.E.) acting as the arbiter. Based on the abstracts, we assessed whether authors interpreted their study results as showing an effect of low-level radiofrequency radiation, as showing no effect, or as indicating an unclear finding.

We used logistic regression models to assess whether the source of funding was associated with the reporting of at least one significant effect in the article (including the abstract). We examined the influence of potential confounders, such as the total number of outcomes that were reported in the article, the type of study (crossover, parallel, other), the four dimensions of study quality (adequate or not adequate/unclear), exposure conditions (position of the antenna next to the ear compared with other locations; use of the 900-MHz band compared with other bands; duration of exposure in minutes), as well as the type of outcome (e.g., cognitive function tests: yes vs. no). Variables were entered one at a time and, given the limited number of studies, models were adjusted for one variable only. Results are reported as odds ratios (ORs) with 95% confidence intervals (CIs). All analyses were carried out in Stata (version 8.2; StataCorp., College Station, TX, USA).

Results

We identified 222 potentially relevant publications and excluded 163 studies that did not meet inclusion criteria (Figure 1). We excluded one study that had been funded by a company producing "shielding" devices that reduce EMF exposure (Croft et al. 2002). A total of 59 studies were included: 12 (20%) were exclusively funded by the telecommunications industry, 11 (19%) were funded by public agencies or charities, 14 (24%) had mixed funding (including industry and industry-independent sources), and in 22 (37%) studies the source of funding was not reported. None of 31 journals published a statement on possible conflicts of interest of the 287 authors listed in the bylines. Five (8%) studies had authors with industry affiliation. All studies except two (3%) were published in journals that use peer review, and one was published in a journal supplement. The bibliographic references are given in the Supplemental Material (http://www.ehponline.org/members/2006/9149/supplemental.pdf).

Blinded and open extraction of data yielded identical results with respect to the reporting of statistically significant effects in the abstract and the message of the title. Study characteristics are shown in Table 1. All studies were published during 1995–2005, with the number of publications increasing from one to

two publications per year to 11 publications in 2004. Median year of publication was 1998 for industry-funded studies, 2002 for public or charity funding and studies with mixed funding sources, and 2003 for studies that did not report their funding source. The median size of all the studies was small (20 study participants); most studies (n = 32, 54%) were of a crossover design and mimicked the exposure situation during a phone call, using the 900-MHz band with the antenna located close to the ear. Exposure duration ranged from 3 to 480 min, with a median of 33 minutes. Thirty-three (59%) studies measured outcomes during exposure, 14 (24%) postexposure, and 12 (20%) at both times. Thirty-nine (66%) studies prevented selection bias with adequate randomization; 15 (25%) blinded both participants and assessors; in 18 (31%) the field intensity had been assessed appropriately, with SAR values ranging from 0.03 to 2 W/kg tissue. Finally, in 14 (24%) studies we considered the statistical analysis to be adequate. Study quality varied by source of funding: Studies with mixed funding (including public agencies or charities and industry) had the highest quality, whereas studies with no reported source of funding did worst (Table 1).

Forty (68%) studies reported one or more statistically significant results ($p < 0.05$) indicating an effect of the exposure (Table 2). Studies funded exclusively by industry reported on the largest number of outcomes but were less likely to report statistically significant results: The OR for reporting at least one such result was 0.11 (95% CI, 0.02–0.78), compared with studies funded by public agencies or charities (Table 3). This finding was not materially altered in analyses adjusted for the number of outcomes reported, study design and quality, exposure characteristics, or outcomes [Table 3; see Supplemental Material, Table 1 (http://www.ehponline.org/members/2006/9149/supplemental.pdf)]. Similar results were obtained when restricting analyses to results reported in abstracts (OR = 0.29; 95% CI, 0.05–1.59) or on the conclusions in the abstract (OR = 0.10, 95% CI, 0.009–1.10). Thirty-seven (63%) studies had a neutral title, 11 (19%) a title reporting an effect, and 11 (19%) a title reporting no effect (Table 2).

Discussion

We examined the methodologic quality and results of experimental studies investigating the effects of the type of radiofrequency radiation emitted by handheld cellular telephones. We hypothesized that studies would be less likely to show an effect of the exposure if funded by the telecommunications industry, which has a vested interest in portraying the use of mobile phones as safe. We found that the studies funded exclusively by industry were indeed substantially less likely to report statistically significant effects on a range of end points that may be relevant to health.

Our findings add to the existing evidence that single-source sponsorship is associated with outcomes that favor the sponsors' products (Bekelman et al. 2003; Davidson 1986; Lexchin et al. 2003; Stelfox et al. 1998). Most previous studies of this issue were based on studies of the efficacy and cost-effectiveness of drug treatments. A recent systematic review and meta-analysis showed that studies sponsored by the pharmaceutical industry were approximately four times more likely to have outcomes favoring the sponsor's drug than studies with other sources of funding (Lexchin et al. 2003). The influence of the tobacco industry on the research it funded has also been investigated (Barnes and Bero 1996, 1998; Bero 2005). To our knowledge, this is the first study to examine this issue in the context of exposure to radiofrequency electromagnetic fields.

Our study has several limitations. We restricted our analysis to human laboratory studies. This resulted in a more homogenous set of studies, but may have reduced the statistical power to demonstrate or exclude smaller associations. The WHO has identified the need for further studies of this type to clarify the effects of radiofrequency exposure on neuroendocrine, neurologic, and immune systems (Foster and Repacholi 2004). We considered including epidemiologic studies but found that practically all of them were publicly funded. The study's primary outcome—the reporting of statistically significant associations—is a crude measure that ignores the size of reported effects. However, we found the same trends when assessing the authors' conclusions in the abstracts.

Although we have shown an association between sponsorship and results, it remains unclear which type of funding leads to the most accurate estimates of the effects of

Table 2. Results from assessments of article text, abstract, and title of 59 experimental studies of the effects of exposure to low-level radiofrequency electromagnetic fields.

	Source of funding			
	Industry (n = 12)	Public or charity (n = 11)	Mixed (n = 14)	Not reported (n = 22)
Article text				
No. (%) of studies with at least one result suggesting an effect at $p < 0.05$	4 (33)	9 (82)	10 (71)	17 (77)
Median no. (range) of outcomes reported	17.5 (4–31)	10 (1–80)	16 (9–44)	7 (1–35)
Median no. (range) of outcomes suggesting an effect at $p < 0.05$	0 (0–6)	1.5 (0–7)	3 (0–15)	1.5 (0–12)
Abstract[a]	(n = 12)	(n = 11)	(n = 14)	(n = 20)
No. (%) of studies with at least one result suggesting a significant effect	4 (33)	7 (64)	10 (71)	15 (75)
Median no. (range) of outcomes reported	3.5 (1–36)	3 (1–5)	6.5 (3–44)	3 (1–64)
Median no. (range) of outcomes suggesting a significant effect	0 (0–6)	1 (0–3)	2 (0–5)	1.5 (0–7)
Authors' interpretation of results [no. (%)]				
No effect of radiofrequency radiation	10 (83.3)	5 (45.5)	4 (28.6)	5 (22.7)
Effect of radiofrequency radiation	1 (8.3)	5 (45.5)	8 (57.1)	14 (63.6)
Unclear finding	1 (8.3)	1 (9)	2 (14.3)	3 (13.6)
Title [no. (%)]				
Neutral	7 (58)	5 (46)	8 (57)	17 (77)
Statement of effect	0 (0)	4 (36)	3 (21)	4 (18)
Statement of no effect	5 (42)	2 (18)	3 (21)	1 (5)

Percentages are column percentages.
[a]Two publications that did not report their source of funding had no abstracts.

Table 3. Probability of reporting at least one statistically significant result ($p < 0.05$) according to source of funding: crude and adjusted ORs (95% CIs) from logistic regression models.

	Source of funding				
	Industry (n = 12)	Public or charity (n = 11)	Mixed (n = 14)	Not reported (n = 22)	p-Value[a]
Crude	0.11 (0.02–0.78)	1 (reference)	0.56 (0.08–3.80)	0.76 (0.12–4.70)	0.04
Adjusted for					
No. of reported outcomes	0.12 (0.02–0.89)	1 (reference)	0.60 (0.08–4.28)	0.96 (0.15–6.23)	0.04
Median study size	0.08 (0.009–0.62)	1 (reference)	0.61 (0.08–4.59)	0.57 (0.08–4.02)	0.02
Study design (crossover, parallel, or other)	0.08 (0.01–0.68)	1 (reference)	0.38 (0.05–3.07)	1.16 (0.16–8.61)	0.029
Study quality					
Randomization adequate	0.04 (0–0.56)	1 (reference)	0.16 (0.01–2.15)	1.27 (0.16–9.89)	0.005
Participants and assessors blinded	0.14 (0.02–0.96)	1 (reference)	0.54 (0.08–3.91)	0.76 (0.12–4.8)	0.09
Statistical analysis adequate	0.12 (0.02–0.85)	1 (reference)	0.67 (0.09–4.85)	0.54 (0.08–3.76)	0.07
Exposure setting appropriate	0.13 (0.02–0.89)	1 (reference)	0.47 (0.07–3.39)	0.86 (0.14–5.5)	0.06

Models adjusted for one variable at a time.
[a]From likelihood ratio tests.

radiofrequency radiation. For example, if researchers with an environmentalist agenda are more likely to be funded by public agencies or charities, then their bias may result in an overestimation of effects. Interestingly, studies with mixed funding were of the highest quality. The National Radiological Protection Board (NRPB 2004) reviewed studies of health effects from radiofrequency (RF) fields and concluded that "scientific evidence regarding effects of RF field exposure from mobile phones on human brain activity and cognitive function ... has included results both supporting and against the hypothesis of an effect." We found that the source of funding explains some of the heterogeneity in the results from different studies. The association was robust and little affected by potential confounding factors such as sample size, study design, or quality.

Possible explanations for the association between source of funding and results have been discussed in the context of clinical research sponsored by the pharmaceutical industry (Baker et al. 2003; Bekelman et al. 2003; Lexchin et al. 2003). The association could reflect the selective publication of studies that produced results that fitted the sponsor's agenda. Sponsors might influence the design of the study, the nature of the exposure, and the type of outcomes assessed. In multivariate logistic regression analysis, the only factor that strongly predicted the reporting of statistically significant effects was whether or not the study was funded exclusively by industry. We stress that our ability to control for potential confounding factors may have been hampered by the incomplete reporting of relevant study characteristics.

Medical and science journals are implementing policies that require authors to disclose their financial and other conflicts of interest. None of the articles examined here included such a statement, in line with a survey of science and medical journals that showed that adopting such policies does not generally lead to the publication of disclosure statements (Krimsky and Rothenberg 2001). A review of 2005 instructions to authors showed that 15 (48%) of the 31 journals included in our study had conflict of interest policies. Our results support the notion that disclosure statements should be published, including statements indicating the absence of conflicts of interest. The role of the funding source in the design, conduct, analysis, and reporting of the study should also be addressed.

There is widespread concern regarding the possible health effects associated with the use of cellular phones, mobile telephone base stations, or broadcasting transmitters. Most (68%) of the studies assessed here reported biologic effects. At present it is unclear whether these biologic effects translate into relevant health hazards. Reports from national and international bodies have recently concluded that further research efforts are needed, and dedicated research programs have been set up in the United States, Germany, Denmark, Hungary, Switzerland, and Japan. Our study indicates that the interpretation of the results from existing and future studies of the health effects of radiofrequency radiation should take sponsorship into account.

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Exhibit C

Books and articles documenting bias in biomedical research, when funded by entities with a financial interest in the result.

Bias in wireless health effect research

Source of Funding and Results of Studies of Health Effects of Mobile Phone Use: Systematic Review of Experimental studies, Anke Huss et al., Environmental Health Perspectives, January 2007.

Mobile telephones and cancer: Is there really no evidence of an association?, Kjell Hansson Mild et al., International Journal of Molecular Medicine, 12, 2003.

Secret Ties to Industry and Conflicting Interests in Cancer Research, Lennart Hardell et al., American Journal of Industrial Medicine (2006).

Disconnect (book), Devra Davis, Penguin/Dutton, 2012.

Lab rats with cell phones?, Christopher Ketcham, Los Angeles Times, Feb. 23, 2010.

Bias in other biomedical research

Doubt is Their Product (book), David Michaels, Oxford University Press, 2008.

Scope and Impact of Financial Conflicts of Interest in Biomedical Research, Justin Bekelman et al., Journal of the American Medical Association, January 22/29, 2008.

Why Review Articles on the Health Effects of Passive Smoking Reach Different Conclusions, Deborah Barnes and Lisa Bero, Journal of the American Medical Association, May 20, 1998.

Is Drug Research Trustworthy?, Charles Seife, Scientific American, December 2012.

Vinyl Chloride: A Case Study of Data Suppression and Misrepresentation, Jennifer Sass et al., Environmental Health Perspectives, July 2005.

An Extensive New Literature Concerning Low-Dose Effects of BPA Shows the Need for a New Risk Assessment, Frederick von Saal and Claude Hughes, Environmental Health Perspectives, August 2005.

Evaluation of Conflict of Interest in Economic Analysis of New Drugs Used in Oncology, Mark Friedberg et al., Journal of the American Medical Association, October 20, 1999.

Many, many more references are cited in the above articles.