



Agenda DATE 5/1/13 TIME 1:35p
SERVED BY Gene Thomas
RECEIVED BY [Signature]

CHARTER REVIEW COMMISSION

Thursday
May 9, 2013
City Council Chambers
4:00 pm to 6:00 pm

1. Roll Call
2. Approval of Agenda
3. Approval of April 23, 2013 Minutes
4. Public Comment
5. Continued Discussion of Topics For Review to include Public Comment

POLICY ISSUES

- a. Limit Contributions to Candidates That Do Not Accept Public Financing
 - b. Salaries to be Set by an Independent Commission
 - c. Full and Complete Disclosure of Uses for Tax Bonds Prior to Election
 - d. Broaden Referendum and Initiative Rights of Voters
 - e. Signatures to be Required for Petitions/Recalls
 - f. Proposal from City of Santa Fe Immigration Committee
 - g. Proposal from Neighborhood Network re Preservation Issues
 - h. Proposal from United Way re Children's Issues and Concerns
6. Discussion/Possible Action Agenda Items for Future Meetings, including setting deadline for submission of proposed amendments to Charter
 7. Communication from Charter Commission Members
 8. Public Comment
 9. Adjournment

Persons with disabilities in need of accommodations, contact the
City Attorney's Office at 955-6512, five (5) working days prior to meeting date.

SUMMARY INDEX
CHARTER REVIEW COMMISSION
Thursday, May 9, 2013

<u>ITEM</u>	<u>ACTION</u>	<u>PAGE</u>
CALL TO ORDER AND ROLL CALL	Quorum	1
APPROVAL OF AGENDA	Approved	2
APPROVAL OF APRIL 23, 2013	Approved w/ministerial corrections	2
PUBLIC COMMENT		2
<u>CONTINUED DISCUSSION OF TOPICS FOR REVIEW TO INCLUDE PUBLIC COMMENT POLICY ISSUES:</u>		
LIMIT CONTRIBUTIONS TO CANDIDATES THAT DO NOT ACCEPT PUBLIC FINANCING	Information/discussion	2-4
SALARIES TO BE SET BY AN INDEPENDENT COMMISSION	Information/discussion	4-6
FULL AND COMPLETE DISCLOSURE OF USES FOR TAX BONDS PRIOR TO ELECTION	Information/discussion	6-9
BROADEN REFERENDUM AND INITIATIVE RIGHTS OF VOTERS	Information/discussion	10-13
SIGNATURES TO BE REQUIRED FOR PETITIONS/ RECALLS	Information/discussion	13
PROPOSAL FROM CITY OF SANTA FE IMMIGRATION COMMITTEE	Information/discussion	13-18
PROPOSAL FROM NEIGHBORHOOD NETWORK RE PRESERVATION ISSUES	Information/discussion	18-24
PROPOSAL FROM UNITED WAY RE CHILDRENS ISSUES AND CONCERNS		24

<u>ITEM</u>	<u>ACTION</u>	<u>PAGE</u>
DISCUSSION/POSSIBLE ACTION AGENDA ITEMS FOR FUTURE MEETINGS, INCLUDING SETTING DEADLINE FOR SUBMISSION OF PROPOSED AMENDMENTS TO CHARTER	Deadline established 05/22/13	24-25
COMMUNICATION FROM CHARTER COMMISSION MEMBERS	Information	25
PUBLIC COMMENT		25-27
ADJOURNMENT		27

**MINUTES OF THE
CHARTER REVIEW COMMISSION
City Council Chambers
Thursday, May 9, 2013**

CALL TO ORDER.

A meeting of the Charter Review Commission was called to order by the Honorable Patricio Serna, Chair, at approximately 5:00 p.m., on Tuesday, April 23, 2013, in the Community Room at the Santa Fe Public Library, 145 Washington Avenue, Santa Fe, New Mexico.

1. ROLL CALL

Roll call indicated the presence of a quorum as follows:

The Honorable Patricio Serna, Chair
Nancy R. Long, Vice-Chair
Steven G. Farber
Brian Patrick Gutierrez
John B. Hiatt
Carol Romero-Wirth
Daniel Werwath

MEMBERS EXCUSED

Houston Johansen
Roman Abeyta

OTHERS ATTENDING

Jamison Barkley, Assistant City Attorney
Irene Romero, City Attorney's Office
Melessia Helberg, Stenographer

There was a quorum of the membership in attendance.

2. APPROVAL OF AGENDA

MOTION: Commissioner Hiatt moved, seconded by Commissioner Werwath, to approve the agenda as presented.

VOTE: The motion was approved unanimously on a voice vote.

3. APPROVAL OF APRIL 23, 2013 MINUTES

Two ministerial changes were made and replacement pages provided.

MOTION: Commissioner Hiatt moved, seconded by Commissioner Long, to approve the minutes of the meeting of April 23, 2013, as amended.

VOTE: The motion was approved unanimously on a voice vote.

4. PUBLIC COMMENT

Former Councilor Heldmeyer said, "We just had a comment that is going to refer to something we're going to talk about later, which is setting up your further agenda. You've had the stalwart few here for the issues that you've covered, but there are individuals and groups that would like to speak to some of the issues at the time that you vote on them. So we hope that when you set up your further agendas that they are very clear about what issues you will be voting on in any given meeting. And then people who wish to comment at that time can comment at that time."

Chair Serna asked the reason Jody Larsen isn't here today.

Former Councilor Heldmeyer said Ms. Larsen had a family emergency, so she may not be around for a while.

5. CONTINUED DISCUSSION OF TOPICS FOR REVIEW TO INCLUDE PUBLIC COMMENT

An updated matrix of all of the issues raised before the Charter Commission prepared by Daniel Werwath and distributed to the Commission, is incorporated herewith to these minutes as Exhibit "1."

A Memorandum dated May 9, 2013, to the Santa Fe Charter Review Commission, from the League of Women Voters of Santa Fe County, regarding *Reminder of Proposed Charter Amendments*, is incorporated herewith to these minutes as Exhibit "2."

A letter from Joseph M. Maestas, received May 9, 2013 via email, to Chairman Serna and the members of the Charter Review Commission, is incorporated herewith to these minutes as Exhibit "3."

A Memorandum dated May 9, 2013, to the Charter Review Commission, from Jamison Barkley, Assistant City Attorney, regarding the rights of referendum, initiative and recall under City Charter, is incorporated herewith to these minutes as Exhibit "4."

POLICY ISSUES:

A) LIMIT CONTRIBUTIONS TO CANDIDATES THAT DO NOT ACCEPT PUBLIC FINANCING.

Commissioner Long said we have discussed two times that we do have contribution limits which are set by City Ordinance. The request, and I think it primarily was from Common Cause was to have a requirement that there be limits, but not have a numerical limit, which would be set by Ordinance.

Jim Harrington said that was a proposal by the League of Woman Voters rather than Common Cause, but Common Cause supports it. The purpose it would serve would to make sure the Council could never repeal contribution limits which they're always trying to do in the Legislature, but we haven't tried to do it here yet, but it could happen.

Former Councilor Heldmeyer said she just handed out the League's specific recommendation on campaign contributions [Exhibit "2"]. As discussed previously, the League thinks it should be in the Charter because that means the City should have a law covering it, and if it's just an Ordinance it could be repealed at any time. She noted that in the recommended wording, the League is not differentiating between those who get public financing and those who do not get public financing, because in point of fact, there are limits on contributions to those who get public financing as well. And we're not saying what those limits should be. We're just saying there should be limits, and they probably will be different for people with public financing and people with private financing, but the limits should be in the Charter. And we appreciate Common Cause supporting this."

Commissioner Long thanked the League for providing the specific language, as requested, which will be very helpful as we take each item up for a vote. She wonders about the proposed language, new Section 4.07, which provides, "The Governing Body shall adopt and ordinance or ordinances." She said since we already have an Ordinance in effect, would be more accurate to say that the "Governing Body shall always have an Ordinance in force ."

Former Councilor Heldmeyer said that is a question for the City's lawyer.

Commissioner Hiatt said he was going to wait until the end of the meeting, but he really wants to press the Commission to move items for decision as quickly as possible. He said we have 3 meetings left to complete our work. He suggested, as we go through the agenda tonight, and as we consider the next agenda that we put as many items on for discussion and decision as we can. He asked Commissioner Long if she is ready to move this to a vote, or do we want more discussion. He said we can have discussion if it is on the next meeting agenda for discussion and possible decision. He said everybody will then know it is time to "get up and talk substantively and move to a decision."

Commissioner Long said, "I agree that it make sense to start taking these off and considering them when we all have some memory of all the discussion and an idea of what the issues are. And I think it's fair to those that keep turning out to propose their positions on these issues, but for tonight since all these policy issues are noticed only for continued discussion and there's nothing about possible action, I would think we cannot take action, but I think it's a great idea for the next meeting. And perhaps, always include possible action so we can actually vote on these."

Chair Serna said this would be consistent with what Councilor Heldmeyer just requested.

MOTION: Commissioner Hiatt moved to table Item 5(A) to the next meeting, and ask that it be on the agenda for discussion and possible decision.

DISCUSSION PRIOR TO SECOND: Ms. Helberg pointed out that this is not on the agenda for action.

Commissioner Farber said if something is tabled it can't be discussed, so you can move to postpone it, which goes to at least you can discuss what you want to do. He said Item #6 is broad enough to be able to discuss our process and what we could be doing to move forward. He would suggest that you raise these issues for a vote under Item #6.

Commissioner Hiatt said he will raise these items under Item #6.

Commissioner Romero-Wirth suggested the following wording for this item: "The Governing Body shall limit the amount of contributions that can be accepted by all candidates." It would take out "adopt an ordinance or ordinances that." She said the point is they already do, so this is one of these again, we want to make sure that they always do.

Commissioner Long said the language works, and we can consider that at the meeting where we vote on this item, unless you have further suggestions.

Ms. Barkley said, "Just throw it out for the Commission's consideration. Do you want to specify that it applies both to candidates that accept public financing and those that are privately financed, or do you want to leave it as candidates."

Commissioner Long said, "We could say 'by all candidates,' and that might be clear.

Chair Serna added this item for discussion and action/vote at the next meeting.

B) SALARIES TO BE SET BY AN INDEPENDENT COMMISSION.

Chair Serna noted the Commissioners received a letter from Joseph Maestas [Exhibit "3"], the person who proposed this, and he won't be present here today. Chair Serna asked if there is another person proposing this, other than Mr. Maestas.

Chair Serna suggested we should set this item for a vote at the next meeting.

Commissioner Romero-Wirth asked if it is included in the matrix [Exhibit "1"]

Commissioner Hiatt said yes, at the bottom.

Commissioner Farber said at the last meeting a gentleman spoke about firms that do surveys with regard to salaries, but other than that, he doesn't recall any discussion about this item throughout the course of our meetings.

Chair Serna agreed.

Commissioner Farber said he doesn't know that it has the support of anybody in the community, and the gentleman just happened to be at the meeting when we discussed it.

Commissioner Long said in reading the letter from the former Mayor of Espanola, Joseph Maestas, that may actually have recommended it as a Charter amendment at one of our first meetings. He is recommending a review of the Albuquerque's Citizens Independent Salary Commissions authority. She said, "I think any survey as to salaries would be more appropriate for the independent commission, rather than us, or even the Council, because they would be looking at salaries, so I don't think that needs to be a part of our consideration. If it is going to move forward it would need specific language."

Commissioner Werwath asked if she is thinking in terms of the broad enabling legislation we've discussed to the effect that, "The City shall adopt an ordinance that creates a process for setting salaries by an independent commission."

Commissioner Long said yes. She said, "We haven't had a lot of discussion or analysis of this issue, but it seems to have some merit so that Councilors aren't setting their own salaries. It takes them a step back as well as the Mayor, and perhaps does something which is more fair for everybody. I like the idea, but I have to admit I don't know a lot about it."

Commissioner Hiatt said, "As I read the summary statement in our spreadsheet, it appears that the Council sets this by ordinance, based on what they the County Commissioners being paid. Is that correct. [Someone nodded assent, but there was no audible response.] And so it could be different than that. It could be more. Do we agree that this is a possibility. If an independent commission were created and it said the Mayor should be paid \$100,000 or something, that could at least be considered. It's not driven by the Legislature or the County Commission. They just do that now by ordinance, that's my understanding in reading that."

Commissioner Long said that's what Ms. Barkley told us.

Commissioner Hiatt asked Ms. Barkley if this correct.

Ms. Barkley said, "Yes, that is correct. The ordinance is set so that the salaries track those of the County Commissioners in Class B counties."

Commissioner Hiatt asked Ms. Barkley if there is no reason that an independent commission, given that authority, could come up with a different salary.

Ms. Barkley said, "Not at all."

Commissioner Romero-Wirth said in looking at Albuquerque's City Charter, Article 4, Section 6, provides, "Compensation of the Council. Councilors shall receive annual salaries as determined by a citizen's independent salary commission."

Commissioner Hiatt asked Commissioner Romero-Wirth to send that language via email to all of the Commissioners.

Commissioner Romero-Wirth said the Commissioners have it, noting it is one of the charters that was sent on March 1, 2013, noting there are 8 City Charters available on line.

Commissioner Farber said he believes the Albuquerque Councilors make about half that of the Santa Fe City Councilors.

Commissioner Werwath said he just googled Albuquerque City Council salaries and they are paid \$17,492 annually.

Chair Serna said the Santa Fe City Councilors are paid \$26,000 annually.

Commissioner Long asked the salary of the Albuquerque Mayor. Staff said they will research this item and get back with the Commission.

Former Councilor Heldmeyer said Albuquerque Council Districts 2, 4, 6 and 8, earn \$17,492 annual, and Council Districts 1, 3, 5 and 7, earn \$10,379 annual. The Council President earns \$19,510. She said she presumes there is some catch up in the election cycles.

Chair Serna added this item for discussion and action/vote at the next meeting.

C) FULL AND COMPLETE DISCLOSURE OF USES FOR TAX BONDS PRIOR TO ELECTION.

Commissioner Hiatt said the language is in the spreadsheet.

Former Councilor Heldmeyer said this is the language proposed by the League of Women Voters, noting this is copied from the current Charter. She said, "It's certainly not something that we are wedded to, it's just for consistency's sake. There was a fairly robust discussion of this when it was first introduced."

Again, the idea that it is something the City should do, most of the times does do, but it's good to have it in the Charter to remind people when they forget to do it."

Commissioner Hiatt said his trouble with this proposal is that it doesn't sound realistic. He said he's been through several bond issues at the County and trying to list everything seems to be, first of all tedious, because there are so many things in the bond. I've also seen jurisdictions that try to move the money around afterwards. He asked, "Is it really realistic to be able to do that. The people that we haven't heard from in this discussion are bond counsel that probably would oppose it, because they're not doing what they like to do, and they understand that."

Former Councilor Heldmeyer said this is a long-standing position of the League since before the first Commission. The League didn't do a separate set of studies for this Charter Commission, because there wasn't time. She said, "It is a policy statement in the sense that it's not saying you have to list every little thing down to the penny. It's not saying you can't move things around if you give people fair warning that's what you're going to do. As in the example given previously, If you say to people, we're going to a bus bond and all the advertising on it says it's going to be a bus bond and in the wording of the ballot issue, it says, yeah, we're going to the buses with it, but we're going to do other stuff. All it's saying it needs to be clear to the public when they vote on it."

Commissioner Romero-Wirth said, "[The word] Schedule to me means a big list where there's not very much room, and I wonder if it could just say something like, 'The Governing Body shall adopt an ordinance or ordinances which shall be clear about the proposed expenditures for any tax increase or bond measure.' Something to make sure they're telling us the purpose of these things, but they're not itemizing."

Commissioner Hiatt asked where they got this language.

Former Councilor Heldmeyer said it is from the League's standing position which is about 10 years old.

Commissioner Hiatt asked if the League got it from another jurisdiction.

Former Councilor Heldmeyer said they got it from the usual League process, which is to have a whole bunch of meetings and to reach consensus, first within the study group, and then the membership. She said it is a very labor intensive and editing process. It doesn't mean every word in it is golden, "but as a Representative of the League, it's what I have to present to you. I'm presenting the League's position, and this position, if they think it is too specific, can make it more general. If they think it's too general, they can make it more specific. That's in your purview as the Charter Commission. The idea is something that the League strongly supports."

Commissioner Romero-Wirth suggested the following language, "The Governing Body shall adopt an ordinance or ordinances that ensure that the City shall be clear and comprehensive about the purpose of proposed expenditures for any tax increase of bond measure that needs to be ratified by the voters." She said Justice Serna has also recommended, "shall disseminate a clear and comprehensive plan of proposed expenditures."

Chair Serna said he likes this language better than his.

Commissioner Romero-Wirth reiterated she doesn't want it to be an itemized list that you can't move off of. She said, for example, the Legislature might fund something on the itemized list and there's no room to move those funds for something else.

Former Councilor Heldmeyer said, "As an individual that is fine with me. The League presents the wording, and you can do with it what you want."

Commissioner Farber said as we're starting to move to refine various language, I think what we ought to do for the next meeting or the meeting after that, if there is a proposal and a proponent of the proposal, is that the very specific language to be voted on should be presented. I think that ought to be the obligation of a proponent. However much we appreciate the input of Common Cause, League of Women Voters and other organizations, it seems to me that it has to be a member of the Commission that says, 'I move whatever.' I would like to suggest that it would be helpful for us that whoever is taking the lead on something has the specific presented that's going to be voted on, rather than trying to hash it out at a meeting. And there can always be amendments, but in terms of our process, it seems it would help it to be more streamlined and efficient."

Commissioner Long said she thinks what is happened here. The Commission has asked proponents, some of whom are on the Commission and some in the audience, to get us language and that is exactly what they have done as others have. And I don't think there's anything that prevents us from having to adopt that wholesale. We can make revisions to it and then vote on it. I don't think we have to have a process whereby someone on the Commission has to take a proposal under their wing, and be the one that does all the drafting and we can't hear from the public about their proposals. Because I think that's what we've been asking for, and I think that's what happened here."

Commissioner Farber said, "Perhaps I'm not being clear, when it comes to the point we're going to vote on something, I'm just suggesting it would good to have something in black and white in front of us, so then we're not quibbling about words, but rather have a concrete idea that is presented ahead of time, rather than just a general idea. It also seems to me that someone has to move something forward, and probably it needs to come from a member of the Commission, to adopt something that the League or Common Cause or the Neighborhood Network or whomever to support it. "

Commissioner Romero-Wirth she disagrees that one of us has to adopt it as our own, or present it. She is worried about saying that the language has to be provided ahead of time in order for us to vote on it, because "I think we're going to run out of time." She said, "If the people who are here and among ourselves, we can agree on language, and maybe the ones that we're playing on now, we'll provide to be

voted on, because we didn't say we were going to vote on anything this time. But in the future I think we ought to say that we might, at any point, vote on any of these, because we're running out of time, as Commissioner Hiatt suggested earlier. These, we could throw out there as, all right, this is what we think and then maybe there'll be some other tweaks at the next meeting, once people have an opportunity to talk to other folks. But we're not going to have time to do all that."

[Commissioner Farber's remarks here are inaudible because his microphone was not turned on.]
He said something about how difficult it is to develop language, it can be confusing and we don't have as clear a statement as possible. He was trying to think of a way for us to have clear statements.

Commissioner Romero-Wirth agreed with Commissioner Farber that language is really important, noting she has tweaks to most of what has been presented to the Commission, and doesn't believe they are ready to forward as amendments to the Charter. She said, "I think there is extraneous language, and sometimes it is not clear, and sometimes it's not broad enough. I want to tweak a lot, so I don't know if it's going to be possible to do that. I think some of that is going to have to happen on the fly."

Former Councilor Heldmeyer said, "Can I offer compromise from the League's position. Jody [Larsen] is the one who is long expert in the League, and should be here to tell us what is League-like, and what is unLeague-like. And there is no worse pejorative that you can use in the League than to be called unLeague like, so I certainly don't want to be un-League like. However, what I can do, is take the contents of this discussion and other discussions that have been held on others of the League's recommendations, and take them to the League Board and see if they are willing to comment on the kinds of comments that have been here, and they may come up and say that language is fine, or no, we stand by what we said. I'm just the messenger."

Commissioner Romero-Wirth said, "I guess I have a problem with that, because we don't have time to do that anymore. What you brought to us as a concept of these things you think should happen, and we have our own authority here, and then there is more accountability still. Because what we're going to suggest is, again just a suggestion, and then the City Council is going to be able to tweak and play and move this stuff around before it goes to voter. I think there are lots of checks along the way and the League will have many opportunities to comment, and the ability comment when it goes to the City Council. I think there will be lots of input for you. I totally respect the League and all the hard work that you do, but we don't have time to write something and then you comment and bring it back."

Councilor Heldmeyer said she isn't asking the Commission to do that or give up any of its authority. She is saying she is taking notes on the discussions and she will take those to the League Board and when these come up for a vote, the League may or may not want to comment further.

Commissioner Romero-Wirth said, "If the League has tweaks it wants to make down the line, if we have time to consider them and put them, in, great, and we can try that."

Chair Serna added this item for discussion and action/vote at the next meeting.

D) BROADEN REFERENDUM AND INITIATIVE RIGHTS OF VOTERS.

Items 5(D) and 5(E) were combined for purposes of presentation, discussion and public comment.

Chair Serna noted there is a Memorandum on the desks from Jamison Barkley [Exhibit "4"].

Former Councilor Heldmeyer said this is a League suggestion, not recommendation. She said the League's position is that the League has no position on recall, which haven't been used since the last Charter Commission. She said it was suggested this Commission might want to look why this is the case, whether they weren't needed in that time period or if there is another reason. She noted Ms. Barkley's Memorandum in this regard. She said the League has no position on the number of signatures, except to say that initiatives and referendum should be available to the public. She said, "It is your job as a Commission to decide if these have been sufficiently available."

Ms. Barkley said there is a correction to her Memorandum, in the first paragraph, "Jim Harrington brought to my attention that... the sentence is the thirty-three and a third percent requirement was institute in 2008, instead of a 20% requirement. And to get a little bit more clear and specific, the requirement is now is thirty-three and a third percent of the actual voters in the prior elections. And the 20% was 20% of all registered voters."

Commissioner Long asked to hear from Mr. Harrington about the reason the change was made and whether there is a recommendation to decrease that number as Albuquerque is at 20% and that is for referendum and initiation, Las Cruces is at 15%, and for recall in Las Cruces it is 10%.

Commissioner Romero-Wirth asked the language we want for this Commission on this issue.

Chair Serna said he thinks the recommendation was that we keep this language as is.

Mr. Harrington said, "Well our recommendation was actually 20% of the actual voters in the last Mayoral Election. For initiative and referendum, thirty-three and a third percent for recall. And then the Council raised it all to a uniform thirty-three and a third percent. The history of it, and some of this I have on hearsay, but we got an earful on the last Commission, was that the first Commission chaired by Karen Walker was split down the middle whether to allow this kind of thing at all. There was a lot of opposition from immigrant rights groups and gay rights groups, who have been abused by these uses. He said Governor Anaya, in particular, who was on the Commission, was opposed to having anything. And the compromise was to put it in there in form, but to make it impossible. And they consciously did that as a practical matter, because 20% of the registered voters is actually 60% of the voters who normally vote, 1/3 of the registered voters. So you effectively had to have more signatures to get on the ballot than you needed votes to win. Our intent was to lower that to something that would be quite difficult, but still possible. And then the Council made that even a little bit tougher, by taking the 20% to thirty-three and a third percent, which is still a considerable decrease. I guess I have to go with our recommendation, which is 20%."

Commissioner Farber said, "I served on the first Charter Commission. And the intention was not to make it impossible, but certainly to make it difficult. We did not have a community that was driven by initiative, referendum and recall, because of the abuses that happened in referendum and recall in California." *[The balance of Commissioner Farber's remarks here are inaudible, because he did not have his microphone turned on, and because Mr. Harrington was speaking at the same time as the Commissioner was speaking.]*

Commissioner Farber said he has not heard from the community at large that there are a large number of people who want it to be reduced from the thirty-three and one third percent set at the last election on the Charter. He said it seems to him that if this is a big issue about which the community is really concerned that people will be able to gather the necessary signatures. He said there is a policy argument to be made that we don't want municipal government to be driven by initiative and referendum unless it's very important. With regard to recall, it should be a very difficult thing to do, unless someone violates the law, they can get the signatures. He said there is always the next election. He said there was a split on the Commission and some people were sensitive to the issue of the abuse in California and some weren't.

Mr. Harrington said in the election on the 7 proposed Charter amendments were approved, but referendum, initial and recall got the least votes for approval, noting there was some rumbling in opposition in making these easier to use, although they never got involved actively..

Commissioner Romero-Wirth said we haven't had public input that this is something this should be changed, and asked the genesis for this change.

Former Councilor Heldmeyer said it came from the League.

Commissioner Romero-Wirth said just a general statement that perhaps it should be adjusted.

Former Councilor Heldmeyer said, "No even that. A general statement that this Commission should look into the fact that these tools of democracy haven't been used, and possibly looking into why, and is that something that needs to be correct. No judgment on that whatsoever."

Commissioner Romero-Wirth asked if there is a recommendation about how "one would look into whether these tools of democracy are appropriately cast."

Former Councilor Heldmeyer said, "Given if there were time, possible polling the community, but forget polling the community. This Commission itself has gotten so little publicity, almost everything you are doing is under the radar."

Commissioner Romero-Wirth said that won't be the case once it gets to the City Council.

Former Councilor Heldmeyer said, "If there's someone out that there is upset about this, I would have thought that they might have approached you about it, but maybe not. I don't know."

Commissioner Romero-Wirth said, "One other thing too, is that I think money and politics, as we all know, has changed quite a bit since this was first looked at, so I think we need to be cognizant of that if we were to make it easier. The fact that there's so much money out there to throw at this kind of stuff, it could easily get abused, and if that was the fear to begin with, that's something to consider."

Mr. Harrington said if the City Clerk is at the next meeting, she does know something about this. She said people have made inquiries and were discouraged, he understood a real long time ago when we were looking at it – being discouraged at the 60% requirement. He doesn't know if people have made inquiries since then about initiative and referendum petitions.

Commissioner Long asked if the City has ever had a successful referendum or initiative, and asked if other cities in New Mexico have had successful referendum or initiative.

[Jim Harrington's response here is inaudible because he was speaking from the audience away from the microphone.]

Yolanda Vigil, City Clerk said, "We have not had any petitions filed for initiative, referendum or recall. We did have an inquiry last year on the recall, but then the issue was settled, so they did not come forward with a petition."

Former Councilor Heldmeyer said there was Commission-Manager form of government that was on the ballot, and Ms. Vigil said that was not on referendum or initiative and was before the Charter was adopted.

Former Councilor Heldmeyer said, "Before the Charter was in place, there was a question on a special election ballot which would require the City Manager to have adequate education and experience background and it failed."

Commissioner Hiatt said, "To answer Commissioner Romero-Wirth, even without language, I'm not sensing a support for this, and I'm ready to put it on, from my point of view personally, to get it off the agenda, and I don't mind expressing that now. I just think we need to narrow this list down to the real nubbins and this one doesn't tickle my fancy."

Chair Serna said, "Another point I would like to mention is the issue Commissioner Romero-Wirth brought up with the super PACS. And I just read an article today in *The New York Times* about someone getting so many millions for their super pack, that they could come in and force a referendum or a recall even in Santa Fe. So, I would be leaning on lowering the number. He said in Wisconsin, it takes \$6 million to run for the Supreme Court, and in Michigan, \$8 million and it's all outside money, and that's why in those states and others where millions and millions are spent on Supreme Court races, the public faith, trust and confidence in the courts is eroded to nothing."

Commissioner Farber asked if we should we used the word "broaden" or the "issue of" the number of signatures, something like that.

Commissioner Romero-Wirth said the proposal was not to reduce the number, but to consider whether these numbers are appropriately cast, just to stick with the metaphor, are they appropriately devised, set up, created so people could actually use them if they wanted to. What we are hearing here is that maybe we don't necessarily want people to use them."

[Commissioner Farber's remarks here are inaudible because his microphone was not turned on.]
He said something about combining Items 5(D) and (E).

Chair Serna said, "Yes we can combine those."

Commissioner Werwath said, "Could I make a request that the Agenda Committee let me know as soon as you have your agenda formulated, since we are now moving to a voting phase, so that I can work to get a press release out to *The Santa Fe New Mexican* and *The Journal North*, and hopefully get some of the public input we so deeply crave."

Commissioner Hiatt said, "Speaking on behalf of the Agenda Committee, of course."

Commissioner Werwath said, "What I have been doing is sending a draft to Irene, so Irene, when you get it me, I guess you can, so we can avoid the Open Meetings Act issues and problems and get it to them."

Commissioner Hiatt said, "Or the Geno rule, as we call it."

Commission Werwath said, "You can send me an individual document, we just can't chat about it."

Commissioner Farber said, "Well, he says no, I think we can, but our process has been is that we've come up with a draft and it is subject to the approval of the Chair. I wouldn't want to send something out before the Chair approves the agenda. I thought, since Irene is in communications in the Chair, and she would know when that happens, to get it to you."

Commissioner Hiatt said then this encompasses both Items 5(D) and (E).

Chair Serna added this item for discussion and action/vote at the next meeting, and asked that this be reflected in the minutes of this meeting.

E) SIGNATURES TO BE REQUIRED FOR PETITIONS/RECALLS.

Items 5(D) and 5(E) were combined for purposes of presentation, discussion and public comment.

See Item 5(C) above. Chair Serna added this item for discussion and action/vote at the next meeting, and asked that this be reflected in the minutes of this meeting

F) PROPOSAL FROM CITY OF SANTA FE IMMIGRATION COMMITTEE.

Mr. Harrington said he saw the agenda and passed the word to Marcela Diaz, Alejandra Seluja and Maria Christine Lopez that this was being considered today, and it sounded as if one of them would be here. He said he has worked on this with Somos un Pueblo Unidos, and could provide information. However, it would be better to have someone from the Immigration Committee presenting on this issue.

Commissioner Farber said we did receive an email a Memo from the Chair of the Immigration Committee through Irene. He said they just wanted a Charter provision that tracks with the language of the Ordinance.

Ms. Barkley said it was sent out via email, and the proposed language from Ms. Seluja, Chair, is now on the spreadsheet [Exhibit "1."

Commissioner Romero-Wirth said the proposed language is, "No municipal resources will be used to identify or apprehend any non-citizen resident on the sole basis of immigration status, unless otherwise required by law to do so.

Chair Serna said then the recommendation is that we keep that as is.

Commissioner Farber said, "No, it is to include that as a Charter Amendment."

Commissioner Long asked if that language is in a City Ordinance or a Resolution.

Ms. Barkley said, "There is no Code provision that provides for that. What there is the Resolution that set up the Immigration Committee. She said when there was talk of an ordinance, it was the Resolution that created the Immigration Task Force."

Commissioner Romero-Wirth said, "I don't know when is a good time to talk about this, but I think we do need to have a discussion about all of these, what do you call them, policy statements that we've been asked to consider on immigration, guns, children, marijuana, neighborhood network, water. I would love to have a conversation. I'd love to have some feedback about whether these are really appropriate things, merits aside, whether these are appropriate things to be putting in our Charter, our governing document that establishes our structure for how we operate as a City government. There is no reason why the elected officials, who can pass ordinances, can't do this stuff right now. And I don't know why we want to put this stuff, or whether it's appropriate to put this stuff in our constitution. I don't know where it starts and stops, and we could have all kinds of stuff. Why aren't the City Councilors doing this, if this is what this community wants."

Commissioner Farber said, "I don't know if you want to have this conversation at this moment, or have it be an agenda item for the next meeting. But I do think it's a legitimate and important discussion to have. I would point out that there are already [policy statements] in the Charter."

Commissioner Romero-Wirth said, "I know there are some, but there's nothing I can do about those, they're already there."

Commissioner Farber said, "Right, and I understand that there can be, respectfully, differences of opinion. But if it were to go to the voters and the voters said yes, it creates some interest." *[The balance of Mr. Farber's statement is inaudible because his microphone was not turned on.]*

Responding to Commissioner Romero-Wirth said, "I just raised the question, because we're starting to come back around on some of these again, and I just think we need to have this conversation, and I don't know what the best way to do it is. I just raised the issue."

Chair Serna said, "I think it should be placed on the agenda as a topic for conservation and perhaps all of us could have input on that."

Commissioner Farber said, "Just a discussion, and then we still have the right to present things, I'm assuming."

Chair Serna said yes.

Commissioner Hiatt said, "I think it makes sense, if we're going to do that at the meeting, to have the discussion early on the agenda."

Chair Serna said, "Yes. Let's have the discussion early in the agenda."

Commissioner Werwath said, "Mr. Chairman, I speak to this particular policy statement. I think Commissioner Romero-Wirth raises a really important issue around policy statements. This one in particular, actually, I would side on thinking that this might be an important thing to include. I do a lot of work in communities, a lot of low income neighborhoods where there is a high proportion of immigrants, and something I come across a lot is a general fear of participation in local government. And I think that having language in the Charter, and I would recommend... I think that language is a little narrow, but I would very much entertain something along the lines of, 'The Governing Body of this Community, should value all residents of that community and value them equally.' I think that is a big part of a barrier to participation in civic process for a lot of the people in the community, so that I just offer that as a perspective from someone working on the ground and trying to get folks to show up at City Council meetings to advocate for the Hopewell neighborhood, who are afraid that if they show up it's going to make them be scrutinized. To the extent that this is an opportunity to lower that barrier, I think it's a valuable thing."

Commissioner Hiatt asked, "Commissioner Werwath, are you suggesting amending the language. Do you want to suggest some other language. As we're all beginning to identify now, we need to narrow the consideration. And if you're going to do that, I'm not suggesting you do it now, but if you are going to do it, we need to see it fairly soon, and we need to focus on this discussion. If we decide to move forward with some policy statements, we do have to be specific on the language soon."

Commissioner Werwath said, "Absolutely."

Commissioner Long said she has had concerns as well about broad policy statements, whether they are appropriate for the Charter, how they get implemented, can we really require ordinances to be adopted. Is that more appropriate for the Council to do over time as elected officials in light of the change that is bound to occur over time. She said there are broad principles on which we can agree that won't change over the next 10 years, or they shouldn't change. She said, "I'm just a little concerned about implementation and how those broad policy statements would.... how you really give any effect to them through the Charter, and can you really require ordinances to be adopted. These are my broad concerns about it."

Chair Serna said we will have full discussion on it, commenting he won't be able to vote, unless it is to break a tie.

Responding to Commissioner Farber, "Chair Serna said apparently there is a divergence of opinion and it will be good to get it out and see what the consensus is. We will have the discussion first, because that is the Immigration Committee Policy Statement.

Commissioner Farber said his understanding is that will be a general discussion with regard to policy statements being included in the Charter, as opposed to any kind of discussion on immigration and such.

Chair Serna said this is correct.

Commissioner Romero-Wirth said we may need to do both, depending on how the members feel.

Commissioner Hiatt said it will also depend on how we shape the agenda for the next meeting.

Commissioner Farber noted Maria Christina Lopez of the Immigration Committee has arrived, and perhaps she might like to make a statement.

Maria Christina Lopez, Member, Immigration Committee, said the City Council adopted a Resolution in 1999, has served as a guide to the Police Department and other agencies of the City in relation to immigrants. She said "What we wanted to do is to have the City Charter include something to the effect that it has been an important part of our City since 1999, and it has made Santa Fe as an example for many cities in the United States, that we respect the rights of everyone, regardless of national origin or immigration status. And from there, we have worked with the Police Department on regulations and policies."

Ms. Lopez said they could do a more general statement if it isn't appropriate to have such specific wording in the Charter from the Resolution.

Commissioner Hiatt said, "Since 1999, have you, or the Immigration Committee identified the use of resources from the City that would be inconsistent with the Resolution. What I'm asking you in general, are there abuses out there that you see that somehow this would change. Otherwise, what you're asking us to consider, I think, is that we some emblazon this in bold language in the Charter, that the Resolution isn't enough by itself. You came in late, so you missed some of the discussion we had about what should be policy in the Charter, and what shouldn't. We started that discussion."

Commissioner Hiatt continued, "So my question to you now is, do you recognize or have any of those examples of use of City resources that are contrary to the recommendation or the Resolution."

Ms. Lopez said, "I would say yes. I would say specifically, even though we have worked very closely with the Police Department, it still happens. It still happens because there is a turnover [in personnel] and even through there is training, that's where I can see if first. We get complaints. What can I tell you. It's not just a simple statement. It really has made this City an example, because people who have their rights violated in the City can refer to the Resolution, can go to the Immigration Committee, can go to the policies of the policy. It's not the kind of thing that is understood by everyone. It's not something that is taken for granted like human rights for everyone. When you are an immigrant, that seems to put you out unless it's mentioned. And so, immigration status is a very important part of this. It seems to bring back a lot of... I can't find the correct words, but yes, we see it happen."

Mr. Hiatt said he is not familiar with the Immigration Committee, and asked what is the Committee response to an immigrant who goes to the Committee and said their rights have been violated, and asked if the Committee investigates those complaints.

Ms. Lopez said, "We asked them to file a complaint with the City. A representative from the Police Department sits on the Committee, and hears the complaint. They have to provide us report in general on whether or not the issue has been taken care of, or not. At this moment I'm also thing of another problem which is people whose wages aren't up to the Living Wage. Immigrants in general, and particularly undocumented immigrants are subject to more abuses than just regular workers. We also get those complaints and we refer them to the City, but there doesn't seem to be a general understanding by the residents of this City that immigrants are residents of the City and should afforded all the rights that any other citizen should have as a resident of the City. Does that make sense."

Commissioner Hiatt said, "I understand. Thank you very much."

Commissioner Romero-Wirth said, "I am hearing you saying, if we were to put this in the Charter, it would strengthen..."

Ms. Lopez said, "It would strengthen protection against other members in our community, immigrants. I guess it's like the Constitution of the United States. Why do we have to have special amendments for special groups. It's the same way. It really would... Being part of the Constitution would

really, I think, would be a teaching tool and also a way to enforce the civil rights of all in this City, all the people in the City. But you understand."

Commissioner Romero-Wirth thanked Ms. Lopez for having a conversation with this Commission, and Ms. Lopez thanked the Commission for inviting her to speak.

Chair Serna added this item for discussion and action/vote at the next meeting.

G) PROPOSAL FROM NEIGHBORHOOD NETWORK RE PRESERVATION ISSUES

Commissioner Hiatt said, "On this particular issue, I just looked at the language... well, I might as well just say it. As the former director of the Land Use Department, I had 3 years to live with this issue. And I want to compliment the Neighborhood Network for all the good work they did. Every time I spoke with them, they were, well, pretty polite, and they were interest in what I had to say, but they certainly had an agenda. And I don't know that I disagree with what they're trying to accomplish, but it harkens to Commissioner Romero-Wirth's comments for me, which is how much we should put in this Charter. How much should we recommend. All of this is a recommendation to the Council."

Commissioner Hiatt continued, "And in the 6 months now that we've been working on this, I've gone back and forth in my mind, what it is that I'm trying to accomplish individually, and what as a group I think we can do. I don't wake up in the middle of the night on this issue, but I do think about it, and I think, you know, we could end up with no recommendations. That would be a not unreasonable thing to do, but we could have none maybe that we want to put forward, or we could have as many as 20 or 25. But it seems to me that, in my mind, it doesn't matter how the Council may reflect on this, or even how the voters reflect on this, it's really got to be our collective judgment about what should be considered by the Council to move forward."

Mr. Hiatt continued, "And so I harken back to Commissioner Romero-With and I would rather think we need to be fewer and more selective in our items. And this is also one that doesn't ring my bell in terms at all, in terms of moving forward. And I don't mean to diss the Neighborhood Network in any way. They've done a lot of wonderful things. And that's just a comment. And since we're on it, I think we are all... I guess I'm just said that we haven't spoke up more about the issues as they've come along, and maybe this is our time. And we've listened to people come in and talk. I'm starting to think I want to express myself to the rest of the Commissioners. And I'm so worried that Melessia gets every word down, that I'm worried she'll get some words down that will come back to haunt me later on in some fashion. I can see on my tombstone, *Hates the Neighborhood Network*. I don't want that to be."

Chair Serna said, "You are saying that we, as a Commission, are going to take a scatter gun approach or a rifle approach."

Commissioner Romero-Wirth said, "Another think we need to consider is, to sort of echo what Commissioner Hiatt was talking about is that all of the things will eventually go to the voters. And I did ask

our legal counsel about how this stuff goes to the voters, and I don't know if that was provided to the public, and I hate to put you on the spot, and maybe you can tell us how it goes to the voters, just so folks know. And I think, on each one of these, the these the voters would say yes or no. It's not like a big slate of, this is what the Charter Commission recommended to the City Council, yes or no. That's not the way it happens. I think we want to be cognizant too about being too onerous on voters, too. I think it would be better for us to focus on things that clearly need to be changed to help City government function better, realizing the process this has to go through. And Jamison, maybe you can explain how that happens."

Ms. Barkley said, "Basically, just for the public, and any clarifying points I can make for the Commissioners. The way that this will happen is that each topic or each section will be voted on as a whole.. So, for example, we'll just take what we're on, the Neighborhood Network, if there were several different amendments to the Charter, this is a bad example for this, but several different amendments to the Charter that would affect the entire thinking of the Commission, they would all be voted on, either up or down, with the end result that the item on the Neighborhood Network was either accepted or denied by the voters. And moving on, the next would be the immigration issue, and the voters would either accept the changes made to the Charter on the immigration topic, or they would deny all the changes. And then we would move on, and so forth."

Commissioner Romero-Wirth said, "To be clear, for example, the section of the Charter on the Mayor, so we might make 5 changes to that section to strengthen the Mayor's role in City government, all 5 of those issues would be voted up or down because it's all in one... because it's all related..."

Ms. Barkley said, "That's a hard example, because with the Mayor, we've discussed several different things and it is perceivable the Council would choose to have the voters vote on, for example, whether the Mayor will be a full time position, separately, rather than whether they would like the Mayor to have the sole authority to hire and fire the City Manager. If we could look at a third example, how about the initiative and reference voter thresholds. I would think we would have the voters decide those both together, so it wouldn't come where there would be thirty-three and one third just for initiative, and say 20 for referendum. So I think that would be an item where the two changes would be made by one vote, and that would be up or down."

Commissioner Romero-Wirth said the Chair has indicated it is the discretion of the City Council to decide what things are group together. She asked if they could group all the policy statements together.

Ms. Barkley said, "I wouldn't think they would do that, because the topics are different, and it's a totally different concern to the voters to include an immigration issue in our Charter than it is to include a marijuana issue, for example. And I would think we would have a log-rolling problem where we would require the voters to decide several different issues with one vote."

Commissioner Romero-Wirth asked if log-rolling illegal at the City level.

Ms. Barkley said, "I would hate to give an opinion on the spot, but I would think yes."

Commissioner Hiatt said he thinks it is illegal everywhere.

Commissioner Long said some of the issues would seem clear to her, and others not so clear, so it will be the Council who would decide specifically how each proposal is voted on.

Ms. Jamison said, "I would think that the Commission would forth a document. And I know that Mr. Harrington provided the report from the previous Charter Review Commission, which separates topics and themes, and the language for each topic and theme, the Charter section, strikeouts and additions, which in total affect the change the Commission recommended."

Commissioner Long said then we would recommend how the topics would be grouped, we need to do that too.

Ms. Barkley said yes.

Mr. Harrington said, "Karen mentioned, I was out of the room, that maybe there was some confusion on what was on the ballot and how they were separated, as to the issue of referendum, initiative and recall. Those were 3 separate ballot propositions to be voted on the last time."

Ms. Barkley said that was a bad example, commenting she was trying to come up with an example where it would seem natural to group them together. So if that question is outstanding and the group would like a better characterization.

Mr. Hiatt believes we can postpone that until we get closer to making recommendations. He said, "I don't want you to do that now."

Ms. Barkley said, "Basically the intent is that you don't want to have the voters voting on each little language separately, so that in the end there is inconsistency, and the Charter becomes a mess because they've accepted here, and declined similar language change below. The idea is that they are voting on one idea change to the Charter at a time, but no more than that."

Commissioner Farber said he has heard several times that we have only 3 more meetings but there's nothing that limits us to 3 meetings. He wants to get through the process as quickly as possible, but he doesn't want to do this at the expense of limiting or shortening debate.

Commissioner Werwath said we do have time limitations.

Commissioner Farber agreed, but said "we could have more than 3 meetings."

Commissioner Werwath said, "I'd have to revisit my notes, but I scheduled us right up to the end. We could maybe get away with one more meeting after the 3 that are scheduled.".

Commissioner Farber said there are a number of topics which justify discussion and a debate before voting.

Commissioner Werwath asked if these are things we haven't discussed.

Commissioner Farber said he is speaking about discussion at the time we are voting, commenting that we need debate at the time of voting.

Commissioner Werwath asked Commissioner Farber if he thinks we need more than 3 meetings to get through these items.

Commissioner Farber said he doesn't know.

Commissioner Werwath said, for the sake of the Councilors, we should try to get everything done in 3 meetings. We've done a lot of deliberation on these things and we should be able to move through them pretty swiftly. We've heard the arguments.

Commissioner Long said she completely agrees with Commissioner Werwath.

Commissioner Romero-Wirth said, "I don't think this is the last stop for these changes. If the City Council wants to add things we've taken off the table, they have that power."

Commissioner Farber said, "I think my colleague here usurped comments of the neighborhood Network by stating his view, and I think it would be appropriate to hear from representatives of the Neighborhood Network."

Cheri Johansen, Vice-President of the Neighborhood Network, said there has been a conflict between the neighborhood and the Land Use Department. She said, "I think it's important along with the environmental and cultural statements we have in Article 2 of the Charter, that we also include language that the preservation of neighborhoods is equally important to the character and the uniqueness of our City. Each of the neighborhoods in our City have their own characteristics, and those are basically the people who live in these neighborhoods. And people willing, or unwillingly move there for those kinds of characteristics – the environment and the atmosphere. We think it's important we emphasize that our neighborhoods are an essential part of everything. And that our neighborhoods should be preserved, and we should add that language to Article 2."

Commissioner Hiatt said, "For the record, I would like to note that Ms. Johansen are very close friends, and we are involved in other activities together, so on my cross examination I'll be relatively easy. In our previous discussion, you mentioned there were difficulties with the Land Use Department, whether it was when I was the Director or the current Director, it doesn't matter. My question to you would be, would you be here promoting this if you were working well with the Land Use Department and you didn't have those issues. Because my recommendation would be, that you should be talking to the City Manager about getting better results from the Land Use Director, but not coming to the Charter Commission to somehow correct that kind of communication, whatever the issue is. I don't know what it is."

Ms. Johansen said, "I think, like some of the issues we have discussed, if it is in Charter it doesn't make any difference who the Land Use Director is, or who the City Manager is. This is a statement as a position that neighborhoods are an essential part of our City and should be protected."

Commissioner Werwath said he has a hard time with the ambiguity of the term "neighborhood protection," and he is trying to think how the governing level document and this interact. He said, "Can you offer some examples of what you mean by "neighborhood protect." What are the qualities of a neighborhood. He said, "Because I'm thinking about neighborhoods, and I'm thinking there is a built environment, there's people, there's trees, there's all these different things that make up an environment. In 100 years, everyone in this room is going to be good, and a neighborhood isn't a neighborhood anymore, it's the buildings and trees."

[Ms. Johansen's remarks here are inaudible.] She said, "I think a neighborhood is the trees and the buildings, but it is also the character of the people, the kinds of things that particular group of people find important. In the Historic District, it is preserving the historic integrity of the City. In the Hopewell District, it might be finding a way to protect the citizens."

Commissioner Romero-Wirth asked, "Do you see, if you put it in the Charter, this idea of protecting neighborhoods, that somehow that would prevent them from evolving in ways that you would want them to. If you say, you have to protect the character and it has to be this way, that if they decide they want to evolve in some other way that everybody is okay with, does the Charter language then say you can't do that, because you have to protect what was there before. Back to, where are the edges of this protection."

Ms. Johansen said it is being a cooperative partner with the City, in whatever is happening in their environment.

Commissioner Romero-Wirth said perhaps we should say that.

Ms. Johansen said, "The way we have proposed to you is indicating the other language of the other two."

Commissioner Romero-Wirth said, then your ultimate goal then is to have the City to be more cooperative with the neighborhood people on the ground.

Ms. Johansen said, "Yes. Nothing personal, but to be sure that the neighborhoods are involved at the beginning of the process of a development or a change, then we can work together very well."

Commissioner Romero-Wirth said it goes back to whether that is something you can control, whether the Charter is the best way to control that.

Commissioner Werwath said the Neighborhood Notification process, or the Neighborhood Ordinance that Councilor Heldmeyer worked so hard on before she left the City Council.

Rick Martinez, President, Neighborhood Network, said it is the Neighborhood Bill of Rights.

Commissioner Romero-Wirth asked what is the Neighborhood Bill of Rights – is it the addition you're making to the Charter or that you would like to have one.

Mr. Martinez said there is a Neighborhood Bill of Rights. He said the best thing about the Bill of Rights is that it gives direction for neighborhoods when things come up and how neighborhoods go. He said, "And your question about how neighborhoods may change, or they may not want to do that. The thing with neighborhoods now days is that they are reinventing themselves, which is always good. We need that kind of reinventing of neighborhoods, whether they ask for higher density.... You take Juanita Street, for example, where the density was set at R-21, which is 21 units per acre, that the neighborhood took up and said they didn't want that. It was too high of a density for them and it was destroying the neighborhood. So they went to the Council and the Council recognized this was destroying the neighborhood.

Mr. Martinez continued, "But the language that we are trying to put in there is something where neighborhoods can stand up and say there is something in the Charter that says the City and the Council has to recognize the neighborhoods as to whether they want to change, and that neighborhoods are important to the City and they always be, whether they are old and stuff like that. The whole idea of getting the language in there is so when people vote on this, or they look at the Charter, they can say there is a way we can protect our neighborhoods, let's keep that. Because we don't have anything like that."

Commissioner Romero-Wirth said, "Wait. Do you see the flip side though, that if there is something in the Charter that says you have to protect the neighborhood and the neighborhood wants the change, or that are ways that..."

Commissioner Werwath said, "Or perhaps the ambiguity of the language allows for it to be used both ways. It potentially could be used against the neighborhoods."

Commissioner Romero-Wirth said, "If there's something you want to do to evolve. You used a great term, reinventing themselves. But if you use the word protect, that means you can't change."

Mr. Martinez said, "No, you could change. When you use the word protection in some of these areas it is being used to enhance the neighborhood protects. We are also using the word enhanced at the same time, to work with that. So, basically, without any language, without anything that is not giving the neighborhoods to do what they need to protect themselves, or change themselves.... this is what the language is all about."

Commissioner Romero-Wirth said, "One more question, I know we have to go, so we should probably have you back. Do you have any Resolution like the immigration folks."

Commissioner Werwath said there are several.

Commissioner Romero-Wirth said she is speaking of a Resolution adopted by the Council supporting neighborhoods, not language for our consideration.

Commissioner Werwath said, "There is the ordinance creating the Early Neighborhood Notification system, the Neighborhood Bill of Rights, and whatever created the neighborhood planner position in the Land Use Department."

Chair Serna said, "What I will do, is invite you, at the next meeting, the first thing on the agenda will be a discussion as to whether the Commission is even going to recommend any policy positions from any of the different groups. So please be present, and give your position, and perhaps you can change a vote or two and retain that, because right now, it's going to be discussed – whether any policy positions will be included in the recommendations. So be present to discuss that."

H) PROPOSAL FROM UNITED WAY RE CHILDRENS ISSUES AND CONCERNS

Chair Serna said this item was skipped, because it is a policy statement and the Commission has heard from them and discussed this issue.

6. DISCUSSION/POSSIBLE ACTION AGENDA ITEMS FOR FUTURE MEETINGS, INCLUDING SETTING DEADLINE FOR SUBMISSION OF PROPOSED AMENDMENTS TO CHARTER.

Chair Serna said, since we have only 3 more meetings, perhaps we should establish a deadline at the next meeting for any further suggestions for amendments.

MOTION: Commissioner Hiatt moved, seconded by Commissioner Long, to establish the next meeting of the Charter Review Commission on May 22, 2013, as the deadline for submission of proposed amendments for consideration.

DISCUSSION: Commissioner Farber said he thinks we need to set a suggested deadline. However, it could be that at the next meeting or two another idea that is important and worthwhile would come forward, and we shouldn't have a hard and fast rule until the meeting before the last meeting, so we can consider that or other items. He said, "I strongly suggest that all of the ideas be here so we can all be thinking about."

Responding to Ms. Barkley, Commissioner Hiatt said Item #6 was advertised on the agenda as having "possible action."

VOTE: The motion was approved on a voice vote with Commissioners Long, Hiatt and Romero-Wirth voting in favor of the motion and Commissioners Werwath, Farber and Gutierrez voting against the motion. The resulting vote was a tie and Chair Serna voted in favor of the motion to break the tie and approve the motion.

Chair Serna asked the minutes to reflect that he will be going on the radio to make it clear that any further changes to the Charter must be submitted by the next, so the public will know and have an opportunity to bring anything new to the Commission.

7. COMMUNICATION FROM CHARTER COMMISSION MEMBERS

Chair Serna said he will not attend the next meeting, and Vice-Chair Long will be presiding. He said he will work with Vice-Chair Long to convey his thoughts on any matters to the Commission for the next meeting.

8. PUBLIC COMMENT

A copy of *Santa Feans Against Cell Towers*, with attachments, submitted for the record by Dr. Felicia Trujillo, is incorporated herewith to these minutes as Exhibit "5."

A copy of an internet article from the IAFF Firefighters, dated March 8, 2011, submitted for the record by Dr. Felicia Trujillo, is incorporated herewith to the minutes as Exhibit "6."

A copy of an internet article from the Science of the Total Environment, dated 2011, submitted for the record by Dr. Felicia Trujillo, is incorporated herewith to these minutes as Exhibit "7."

A copy of an internet article from NRC Research Press, dated November 5, 2010, submitted for the record by Dr. Felicia Trujillo, is incorporated herewith to these minutes as Exhibit "8."

Dr. Felicia Trujillo thanked the Commissioners and staff and all those contributing to the presentation and bettering of Santa Fe, her home town, noting she went to high school in what is now City Hall. She said her work has taken her to other states, Europe, Australia and New Zealand, and is always glad to find Santa Fe's insightful planning unmatched by any other city in the world which she has visit.

Dr. Trujillo said she here to speak on behalf of doctors, health care professionals and scientists, about their concern there is no overview planning to limit cell tower expansion that will affect our children and Santa Fe's unique historic legacy of building and areas. She said in 2011, when a cell tower was planned for Ft. Marcy, Doctors warned that a policy of International Association of Fighters ruled not to allow cell towers on any of their facilities "due to proven negative health effects on firefighters." She provide the website for worldwide research substantiated this ruling [Exhibit "6"]. Dr. Trujillo also distributed materials which are Exhibits "5," "6," "7" and "8."

Dr. Trujillo said the people need this same protection for their childrens schools and homes. She said it is wonderful that we saved the Fire Chief's office in Ft. Marcy Park and would like to extend that to other areas, especially schools. In March 2011, they met with Principal Mike Lee and the Gonzales PTA,

about the dangers of AT&T's proposed cell tower being sited next to Gonzales School, at 100 N. St. Francis, and next to a dry river bed and 6 gas pumps, as well as a major City gateway. She said, "Cell towers have collapsed and/or burst into flamed. This is a tragedy that didn't need to happen. Although parents, children and neighbors braved a snowstorm to picket the Burger King site, only 1 x 2 inch article with two sentences reported this on page 10A of *The New Mexican*."

Dr. Trujillo continued, "Attached, on top [of the materials distributed by Dr. Trujillo] is our half page ad featuring Gonzales School mom, Monica Rivera with actress Ali MacGraw, and owners of a leading Santa Fe business and clinic, all asking the City to not allow the tower. She said for true transparency, publication of tower applications in *The New Mexico* would tell the public about cell towers planned for their schools and neighbors. She said the research is on page 2, and she provided the complete study."

Dr. Trujillo said one of the concerned parents is a Los Aamos physicist and formerly a career Navy engineer convince the Santa Fe School Board to adopt a resolution against building the tower next to Gonzales School, noting there was national coverage.

Dr. Trujillo said, "We would ask you to support the school board in formulating a "No Tower Zone" near schools, or to make it a topic." She said they were able to notify the Santa Fe Community College President, Dr. Anna Guzman, and governing board, about the cancer cluster of students and faculty at a San Diego campus. She said people are warned not to be exposed to additional radiation after their treatment. This resulted in SFCC turning down AT&T's offer of a tower on campus. They were impressed by Kelley Brennan and the City Council in the positive response to providing the legal advise of the leading FCC specialists, whose suggestions for our Telecommunication Ordinance, now protect our citizens from being exposed to 300-600% higher radiation levels. She said they would like the next Ordinance to include surprise testing for towers, to monitor the humans for radiation levels.

Dr. Trujillo said cell towers are sited disproportionately in working class neighborhoods. She said a new federal law has superceded the City's attempt to control the radiation levels under its ordinance. And a pre-existing cell tower can add antennas at will. She spoke about existing installations and the hazards of living near a cell tower.

Dr. Trujillo said, "All we ask, as this decision will affect thousands of lives and many generations in Santa Fe, is that you include this issue in the creation of a legal protection to keep our City from being over-run by cell towers."

Commissioner Hiatt said, "As you have heard us discuss, it would helpful to have language. So before we take this up again, and we will, would you please consider submitting some language to us. The second point I have is, if you convince us how we can overcome the federal law that prohibits cities from taking health consideration into consideration, I would like to know that."

Dr. Trujillo said when the Ft. Marcy tower planned, Chief Salas walked over here and that "died within a day, so something was found by the City Attorney's Office that addressed that.

Commissioner Farber said, "I just want to tell you how much I appreciate you bringing this matter forward. This is not an 'out there, wu wu type position.' I fundamentally believe that in 20-30 years, there will be clusters of brain tumors. I refuse to carry a cell phone to the chagrin of my children, although I do borrow it from time to time I have to admit. And if anybody reads the manual when you get a new cell phone, there is a warning which says you should keep it away from your ear. This is a very real issue. When we talk about cell phone towers, it is a fundamental problem in this community that I tried to address 20 years ago. We are limited in terms of what we can do, by this federal legislation because it is under the *[Inaudible because several people were talking at the same time.]*"

Commissioner Farber continued, "I think there is a split in this Commission about whether we should have policy statements or not in the Charter. We certainly won't be doing ordinances, that's not our job. But if you have specific policy language for consideration, I would echo what Commissioner Hiatt says in terms of presenting them, and our City Attorney will include this, hopefully, in the Charter matrix, because it got in before the deadline. I do think there is a health concern that is not discussed, and whether it is a part of the Charter or not, I wanted to share my personal concerns about what exists, even with regard to wireless, although I know that level is so much lower from what I gather from Bill Bruno. But in any event, thank you. I appreciate it."

Dr. Trujillo thanked Commissioner Farber, noting she can provide data and specific language.

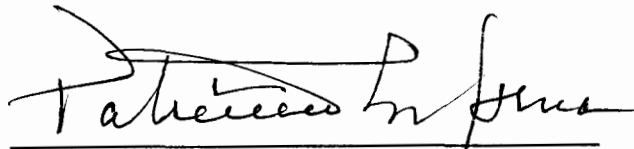

Commissioner Werwath asked Dr. Trujillo to review the Charter and suggest where in the Charter she would like the language to go, noting we need to get this information from everyone who is proposing an amendment/suggested language changes to the Charter.

9. ADJOURNMENT

There was no further business to come before the Commission.

MOTION: Commissioner Werwath moved, seconded by Commissioner Gutierrez, to adjourn the meeting.

VOTE: The motion was approved unanimously on a voice vote, and the meeting was adjourned at approximately 6:30 p.m.


The Honorable Patricio Serna, Chair
Melessia Helberg, Stenographer

Topic	Proposed By	Summary	Rec	Rationale	Issues	Supporting Documents	Proposed Language	Charter Article or Section	Related City Code Provision or Other Authority
Campaign Contribution Limits	LWV	This issue pertains to whether to include in the City Charter language that requires the city to have an ordinance in place that creates campaign contribution limits. There is currently an ordinance in place, this provision would not pertain to the amounts of campaign contribution limits, as these issues are subject to revision as a result of external requirements (campaign finance court decisions, etc.). But this would preclude the City Council deciding to eliminate the current ordinance completely.				2/26/13 Memo by Marcos Martinez, CAO	"The governing body shall adopt an ordinance or ordinances that limit the amount of campaign contributions that can be accepted by candidates."	Section 2.05 or Article IV	SFCC 9-2.14(C)-(D)
All-Mail Ballot for Elections	LWV	This proposed amendment would allow for certain elections to be conducted completely through the mail.	NO	All-mail elections are currently allowed under the Charter and relevant election law.				Article IV	

EXHIBIT "1"

Topic	Proposed By	Summary	Rec	Rationale	Issues	Supporting Documents	Proposed Language	Charter Article or Section	Related City Code Provision or Other Authority
Independent Redistricting,	LWV	Currently redistricting of City Council Districts is the responsibility of the City Council. This initiative would establish a process for an independent commission to create districts.		<p>The City shall adopt an ordinance or ordinances regulating redistricting that provide the people with a meaningful choice in electing their representatives. The governing body shall adopt an ordinance or ordinances that create an independent citizen commission that will develop a plan for redistricting council districts. The public must have access to all information used in the redistricting process on a timely basis, and have the opportunity to comment and be heard on the proposed redistricting processes, criteria, and results. The criteria for preparing redistricting maps should require that districts meet all federal criteria including equal population and the provisions of the Voting Rights Act. In addition, it is important that districts: be contiguous; be reasonably compact, in terms of travel time from one part of the district to another; avoid crossing geographic barriers to travel, such as mountain ranges; minimize the partition of major jurisdictions (counties, municipalities) to the extent possible; and not intentionally favor nor disfavor any candidate.</p>		LWV handout	<p>The City shall be divided into four dual-member districts numbered one through four. The City shall adopt an ordinance or ordinances regulating the composition of those districts that provide people with meaningful choice in electing their representatives. District boundaries shall be reviewed and revised at least every ten years following the decennial census by an independent citizens' redistricting commission. [The governing body shall, by ordinance, set the boundaries of each district and establish a procedure for the periodic review of district boundaries.]</p>	Article IX or Section 6.03	

Topic	Proposed By	Summary	Rec	Rationale	Issues	Supporting Documents	Proposed Language	Charter Article or Section	Related City Code Provision or Other Authority
Independent Redistricting ₂	Common Cause					Common Cause handout	<p>The City shall be divided into four dual-member districts numbered one through four. District boundaries shall be reviewed and revised following every decennial census by an independent citizens' redistricting commission.</p> <p>The governing body shall, by ordinance, [set the boundaries of each district and] establish a procedure for <u>the appointment and deliberations of the commission which will, to the maximum practicable extent, ensure that the commission's decisions will be based exclusively on</u> the periodic review of district boundaries. In establishing the district boundaries, the governing body shall consider the following principles in the following order of priority:</p>	Section 6.03	

Topic	Proposed By	Summary	Rec	Rationale	Issues	Supporting Documents	Proposed Language	Charter Article or Section	Related City Code Provision or Other Authority
cont'd							A. each district shall contain as nearly as possible substantially the same population based upon the most recent federal census; B. districting plans must avoid dilution of minority voting strength; C. communities of interest, including those based upon ethnic and economic factors, shall be preserved within a single district whenever reasonable; D. each district shall be formed of compact, contiguous territories. The total length of all district boundary lines shall be as short as possible; E. districting plans shall compensate for U.S. census undercount of minorities.		
At-Large City Council Districts or Partial Districting	Karen Walker	Currently the City Council is divided into 4 districts with two Councilors representing each district. This initiative would make half the City Councilors elected citywide. Current New Mexico Law requires precludes at-large councilors, but this could initiative could be added conditional on changed to New Mexico State Law, <i>OR could leave four councilors assigned by district and the remaining four at-large.</i>	NO	This type of City Council districting is precluded by state law. All municipalities with a population greater than 10,000 must be represented by single-member districts <i>BUT SEE</i> Karen Walker's 3/21/13 email		Undated Memo by Marcos Martinez, CAO; Walker 3/21/13 email		Section 6.03	
Councilor Resign to Run for Mayor	Enabling Resolution	Currently half of the City Councilors would have to resign if they were to run for Mayor because of staggered terms. State law prohibits individuals from simultaneously seeking two municipal elected positions during the same election cycle. This potential amendment is intended to create equity between the off year and Mayor election year councilors.						Section 6.05	

Topic	Proposed By	Summary	Rec	Rationale	Issues	Supporting Documents	Proposed Language	Charter Article or Section	Related City Code Provision or Other Authority
Term Limits for Mayor and City Councilors	Enabling Resolution	Currently the Mayor and City Council are not bound to any limit on the number of terms that can be served. While term-limits are currently not allowed under the New Mexico Constitution, term-limits could be included in an initiative contingent on an amendment to the state constitution.	NO	Term limits are currently not legal under the New Mexico State Constitution. It was the feeling of the commission that it was not worth pursuing Charter Amendments that could not be legally implemented.		Staff Brief		Sections 5.03, 6.05	N.M. Const. art. VII, Sec. 2; <i>Cottrell v. Santillanes</i> , 120 N.M. 367
Ranked Choice Voting Implementation	John Otter	In 2008 the voters adopted ranked choice voting with the provision that it would be implemented when it was financially feasible. At issue is the inability of the current municipal voting machines to tabulate ranking voting. This initiative would create an amendment to charter section 4.06 to create an alternative way of implementing ranked choice voting, either through the purchase of additional equipment or hand counting ballots after primary choice is tabulated by machine.				Staff Memo, Secretary of State Correspondence, Heldemeyer handouts		Section 4.06	
Typographical Error to Ranked Choice Voting Section	John Otter					Otter 4/22/12 email	"Commencing with the general municipal election in March 2010, or as soon thereafter as equipment and software for tabulation of votes and the ability to correct incorrectly marked, in-person ballots[,] is available at a reasonable price, and at all subsequent elections, the mayor, councilors and municipal judge shall be elected using a ranked choice (sometimes called instant runoff) voting system"	Section 4.06	
Change Municipal Elections to Fall	Karen Heldemeyer	Currently municipal elections take place in March. This initiative would move elections to an unspecified date in the fall.		Testimony has been presented that March elections pose challenges for candidates both from weather and the legislative session. Furthermore, because of the schedule, newly elected councilors must immediately begin the city budget process without direct governance experience.		Heldemeyer handout		Section 4.01(A)	

Topic	Proposed By	Summary	Rec	Rationale	Issues	Supporting Documents	Proposed Language	Charter Article or Section	Related City Code Provision or Other Authority
Full Time Mayor (strong/weak mayor)	Nancy Long & Mayor Maestas	The Mayor position of the City of Santa Fe is a half-time paid position. This initiative would increase the Mayor's position to a full-time job.						Article V	
Mayor to Vote on all Matters before the Council (strong/weak mayor)	LWV	Currently the Mayor only votes on matter before City Council in the event of a tie vote. This initiative would allow the Mayor to cast a vote on all issues before the Council.					Replace "vote only in the case of a tie or when his or her vote will provide the necessary number of votes required by law for taking action on an issue before the governing body" with "vote on all matters before the governing body."	Section 5.01(B)	
Mayor Hire/Fire the City Manager (strong/weak mayor)		Currently the CM is appointed by the mayor with the advice and consent of the governing body & fired by the mayor with approval of council or by a majority of the governing body. This measure would remove the council's authority to approve and to vote on firing.						Sections 5.01(D), 8.01, 8.04	SFCC 2-1.9(A), 2-4.3(B)-(C)
Definitions for Chief Executive Officer (Mayor) and Chief Administrative Officer (City Manager) (strong/weak mayor)	LWV	Currently the Chief Executive Officer (Mayor) and Chief Administrative Officer (City Manager) have no definition in the City Charter. This initiative would create a description of the Chief Executive Officer's role within the city government.						Sections 5.01(C), 8.03(A)	
Manager Does Not Hire/Fire City Attorney or City Clerk	LWV	Current City Charter language states that all employees aside from the City Manager are hired and fired at the Manager's Discretion. This is not accurate because the City Clerk and City Attorney serve at the pleasure of the City Council. This initiative would simply clarify this language to exclude the Clerk and Attorney from the language.						Section 8.03(B)	SFCC 2-4.6(B)

Topic	Proposed By	Summary	Rec	Rationale	Issues	Supporting Documents	Proposed Language	Charter Article or Section	Related City Code Provision or Other Authority
Signature Thresholds for Petitions, Initiatives and Recalls	LWV?	Currently citizen referendum and initiative petitions requires a minimum number of signatures equal to 33 1/3% of the number of voters who voted in the last mayoral election with at least 10% of signatures coming from each City Council District. City Council recall petitions require 33 1/3 % of signatures from a given district from the previous mayoral election year. Mayoral recall requires 33 1/3% of the total number of voters in the previous mayoral election including at least 15% of the actual number of voters in each district who participated in the previous mayoral election. This initiative would adjust the signature thresholds.						Sections 3.01-3.03	
Tax Bond Elections to Require Full Expenditure Timetable	LWV	Currently the city is not required to disclose a timeline for expending bond funds and there is no standardized format for how information about bond expenditures is presented to voters, aside from the language contained in the ballot.					"The governing body shall adopt an ordinance or ordinances that ensure that the city will disseminate a clear, comprehensive schedule of proposed expenditures for any tax increase or bond measure that needs to be ratified by voters."	Article IV?	
Audit Committee	Steven Farber	Would solidify audit committee by incorporating into Charter.				Ordinance establishing internal audit department, resumes of audit committee members		Article IX?	
Salaries Set By Independent Commission	LWV & Mayor Maestas	Currently salaries for the Mayor and City Councilors are set by ordinance to equal the maximum amount authorized by the legislature to be paid to Class A county commissioners. This initiative would create an independent commission to create and review salaries.						Article V, Article VI	SFCC 2-1.2, NMSA 1978, Section 4-44-4 (though the code erroneously cites Section 4-44-4.1)

Topic	Proposed By	Summary	Rec	Rationale	Issues	Supporting Documents	Proposed Language	Charter Article or Section	Related City Code Provision or Other Authority
Policy Statement Regarding Personal Use and Possession of Marijuana by Adults	Steven Farber	This would be a separate provision in the Charter that would set forth a policy that the City of Santa Fe Police Department and City Attorney's Office shall make the investigation, arrest, and prosecution of marijuana offenses, where the marijuana was intended for adult person use, the City's lowest law enforcement priority.				Various Farber handouts		Article II	
Policy Statement Gun Violence Prevention	Steven Farber	This would be a separate provision in the Charter that would require the City Council to enact gun violence prevention ordinances within six months of adoption of the amendment to the Charter.						Article II	

Topic	Proposed By	Summary	Rec	Rationale	Issues	Supporting Documents	Proposed Language	Charter Article or Section	Related City Code Provision or Other Authority
Policy Statement Water	LWV	This policy statement would include specific mention of water resources in declaration 2.03 Environmental Protection					"Because water quality and availability are extremely important to the citizens of Santa Fe, the governing body shall protect, preserve, and enhance the city's water resources through regulation, conservation, and tying development to water availability."	Section 2.03	
Policy Statement Technology	Daniel Werwath	This policy statement would encourage the City to incorporate the use of modern communication technologies to increase transparency and participation in local government						Article II	

Topic	Proposed By	Summary	Rec	Rationale	Issues	Supporting Documents	Proposed Language	Charter Article or Section	Related City Code Provision or Other Authority
Policy Statement Neighborhoods	Neighborhood Network	This policy statement would acknowledge the important of neighborhoods in the unique identity and community fabric in the City of Santa Fe.				Neighborhood Network handout	"Neighborhoods are key to the historical and cultural heritage defining the diverse and unique character of Santa Fe. In order to protect Santa Fe's neighborhoods and their quality of life, the governing body shall promote and prioritize neighborhood protection in land use planning, development and building determinations. To enhance and ensure neighborhood protections, the governing body will promote communication with Neighborhoods and Neighborhood Associations. The governing body shall encourage and recognize Neighborhood Associations to represent and articulate the legitimate interests of neighborhoods. The governing body shall endeavor to preserve the unique cultural and architectural heritage of individual neighborhoods. To effect these ends, the governing body may enact ordinances and establish appropriate commissions/commissioners with jurisdiction, authority, and staff sufficient to effectively administer this policy."	Article II	
Policy Statement Immigration	City Immigration Committee	This policy statement would indicate that city resources should not be expended on the enforcement of federal immigration laws.					"No municipal resources will be used to identify or apprehend any non-citizen resident on the sole basis of immigration status, unless otherwise required by law to do so."	Article II	

Topic	Proposed By	Summary	Rec	Rationale	Issues	Supporting Documents	Proposed Language	Charter Article or Section	Related City Code Provision or Other Authority
Policy Statement Children	United Way of Santa Fe County					United Way handout	<p>Our Commitment to Our Children. "Our children are Santa Fe's most valuable asset. In order to nurture and protect our children and to enhance our children's ability to thrive and to grow into productive members of society, the governing body shall take into account the effects of any action on our children and shall take action to support and protect our children. To effect these ends, the governing body may take whatever action is necessary and may enact ordinances and may establish appropriate commissions with jurisdiction, authority, and staff sufficient to effectively administer this policy."</p>	Article II	

To: Santa Fe Charter Review Commission
From: League of Women Voters of Santa Fe County
Date: May 9, 2013
Topic: Reminder of Proposed Charter Amendments

The League of Women Voters would like to remind the Charter Commission of 2 proposed charter amendments that are on today's agenda. These are:

Article IV. Elections

new 4.07. Limits on campaign contributions

The governing body shall adopt an ordinance or ordinances that limit the amount of campaign contributions that can be accepted by candidates.

New 4.08. Tax and bond measure elections

The governing body shall adopt an ordinance or ordinances that ensure that the city will disseminate a clear, comprehensive schedule of proposed expenditures for any tax increase or bond measure that needs to be ratified by the voters.

Exhibit "2"

Chairman Serna and Members of the Charter Review Commission:

Thank you for the invitation to attend and participate in your May 9th commission meeting. I am especially appreciative of your plans to further consider one of my charter amendment recommendations to remove the Governing Body's authority to set their own annual salaries and, instead, create a citizens' independent commission to determine such salaries.

I urge you to review the City of Albuquerque's Citizens' Independent Salary Commission's authority and process for potential application to Santa Fe. As a champion for ethical and transparent government, I truly believe that this particular charter amendment would be another step forward in building good government here in our great city.

When I recommended this charter amendment, I was simply a concerned citizen. Since then, I have public declared an interest in running for the office of Mayor of Santa Fe. Although I am not yet a candidate, I feel it would be perceived as a conflict of interest for me to attend your commission meeting and provide comments on this with the future possibility of benefiting from it. Consequently, I regret to inform you that I will not be attending your May 9th meeting.

Thank you all for giving of your time to better our city through this charter review process and following a very robust public involvement process.

Sincerely,

Joseph M. Maestas

Joseph M. Maestas

3999A Old Santa Fe Trail

Santa Fe, NM


Exhibit "3"

City of Santa Fe, New Mexico

memo

DATE: May 9, 2013

TO: The Charter Review Commission

FROM: Jamison Barkley, Assistant City Attorney 

SUBJECT: Rights of referendum, initiative, and recall under City Charter

The Charter Review Commission Chair, Justice Serna, requested that I research the required voter thresholds for the citizen rights of initiative, referendum, and recall. Currently under the Charter, a petition for referendum is sufficient if it contains the signatures of thirty-three and one third percent of the voters in the prior mayoral election, with each council district represented with at least ten percent of the voters from the prior mayoral election. Sections 3.01 E.-3.02 F. For recall of the mayor, the signatures of thirty-three and one third of the voters in the prior mayoral election are required, but each council district must have at least fifteen percent of the voters in the prior mayoral election. Section 3.03 G. [1]. For recall of councilors, there must be signatures from at least thirty-three and one third percent of the voters from the prior mayoral election from that council district. *Id.* at [2]. The thirty-three and a third percent requirement was instituted in 2008, in place of a twenty percent requirement.

Albuquerque

For referendum and initiative, Albuquerque requires signatures from the greater of: (1) more than twenty percent of the average number of voters from the four prior regular municipal elections, or (2) more than twenty percent of the number of voters who voted at the prior regular municipal election. For recall, thirty-three and one third percent of the number of persons who voted in the last municipal election for the same position.

Las Cruces

For referendum and initiative, Las Cruces requires signatures from at least fifteen percent of the total number of ballots cast for councilors in the two prior city elections. For recall of a councilor, there must be signatures from at least ten percent of the registered voters in that district. For recall of a mayor, there must be ten percent of the total city registered voters.

Exhibit "4"

Santa Feans Against Cell Towers [SFACT] Support Parents Protecting Their Children From Cell Towers



Monica Rivera
Gonzales Community School Mom

"I want to let Superintendent Joel Boyd and Principal Mike Lee know if they allow a cell tower to be built at the Burger King, I will not have my kids go to Gonzales Community School. I think many parents will feel the same."

All MacGraw
Actress & Community Member

"I want to express my admiration for those insightful churches, schools, and property owners who resist the temptation to lease to cell towers, despite the financial incentives to do so. The scientific data is sufficient for us to know that cell towers do not belong near schools and homes."



Lorin Parrish, BODY of Santa Fe

"Many of us work hard to keep our families healthy and yet we are allowing cellphone towers to be sited near our schools throughout Santa Fe, endangering our children when scientists have shown children are much more vulnerable to exposures by cell towers emitting Electro-Magnetic Fields and Radiation (EMF/EMR)."

Other vulnerable populations are pregnant women who may miscarry, those with medical implants and even normal, healthy people can develop cancers with ongoing exposures to EMF/EMR.

The World Health Organization categorized EMF and the microwave radiation in all wireless technology as a Class 2B: Possibly Carcinogen, sharing that category with DDT, lead, and asbestos. Santa Fe can make better choices than this!"

Robyn Benson, DOM
SANTA FE SOUL Health and Healing Center

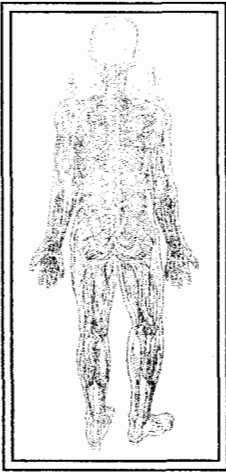
"Many experts in the field of electromagnetic pollution: Dr. Magda Havas, brain surgeons Dr. Sanjay Gupta, and Dr. Keith Black and Dr. Pawluk are reporting research finding that exposure to harmful EMFs (electromagnetic fields from cell phone technology) is "the biggest biological experiment ever," as stated by Dr. David O. Carpenter, Director of the Institute for Health and the Environment at S.U.N.Y.. Albany."

Daily, I see patients in my practice who are suffering from many of the common side effects of EMF exposure including vertigo, anxiety, heart palpitations and disturbed sleep, just to name a few."



From: Santa Fe Doctors W.A.R.N. (Wireless and Radiation Network), California Brain Tumor Association, Campaign for Radiation Free Schools, Center for Electromog Prevention, Doctors for Safe Schools, Ecological Options Network, Electromagnetic Safety Alliance, Moms of Merrick, The People's Initiative Foundation, Wireless Radiation Safety Council, The Center for Safer Wireless

Submitted by



SANTA FE DOCTORS W.A.R.N. WIRELESS AND RADIATION NETWORK

(505) 471-4194

P O Box 28068, Santa Fe, New Mexico 87592-8068

To the Members of the Charter Review Commission

May 9, 2013

I am speaking for Santa Fe Doctors W.A.R.N., comprised of ninety-five local health care professionals and scientists, who have grave concerns that there is no City overview planning—as there is in other cities—to limit cell tower expansion that will affect our children and Santa Fe's unique historic legacy of buildings and areas.

1 In 2012, when a cell tower was planned for Ft. Marcy Park, Doctors W.A.R.N. was able to alert our City Fire Chiefs, that a 2004 Policy of the International Association of Fire Fighters **ruled to NOT allow cell towers or antennas on any of their facilities due to proven negative health effects on fire fighters.** They also provide worldwide research to substantiate this: <http://www.iaff.org/hs/Facts/CellTowerFinal.asp>. The people of Santa Fe need that protection of their children's schools and homes.

2 In March of 2012, we were able to alert Principal Mike Lee and the Gonzales PTA about the dangers of AT&T's proposed cell tower being sited next to their grade school at 100 N. St. Francis—and next to a dry river bed and six gas pumps. as well as a major City gateway. Cell towers have collapsed and/or burst into flames. This is a tragedy waiting to happen. Although parents, children and neighbors braved a snow storm to picket the Burger King site, only a 1 inch by 2 inch picture with two sentences reported this on page 10A of the New Mexican. Attached is our half page ad featuring Gonzales School Mom, Monica Rivera with Actress Ali MacGraw and owners of a leading Santa Fe business and clinic—all asking for the City to not allow this tower. For true transparency, publication of tower applications in the New Mexican would inform the public about cell towers planned for their schools and neighborhoods. [See page 2 for research.]

3 These concerned parents—one father is a Los Alamos Physicist and formerly a career Navy engineer—also convinced the once skeptical Santa Fe School Board to pass a Resolution against this tower being built next to Gonzales School, which gathered national coverage. We would ask you to support the School Board in formulating a no-tower zone near public schools. [See <http://www.youtube.com/watch?v=IBTBoMuLTkQ>]

4 Recently, we were able to alert the Santa Fe Community College President, Dr. Ana Guzman and her Governing Board about the cancer cluster and seven deaths of students and faculty at a San Diego Campus within two years after leasing to a cell tower. [See information on page 3.] That information combined with Rancho Viejo residents who, as cancer survivors, are warned not to be exposed to radiation resulted in their turning down AT & T's offer of a tower on campus.

5 We were very impressed by Assistant City Attorney Kelley Brennan and the City Council in their positive response to our providing the legal advice of a leading FCC specialist whose suggestions for our TeleCom Ordinance protected Santa Fe citizens from being exposed to 300-600% higher radiation. We would suggest that the new Ordinance includes surprise testing of towers to monitor their adherence to their promised radiation levels, as TeleComs are known to power up until a test date is announced.

6 However, in February 2012, a new federal Section 6409 Wireless Facilities Deployment has superseded our City's attempt to control the radiation levels as per our Ordinance, and now any "pre-existing" cell tower can have multiple antennas added, with no limit protection or surprise testing of their radiation levels. The proliferation of antennas will destroy the aesthetics of our Ancient City.

7 In addition, Assistant City Attorney Kelley Brennan has informed us of a new intrusion by the TeleCom Industry upon historic buildings and sites, especially if an antenna is ruled "pre-existing."

All we ask—as this decision will affect the thousands of lives and many generations in Santa Fe—is that you please include this issue and the creation of legal protection for our City Beautiful from being overrun by cell towers, which is now the industry's goal. Doctors W.A.R.N. can again offer assistance in the form of the same FCC Specialist who has written FCC compliant ordinances that are now protecting other cities.

We remain at your service, Felicia N. Trujillo, ND

Members include 95 concerned scientists and health care professionals including local Medical Doctors, Dentists, Doctors of Optometry, Nurses, Physical Therapists, Psychiatrists, Physicists, Osteopathic and Naturopathic Physicians, Acupuncturists, and Massage Therapists who have supported more protective laws and legislation for the State of New Mexico.

*Coordinators:
Felicia N. Trujillo, ND,
Feldenkrais® Practitioner
Michael Blanshan,
Traditional Naturopath*

Recently published research found that 81% of cancer deaths occurred in those residing for ten years within 1500 feet of a cell tower, while only 19% of cancer deaths occurred outside this area with fewer cell towers. See: *A.C. Dode et al/Science of the Total Environment Journal*

Within 328 feet = 3,569 deaths

Within 656 feet = add 1,408 deaths

Within 984 feet = add 973 deaths

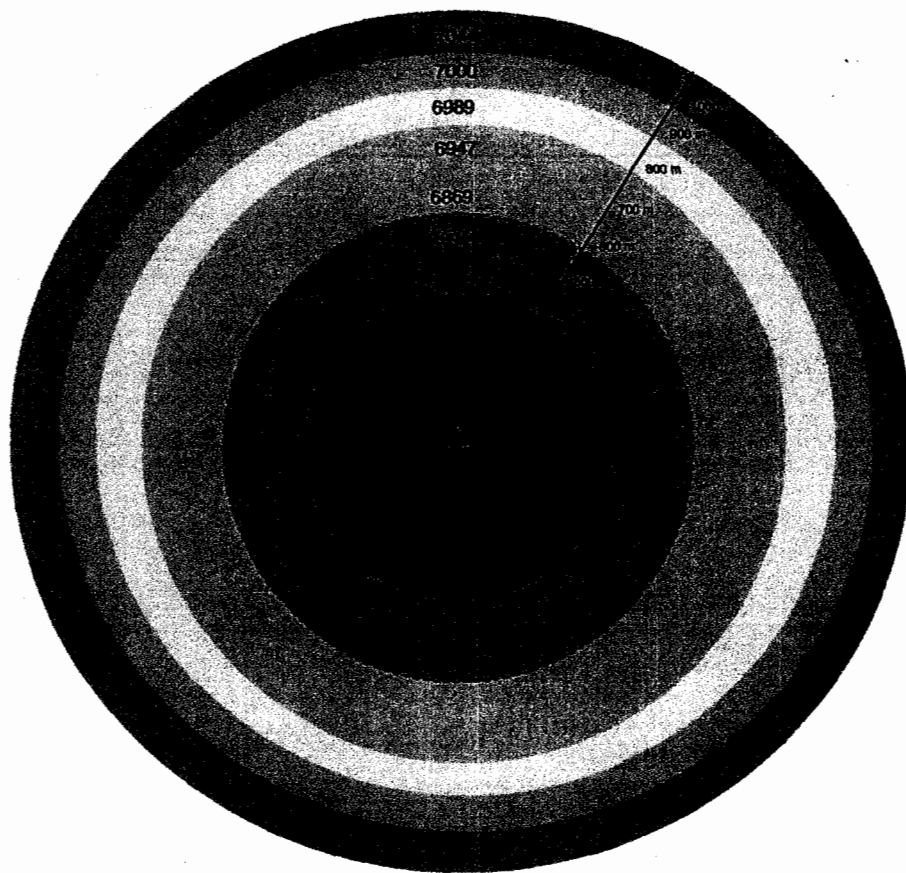
Within 1312 feet = add 482 deaths = 6432 deaths

Within 1640 feet = add 292 deaths and so on within 3281 feet

Beyond 3281 feet add 147 deaths = 7,191 deaths total

Research published by respected peer-reviewed scientific journals show that cell towers are especially dangerous for: Children, young persons who are still developing, those with medical implants, or with any medical frailty, heart problems, or pregnant, as EMF is documented as causing miscarriages. Research has also shown EMF/EMR exposures from cellphones and cordless phones causes death of thyroid cells and sperm viability.

Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte Municipality



□ Adilza C. Dode a,b,e, □, Mônica M.D. Leão c, Francisco de A.F. Tejo d, Antônio C.R. Gomes e, Daiana C. Dode e, f, Michael C. Dode e, Cristina W. Moreira b, Vânia A. Condessa b, Cláudia Albinatti b, Waleska T. Caiaffa ga Minas Methodist University Center Izabela Hendrix, Belo Horizonte City, Minas Gerais State, Brazil b Municipal Government of Belo Horizonte, Municipal Health Department, Belo Horizonte City, Minas Gerais State, Brazil c UFMG—Universidade Federal de Minas Gerais-Belo Horizonte, Environmental and Sanitary Engineering Department, Belo Horizonte City, Minas Gerais State, Brazil d UFCG—Universidade Federal de Campina Grande, Center of Electrical Engineering and Informatics, Academic Unit of Electrical Engineering, Paraíba State, Brazil e MRE Engenharia (Electromagnetic Radiations Measurement—Engineering), Belo Horizonte City, Minas Gerais State, Brazil f Faculty of Medical Sciences, Medicine-Belo Horizonte, Belo Horizonte City, Minas Gerais State, Brazil g UFMG—Universidade Federal de Minas Gerais-Belo Horizonte, Urban Health Observatory, Belo Horizonte City, Minas Gerais State, Brazil



From Mrs. Virginia Farver, mother of San Diego State University student, Philip Farver:

My son Rich was diagnosed with GBM Brain Cancer on March 14, 2008 and lived just short of seven months with this disease, dying October 11, 2008 at home in Colorado. August 7, 2009 approximately nine months after Rich's death is when I found the articles about the SDSU cancer cluster. I met with Professors Nancy Speckmann and Farid Abdel-Nour and both Professors told me that Rich, would spend long hours in Nasatir Hall, Room 131. Rich, was a Teacher's Assistant for Prof. Nancy Speckmann and would meet with students, grade papers, and be in this building and room on weekends studying. All those who died, the majority from brain cancer, worked long hours in the same location, in a room facing the cell tower.

The photographs show my son before the cell tower was sited and, at his graduation, before he was diagnosed, but was beginning to have symptoms of headaches, confusion, etc.

This cancer cluster was reported in TV news, and news articles links below and *was instrumental in the World Health Organization changing its classification for Non-Ionizing Radiation to a Class 2B Carcinogen, May 2011. Class 2B includes: Lead, DDT and HIV virus.*

SEVEN KNOWN VICTIMS, including staff:

Rich Farver - my son, diagnosed and **died from GBM Brain Cancer**, October 11, 2008, 1 week after his 29th Birthday/ Nasatir Hall, Room 131, facing HPWREN cell tower. See photos above before and after illness began.

Charles Cutter - diagnosed and **died from GBM Brain Cancer**, June 19, 2008/ Nasatir Hall, Room 131, facing HPWREN cell tower.

Lou Terrell - diagnosed with **Primary Brain Lymphoma** (Brain Cancer) 2008/ Nasatir Hall, Room right next to 131 and facing the HPWREN cell tower.

Ms. Laurel Amtower - diagnosed with **GBM Brain Cancer**, November 2009, died August 29, 2010/ Arts & Letters Building, right next to Nasatir Hall, (within yards), facing HPWREN cell tower.

Dwight Anderson - diagnosed with a different form of cancer and also worked at Nasatir Hall, Room 131, facing HPWREN cell tower.

Mrs. Kathy O'Hara - diagnosed with **GBM Brain Cancer**, May 2008/ KPBS News Station on campus.

Richard Funston - diagnosed and died from **GBM Brain Cancer** in 1993 with cell tower present and taken down in 1995 to once again, be replaced/ Nasatir Hall, Room 131.

This story was Instrumental in the WHO - World Health Organization changing its classification for Non-Ionizing Radiation to a Class 2B Carcinogen, May 2011.

Articles and News Video Footage:

www.nbcsandiego.com/news/local-beat/Coincidence-or-cluster.html

www.nbcsandiego.com/news/health/SDSU_Room_Haunted_by_Cancer_San_Diego.html

www.healthjournalism.org/blog/tag/brain-cancer

www.healthjournalism.org/blog/2009/03/san-diego-cancer-clusters-hazard-or-coincidence

www.voiceofsandiego.org/this_just_in/article_55020cc7-839f-533a-8a...

www.voiceofsandiego.org/science/article_6a12a31b-777c-5560-bf88-75...



IAFF FireFighters



Member Login

INTERNATIONAL ASSOCIATION OF FIRE FIGHTERS, AFL-CIO, CIO

[Health & Safety Home](#)
[Contact Us](#)
[Alerts](#)
[WFL](#)

Username:

Health, Safety & Medicine

Password: go

[Register!](#)
[Help](#)
[Forgot Password?](#)
[Home](#)[About Us](#)[History](#)[Mission](#)[Executive Board](#)[Board of Directors](#)[Regional Councils](#)[International Council](#)[International Council](#)[International Council](#)[International Council](#)[International Council](#)[International Council](#)[International Council](#)[International Council](#)[International Council](#)[International Council](#)[International Council](#)[International Council](#)[International Council](#)[International Council](#)[International Council](#)[International Council](#)

INTERNATIONAL ASSOCIATION OF FIRE FIGHTERS

DIVISION OF OCCUPATIONAL HEALTH, SAFETY AND MEDICINE

Position on the Health Effects from Radio Frequency/Microwave (RF/MW) Radiation in Fire Department Facilities from Base Stations for Antennas and Towers for the Conduction of Cell Phone Transmissions

The International Association of Fire Fighters' position on locating cell towers commercial wireless infrastructure on fire department facilities, as adopted by its membership in August 2004 ⁽¹⁾, is that the IAFF oppose the use of fire stations as base stations for towers and/or antennas for the conduction of cell phone transmissions until a study with the highest scientific merit and integrity on health effects of exposure to low-intensity RF/MW radiation is conducted and it is proven that such sitings are not hazardous to the health of our members.

Further, the IAFF is investigating funding for a U.S. and Canadian study that would characterize exposures from RF/MW radiation in fire houses with and without cellular antennae, and examine the health status of the fire fighters as a function of their assignment in exposed or unexposed fire houses. Specifically, there is concern for the effects of radio frequency radiation on the central nervous system (CNS) and the immune system, as well as other metabolic effects observed in preliminary studies.

It is the belief of some international governments and regulatory bodies and of the wireless telecommunications industry that no consistent increases in health risk exist from exposure to RF/MW radiation unless the intensity of the radiation is sufficient to heat body tissue. However, it is important to note that these positions are based on non-continuous exposures to the general public to low intensity RF/MW radiation emitted from wireless telecommunications base stations. Furthermore, most studies that are the basis of this position are at least five years old and generally look at the safety of the phone itself. IAFF members are concerned about the effects of living directly under these antenna base stations for a considerable stationary period of time and on a daily basis. There are established biological effects from exposure to low-level RF/MW radiation. Such biological effects are recognized as markers of adverse health effects when they arise from exposure to toxic chemicals for example. The IAFF's efforts will attempt to establish whether there is a correlation between such biological effects and a health risk to fire fighters and emergency medical personnel due to the siting of cell phone antennas and base stations at fire stations and facilities where they work.

Background

Critical questions concerning the health effects and safety of RF/MW radiation remain. Accordingly, should we allow exposure of our fire fighters and emergency medical personnel to this radiation to continue for the next twenty years when there is ongoing controversy over many aspects of RF/MW health effects? While no one disagrees that serious health hazards occur when living cells in the body are heated, as happens with high intensity RF/MW exposure (just like in a microwave oven), scientists are currently investigating the health hazards of low intensity RF/MW exposure. Low intensity RF/MW exposure is exposure which does not raise the temperature of the living cells in the body.

Additionally, a National Institute of Environmental Health Sciences panel designated power frequency electromagnetic fields (ELF/EMF) as "possible human carcinogens." ⁽²⁾ In March 2002 The International Association on Research on Cancer of the World Health Organization also assigned this designation to ELF/EMF in Volume 80 of its IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals ⁽³⁾

Exhibit "6"

INTERNATIONAL ASSOCIATION OF FIRE FIGHTERS OPPOSE CELL TOWERS/ANTENNA ON FIRE STATIONS

DIVISION OF OCCUPATIONAL HEALTH, SAFETY AND MEDICINE

<http://www.iaff.org/hs/Facts/CellTowerFinal.asp>

Position on the Health Effects from Radio Frequency/Microwave (RF/MW) Radiation in Fire Department Facilities from Base Stations for Antennas and Towers for the Conduction of Cell Phone Transmissions

The International Association of Fire Fighters' position on locating cell towers commercial wireless infrastructure on fire department facilities, as adopted by its membership in August 2004 ⁽¹⁾, is that the IAFF oppose the use of fire stations as base stations for towers and/or antennas for the conduction of cell phone transmissions until a study with the highest scientific merit and integrity on health effects of exposure to low-intensity RF/MW radiation is conducted and it is proven that such sitings are not hazardous to the health of our members.

<http://www.iaff.org/hs/Facts/CellTowerFinal.asp>

Further, the IAFF is investigating funding for a U.S. and Canadian study that would characterize exposures from RF/MW radiation in fire houses with and without cellular antennae, and examine the health status of the fire fighters as a function of their assignment in exposed or unexposed fire houses. Specifically, there is concern for the effects of radio frequency radiation on the central nervous system (CNS) and the immune system, as well as other metabolic effects observed in preliminary studies.

It is the belief of some international governments and regulatory bodies and of the wireless telecommunications industry that no consistent increases in health risk exist from exposure to RF/MW radiation unless the intensity of the radiation is sufficient to heat body tissue. However, it is important to note that these positions are based on non-continuous exposures to the general public to low intensity RF/MW radiation emitted from wireless telecommunications base stations. Furthermore, most studies that are the basis of this position are at least five years old and generally look at the safety of the phone itself. IAFF members are concerned about the effects of living directly under these antenna base stations for a considerable stationary period of time and on a daily basis. There are established biological effects from exposure to low-level RF/MW radiation. Such biological effects are recognized as markers of adverse health effects when they arise from exposure to toxic chemicals for example. The IAFF's efforts will attempt to establish whether there is a correlation between such biological effects and a

health risk to fire fighters and emergency medical personnel due to the siting of cell phone antennas and base stations at fire stations and facilities where they work.

Background

Critical questions concerning the health effects and safety of RF/MW radiation remain. Accordingly, should we allow exposure of our fire fighters and emergency medical personnel to this radiation to continue for the next twenty years when there is ongoing controversy over many aspects of RF/MW health effects? While no one disagrees that serious health hazards occur when living cells in the body are heated, as happens with high intensity RF/MW exposure (just like in a microwave oven), scientists are currently investigating the health hazards of low intensity RF/MW exposure. Low intensity RF/MW exposure is exposure which does not raise the temperature of the living cells in the body.

Additionally, a National Institute of Environmental Health Sciences panel designated power frequency electromagnetic fields (ELF/EMF) as "possible human carcinogens." ⁽²⁾ In March 2002 The International Association on Research on Cancer of the World Health Organization also assigned this designation to ELF/EMF in Volume 80 of its *IARC Monographs on the Evaluation of Carcinogenic Risks to Humans*. ⁽³⁾

Fixed antennas used for wireless telecommunications are referred to as cellular base stations, cell stations, PCS ("Personal Communications Service") stations or telephone transmission towers. These base stations consist of antennas and electronic equipment. Because the antennas need to be high in the air, they are often located on towers, poles, water tanks, or rooftops. Typical heights for freestanding base station towers are 50-200 feet.

Some base stations use antennas that look like poles, 10 to 15 feet in length, that are referred to as "omni-directional" antennas. These types of antennas are usually found in rural areas. In urban and suburban areas, wireless providers now more commonly use panel or sector antennas for their base stations. These antennas consist of rectangular panels, about 1 by 4 feet in dimension. The antennas are usually arranged in three groups of three antennas each. One antenna in each group is used to transmit signals to wireless phones, and the other two antennas in each group are used to receive signals from wireless phones.

At any base station site, the amount of RF/MW radiation produced depends on the number of radio channels (transmitters) per antenna and the power of each transmitter. Typically, 21 channels per antenna sector are available. For a typical cell site using sector antennas, each of the three transmitting antennas could be connected to up to 21 transmitters for a total of 63 transmitters. When omni-directional antennas are used, a cellular base station could theoretically use up to 96 transmitters. Base stations used for PCS communications generally require fewer transmitters than those used for cellular

radio transmissions, since PCS carriers usually have a higher density of base station antenna sites.

The electromagnetic RF/MW radiation transmitted from base station antennas travel toward the horizon in relatively narrow paths. The individual pattern for a single array of sector antennas is wedge-shaped, like a piece of pie. Cellular and PCS base stations in the United States are required to comply with limits for exposure recommended by expert organizations and endorsed by government agencies responsible for health and safety. When cellular and PCS antennas are mounted on rooftops, RF/MW radiation levels on that roof or on others near by would be greater than those typically encountered on the ground.

The telecommunications industry claims cellular antennas are safe because the RF/MW radiation they produce is too weak to cause heating, i.e., a "thermal effect." They point to "safety standards" from groups such as ANSI/IEEE or ICNIRP to support their claims. But these groups have explicitly stated that their claims of "safe RF/MW radiation exposure is harmless" rest on the fact that it is too weak to produce a rise in body temperature, a "thermal effect."⁽⁴⁾

There is a large body of internationally accepted scientific evidence which points to the existence of non-thermal effects of RF/MW radiation. The issue at the present time is not whether such evidence exists, but rather what weight to give it.

Internationally acknowledged experts in the field of RF/MW radiation research have shown that RF/MW transmissions of the type used in digital cellular antennas and phones can have critical effects on cell cultures, animals, and people in laboratories and have also found epidemiological evidence (studies of communities, not in the laboratory) of serious health effects at "non-thermal levels," where the intensity of the RF/MW radiation was too low to cause heating. They have found:

- Increased cell growth of brain cancer cells ⁽⁵⁾
- A doubling of the rate of lymphoma in mice ⁽⁶⁾
- Changes in tumor growth in rats ⁽⁷⁾
- An increased number of tumors in rats ⁽⁸⁾
- Increased single- and double-strand breaks in DNA, our genetic material ⁽⁹⁾
- 2 to 4 times as many cancers in Polish soldiers exposed to RF ⁽¹⁰⁾
- More childhood leukemia in children exposed to RF ⁽¹¹⁾
- Changes in sleep patterns and REM type sleep ⁽¹²⁾
- Headaches caused by RF/MW radiation exposure ⁽¹³⁾
- Neurologic changes ⁽¹⁴⁾ including:
 - Changes in the blood-brain-barrier ⁽¹⁵⁾
 - Changes in cellular morphology (including cell death) ⁽¹⁶⁾
 - Changes in neural electrophysiology (EEG) ⁽¹⁷⁾

- Changes in neurotransmitters (which affect motivation and pain perception) ⁽¹⁸⁾
- Metabolic changes (of calcium ions, for instance) ⁽¹⁹⁾
- Cytogenetic effects (which can affect cancer, Alzheimer's, neurodegenerative diseases) ⁽²⁰⁾
- Decreased memory, attention, and slower reaction time in school children ⁽²¹⁾
- Retarded learning in rats indicating a deficit in spatial "working memory" ⁽²²⁾
- Increased blood pressure in healthy men ⁽²³⁾
- Damage to eye cells when combined with commonly used glaucoma medications ⁽²⁴⁾

Many national and international organizations have recognized the need to define the true risk of low intensity, non-thermal RF/MW radiation exposure, calling for intensive scientific investigation to answer the open questions. These include:

- The World Health Organization, noting reports of "cancer, reduced fertility, memory loss, and adverse changes in the behavior and development of children." ⁽²⁵⁾
- The U. S. Food and Drug Administration (FDA) ⁽²⁶⁾
- The International Agency for Research on Cancer (IARC) ⁽²⁷⁾
- The Swedish Work Environmental Fund ⁽²⁸⁾
- The National Cancer Institute (NCI) ⁽²⁹⁾
- The European Commission (EC) ⁽³⁰⁾
- New Zealand's Ministry of Health ⁽³¹⁾
- National Health and Medical Research Council of Australia ⁽³²⁾
- Commonwealth Scientific Industrial Research Organization of Australia (CSIRO) ⁽³³⁾
- The Royal Society of Canada expert group report prepared for Health Canada ⁽³⁴⁾
- European Union's REFLEX Project (Risk Evaluation of Potential Environmental Hazards from Low Frequency Electromagnetic Field Exposure Using Sensitive *in vitro* Methods) ⁽³⁵⁾
- The Independent Group on Electromagnetic Fields of the Swedish Radiation Protection Board (SSI) ⁽³⁶⁾
- The United Kingdom's National Radiological Protection Board (NRPB) ⁽³⁷⁾
- The EMF-Team Finland's Helsinki Appeal 2005 ⁽³⁸⁾

Non-thermal effects are recognized by experts on RF/MW radiation and health to be potential health hazards. Safe levels of RF/MW exposure for these low intensity, non-thermal effects have not yet been established.

The FDA has explicitly rejected claims that cellular phones are "safe." ⁽³⁹⁾

The Environmental Protection Agency (EPA) has stated repeatedly that the current (ANSI/IEEE) RF/MW safety standards protect only against thermal effects. ⁽⁴⁰⁾

Many scientists and physicians question the safety of exposure to RF/MW radiation. The CSIRO study, for example, notes that there are no clear cutoff levels at which low intensity RF/MW exposure has no effect, and that the results of ongoing studies will take years to analyze. ⁽⁴¹⁾

Internationally, researchers and physicians have issued statements that biological effects from low-intensity RF/MW radiation exposure are scientifically established:

- The 1998 Vienna-EMF Resolution ⁽⁴²⁾
- The 2000 Salzburg Resolution on Mobile Telecommunication Base Stations ⁽⁴³⁾
- The 2002 Catania Resolution ⁽⁴⁴⁾
- The 2002 Freiburger Appeal ⁽⁴⁵⁾
- The 2004 Report of the European Union's REFLEX Project (Risk Evaluation of Potential Environmental Hazards from Low Frequency Electromagnetic Field Exposure Using Sensitive *in vitro* Methods) ⁽⁴⁶⁾
- The 2004 Second Annual Report from Sweden's Radiation Protection Board (SSI) Independent Expert Group on Electromagnetic Fields Recent Research on Mobile Telephony and Health Risks ⁽⁴⁷⁾
- Mobile Phones and Health 2004: Report by the Board of NRPB (The UK's National Radiological Protection Board) ⁽⁴⁸⁾

The county of Palm Beach, Florida, the City of Los Angeles, California, and the country of New Zealand have all prohibited cell phone base stations and antennas near schools due to safety concerns. The British Columbia Confederation of Parent Advisory Councils [BCCPAC] passed a resolution in 2003 banning cellular antennae from schools and school grounds. This organization is comparable to the Parent Teachers Association (PTA) in the United States. The resolution was directed to B.C. Ministry of Education, B.C. Ministry of Children and Family Development, B.C. School Trustees Association, and B.C. Association of Municipalities.

US Government Information

In the United States, the Federal Communications Commission (FCC) has used safety guidelines for RF/MW radiation environmental exposure since 1985.

The FCC guidelines for human exposure to RF/MW radiation are derived from the recommendations of two organizations, the National Council on Radiation Protection and Measurements (NCRP) and the Institute of Electrical and Electronics Engineers (IEEE). In both cases, the recommendations were developed by scientific and engineering experts drawn from industry, government, and academia after extensive reviews of the scientific literature related to the biological effects of RF/MW radiation.

Many countries in Europe and elsewhere use exposure guidelines developed by the International Commission on Non-Ionizing Radiation Protection (ICNIRP). The ICNIRP safety limits are generally similar to those of the NCRP and IEEE, with a few exceptions.

For example, ICNIRP recommends different exposure levels in the lower and upper frequency ranges and for localized exposure from certain products such as hand-held wireless telephones. Currently, the World Health Organization is working to provide a framework for international harmonization of RF/MW radiation safety standards.

In order to affirm conformity to standards regarding heating of tissue, measurements are time averaged over 0.1 hours [6 minutes]. This method eliminates any spikes in the readings. Computer power bars have surge protectors to prevent damage to computers. **Fire fighters and emergency medical personnel do not!**

The NCRP, IEEE, and ICNIRP all have identified a whole-body Specific Absorption Rate (SAR) value of 4 watts per kilogram (4 W/kg) as a threshold level of exposure at which harmful biological thermal effects due to tissue heating may occur. Exposure guidelines in terms of field strength, power density and localized SAR were then derived from this threshold value. In addition, the NCRP, IEEE, and ICNIRP guidelines vary depending on the frequency of the RF/MW radiation exposure. This is due to the finding that whole-body human absorption of RF/MW radiation varies with the frequency of the RF signal. The most restrictive limits on whole-body exposure are in the frequency range of 30-300 MHz where the human body absorbs RF/MW energy most efficiently. For products that only expose part of the body, such as wireless phones, exposure limits in terms of SAR only are specified.

Similarly, the exposure limits used by the FCC are expressed in terms of SAR, electric and magnetic field strength, and power density for transmitters operating at frequencies from 300 kHz to 100 GHz. The specific values can be found in two FCC bulletins, OET Bulletins 56 and 65.

OET Bulletin 56, "Questions and Answers about Biological Effects and Potential Hazards of Radiofrequency Electromagnetic Fields" was designed to provide factual information to the public by answering some of the most commonly asked questions. It includes the latest information on FCC guidelines for human exposure to RF/MW radiation. Further information and a downloadable version of Bulletin 56 can be found at: <http://www.fcc.gov/oet/info/documents/bulletins/#56>

OET Bulletin 65, "Evaluating Compliance With FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields" was prepared to provide assistance in determining whether proposed or existing transmitting facilities, operations or devices comply with limits for human exposure to RF/MW radiation adopted by the Federal Communications Commission (FCC). Further information and a downloadable version of Bulletin 65 can be found at: <http://www.fcc.gov/oet/info/documents/bulletins/#65>

The FCC authorizes and licenses products, transmitters, and facilities that generate RF and microwave radiation. It has jurisdiction over all transmitting services in the U.S. except those specifically operated by the Federal Government. Under the National Environmental Policy Act of 1969 (NEPA), the FCC has certain responsibilities to

consider whether its actions will significantly affect the quality of the human environment. Therefore, FCC approval and licensing of transmitters and facilities must be evaluated for significant impact on the environment. Human exposure to RF radiation emitted by FCC-regulated transmitters is one of several factors that must be considered in such environmental evaluations. In 1996, the FCC revised its guidelines for RF/MW radiation exposure as a result of a multi-year proceeding and as required by the Telecommunications Act of 1996.

For further information and answers to questions about the safety of RF/MW radiation from transmitters and facilities regulated by the FCC go to <http://www.fcc.gov/oet/rfsafety/rf-faqs.html>.

Canadian Government Information

Industry Canada is the organization that sets regulatory requirements for electromagnetic spectrum management and radio equipment in Canada. Industry Canada establishes standards for equipment certification and, as part of these standards, developed RSS-102, which specifies permissible radiofrequency RF/MW radiation levels. For this purpose, Industry Canada adopted the limits outlined in Health Canada's Safety-Code 6, which is a guideline document for limiting RF exposure. A downloadable version of "*RSS-102 - Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields*", as well as additional information can be found at: [http://strategis.ic.gc.ca/epic/internet/insmt-gst.nsf/vwapj/rss102.pdf/\\$FILE/rss102.pdf](http://strategis.ic.gc.ca/epic/internet/insmt-gst.nsf/vwapj/rss102.pdf/$FILE/rss102.pdf).

Safety Code 6 specifies the requirements for the use of radiation emitting devices. This Code replaces the previous Safety Code 6 - EHD-TR-160. A downloadable version of "*Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz TO 300 GHz - Safety Code 6*", as well as further detailed information can be found at <http://www.hc-sc.gc.ca/hecs-sesc/ccrpb/publication/99ehd237/toc.htm>.

US and Canadian Legal Issues

Although some local and state governments have enacted rules and regulations about human exposure to RF/MW radiation in the past, the Telecommunications Act of 1996 requires the United States Federal Government to control human exposure to RF/MW radiation. In particular, Section 704 of the Act states that, "No State or local government or instrumentality thereof may regulate the placement, construction, and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the Commission's regulations concerning such emissions." Further information on federal authority and FCC policy is available in a fact sheet from the FCC's Wireless Telecommunications Bureau at www.fcc.gov/wtb.

In a recent opinion filed by Senior Circuit Judge Stephen F. Williams, No. 03-1336 *EMR Network v. Federal Communications Commission and United States of America*, the Court upheld the FCC's decision not to initiate an inquiry on the need to revise its regulations to address non-thermal effects of radiofrequency (RF) radiation from the facilities and products subject to FCC regulation as EMR Network had requested in its September 2001 Petition for Inquiry.

At the request of the EMR Network, the EMR Policy Institute provided legal and research support for this appeal. On January 13, 2005, a Petition for Rehearing *en banc* by the full panel of judges at the DC Circuit Court of Appeals was filed. Briefs, background documents and the DC Circuit decision are found at: http://www.emrpolicy.org/litigation/case_law/index.htm.

The Toronto Medical Officer of Health for the Toronto Board of Health recommended to Health Canada that public exposure limits for RF/MW radiation be made 100 times stricter; however the recommendation was not allowed, since, as in the US, only the Canadian federal government can regulate RF/MW radiation exposure level.

World Health Organization Efforts

In 1996, the World Health Organization (WHO) established the International EMF Project to review the scientific literature and work towards resolution of health concerns over the use of RF/MW technology. WHO maintains a Web site that provides addition information on this project and about RF/MW biological effects and research. For further information go to <http://www.who.int/peh-emf/en/>.

Conclusion

For decades, the International Association of Fire Fighters has been directly involved in protecting and promoting the health and safety of our membership. However, we simply don't know at this time what the possible health consequences of long-term-exposure to low-intensity RF/MW radiation of the type used by the cell phone base stations and antennas will be. No one knows--the data just aren't there. The chairman of the International Commission on Non-Ionizing Radiation Protection (ICNIRP), one of the leading international organizations which formulated the current RF/MW radiation exposure guidelines, has stated that the guidelines include "no consideration regarding prudent avoidance" for health effects for which evidence is less than conclusive ⁽⁴⁹⁾

Again, fire department facilities, where fire fighters and emergency response personnel live and work are not the proper place for a technology which could endanger their health and safety

The only reasonable and responsible course is to conduct a study of the highest scientific merit and integrity on the RF/MW radiation health effects to our membership and, in the interim, oppose the use of fire stations as base stations for towers and/or antennas

for the conduction of cell phone transmissions until it is proven that such sitings are not hazardous to the health of our members.

Footnotes

[\[back\]](#) 1. **Revised and Amended IAFF Resolution No. 15; August 2004**

Study of Firefighters Exposed to Radio Frequency (RF) Radiation from Cell Towers/Masts

WHEREAS, fire stations across the United States and Canada are being sought by wireless companies as base stations for the antennas and towers for the conduction of cell phone transmissions; and

WHEREAS, many firefighters who are living with cell towers on or adjacent to their stations are paying a substantial price in terms of physical and mental health. As first responders and protectors of the general public, it is crucial that firefighters are functioning at optimal cognitive and physical capacity at all times; and

WHEREAS, the brain is the first organ to be affected by RF radiation and symptoms manifest in a multitude of neurological conditions including migraine headaches, extreme fatigue, disorientation, slowed reaction time, vertigo, vital memory loss and attention deficit amidst life threatening emergencies; and

WHEREAS, most of the firefighters who are experiencing symptoms can attribute the onset to the first week(s) these towers/antennas were activated; and

WHEREAS, RF radiation is emitted by these cellular antennas and RF radiation can penetrate every living cell, including plants, animals and humans; and

WHEREAS, both the U. S. and Canadian governments established regulatory limits for RF radiation based on thermal (heat) measurements with no regard for the adverse health effects from non-thermal radiation which is proven to harm the human brain and immune system; and

WHEREAS, the U. S. Environmental Protection Agency stated in a July 16, 2002, letter, "Federal health and safety agencies have not yet developed policies concerning possible risk from long-term, non-thermal exposures. The FCC's exposure guideline is considered protective of effects arising from a thermal mechanism (RF radiation from cell towers is non-thermal) but not from all possible mechanisms. Therefore, the generalization by many that the guidelines protecting human beings from harm by any or all mechanisms is not justified"; and

WHEREAS, an Expert Panel Report requested by the Royal Society of Canada prepared for Health Canada (1999) stated that, "Exposure to RF fields at intensities far less than

levels required to produce measurable heating can cause effects in cells and tissues. These biological effects include alterations in the activity of the enzyme ornithine decarboxylase, in calcium regulation, and in the permeability of the blood-brain barrier. Some of these biological effects brought about by non-thermal exposure levels of RF could potentially be associated with adverse health effects"; and

WHEREAS, based on concerns over growing scientific evidence of dangers from RF radiation, an international conference was convened in Salzburg, Austria, in the summer of 2000 where renowned scientists declared the upper-most RF radiation exposure limit from a tower-mast should be 1/10th of 1 microwatt (Note that 1/10th of 1 microwatt is 10,000 times lower than the uppermost limit allowed by the U. S. or Canada.); and it should be noted this limit was set because of study results showing brain wave changes at 1/10th of 1 microwatt; and

WHEREAS, in a recently cleared paper by Dr. Richard A. Albanese of the U. S. Air Force, a highly recognized physician in the area of the impact of radiation on the human body, Dr. Albanese states, "I would ask a good faith effort in achieving as low exposure rates as are possible within reasonable financial constraints. Also I would fund targeted studies using animal subjects and human groups living or working in high radiation settings or heavy cellular phone users, emphasizing disease causations. I urge acceptance of the ideal that there should be no unmonitored occupational or environmental exposures whose associated disease rates are unknown." (The opinions expressed herein are those of Dr. Albanese, and do not reflect the policies of the United States Air Force.); and

WHEREAS, recently a study, not affiliated with the wireless industry, was conducted of firefighters exposed to RF radiation from cell towers/antennas affixed to their stations. ** The study revealed brain damage that can be differentiated from chemical causation (such as inhalation of toxic smoke) suggesting RF radiation as the cause of the brain damage found on SPECT scans; and

WHEREAS, firefighters are the protectors of people and property and should be protected under the Precautionary Principle of Science and therefore, unless radiation is proven safe and harmless, cellular antennas should not be placed on or near fire stations; therefore be it

RESOLVED, That the IAFF shall seek funding for an initial U. S. and Canadian study with the highest scientific merit and integrity, contrasting firefighters with residence in stations with towers to firefighters without similar exposure; and be it further

RESOLVED, That in accordance with the results of the study, the IAFF will establish protective policy measures with the health and safety of all firefighters as the paramount objective; and be it further

RESOLVED, That the IAFF oppose the use of fire stations as base stations for antennas and towers for the conduction of cell phone transmissions until such installations are proven not to be hazardous to the health of our members.

****Note:** A pilot study was conducted in 2004 of six California fire fighters working and sleeping in stations with towers. The study, conducted by Gunnar Heuser, M.D., PhD. of Agoura Hills, CA, focused on neurological symptoms of six fire fighters who had been working for up to five years in stations with cell towers. Those symptoms included slowed reaction time, lack of focus, lack of impulse control, severe headaches, anesthesia-like sleep, sleep deprivation, depression, and tremors. Dr. Heuser used functional brain scans - SPECT scans - to assess any changes in the brains of the six fire fighters as compared to healthy brains of men of the same age. Computerized psychological testing known as TOVA was used to study reaction time, impulse control, and attention span. The SPECT scans revealed a pattern of abnormal change which was concentrated over a wider area than would normally be seen in brains of individuals exposed to toxic inhalation, as might be expected from fighting fires. Dr. Heuser concluded the only plausible explanation at this time would be RF radiation exposure. Additionally, the TOVA testing revealed among the six fire fighters delayed reaction time, lack of impulse control, and difficulty in maintaining mental focus.

[back] 2. An international blue ribbon panel assembled by the National Institute of Environmental Health Sciences (NIEHS) designated power frequency electromagnetic fields (EMF) as "possible human carcinogens" on June 24, 1998. The panel's decision was based largely on the results of epidemiological studies of children exposed at home and workers exposed on the job. The evaluation of the EMF literature followed procedures developed by the International Agency for Research on Cancer (IARC), based in Lyon, France. The working group's report will be the basis for the NIEHS report to Congress on the EMF Research and Public Information Dissemination program (EMF RAPID). The National Radiological Protection Board (NRPB) of the United Kingdom noted that the views of its Advisory Group on Non-Ionizing Radiation are "consistent with those of the NIEHS expert panel."

June 26, 1998 statement of the National Radiological Protection Board, cited in Microwave News, July/August 1998

[back] 3. World Health Organization; International Agency for Research on Cancer; IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; Volume 80 Non-Ionizing Radiation, Part 1: Static and Extremely Low-Frequency (ELF) Electric and Magnetic Fields; 2002; 429 pages; ISBN 92 832 1280 0; See <http://www-cic.iarc.fr/htdocs/monographs/vol80/80>. This IARC Monograph provides the rationale for its designation of ELF/EMF as a possible human carcinogen. It states that:

A few studies on genetic effects have examined chromosomal aberrations and micronuclei in lymphocytes from workers exposed to ELF electric and magnetic fields. In these studies, confounding by genotoxic agents (tobacco, solvents) and

comparability between the exposed and control groups are of concern. Thus, the studies reporting an increased frequency of chromosomal aberrations and micronuclei are difficult to interpret.

Many studies have been conducted to investigate the effects of ELF magnetic fields on various genetic end-points. Although increased DNA strand breaks have been reported in brain cells of exposed rodents, the results are inconclusive; most of the studies show no effects in mammalian cells exposed to magnetic fields alone at levels below 50 μ T. However, extremely strong ELF magnetic fields have caused adverse genetic effects in some studies. In addition, several groups have reported that ELF magnetic fields enhance the effects of known DNA- and chromosome-damaging agents such as ionizing radiation.

The few animal studies on cancer-related non-genetic effects are inconclusive. Results on the effects on in-vitro cell proliferation and malignant transformation are inconsistent, but some studies suggest that ELF magnetic fields affect cell proliferation and modify cellular responses to other factors such as melatonin. An increase in apoptosis following exposure of various cell lines to ELF electric and magnetic fields has been reported in several studies with different exposure conditions. Numerous studies have investigated effects of ELF magnetic fields on cellular end-points associated with signal transduction, but the results are not consistent.

[back] 4. The International Commission on Non-Ionizing Radiation Protection (ICNIRP) statement "Health Issues Related to the Use of Hand-Held Radiotelephones and Base Transmitters" of 1996 reads:

"Thermally mediated effects of RF fields have been studied in animals, including primates. These data suggest effects that will probably occur in humans subjected to whole body or localized heating sufficient to increase tissue temperatures by greater than 1°C. They include the induction of opacities of the lens of the eye, possible effects on development and male fertility, various physiological and thermoregulatory responses to heat, and a decreased ability to perform mental tasks as body temperature increases. Similar effects have been reported in people subject to heat stress, for example while working in hot environments or by fever. The various effects are well established and form the biological basis for restricting occupational and public exposure to radiofrequency fields. In contrast, non-thermal effects are not well established and currently do not form a scientifically acceptable basis for restricting human exposure for frequencies used by hand-held radiotelephones and base stations."

International Commission on Non-Ionizing Radiation Protection, "Health Issues Related to the Use of Hand-Held Radiotelephones and Base Transmitters," Health Physics 70:587-593, 1996

The ANSI/IEEE Standard for Safety Levels of 1992 similarly states:

"An extensive review of the literature revealed once again that the most sensitive measurements of potentially harmful biological effects were based on the disruption of ongoing behavior associated with an increase of body temperature in the presence of electromagnetic fields. Because of the paucity of reliable data on chronic exposures, IEEE Subcommittee IV focused on evidence of behavioral disruption under acute exposures, even disruption of a transient and fully reversible nature."

IEEE Standards Coordinating committee 28 on Non-Ionizing Radiation Hazards: Standard for Safe Levels With Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 KHz to 300 GHz (ANSI/IEEE C95.1-1991), The Institute of Electrical and Electronics Engineers, New York, 1992.

[back] 5. Drs. Czerska, Casamento, Ning, and Davis (working for the Food and Drug Administration in 1997) using "a waveform identical to that used in digital cellular phones" at a power level within our current standards (SAR of 1.6 W/Kg, the maximum spatial peak exposure level recommended for the general population in the ANSI C95.1-1991 standard) found increases in cellular proliferation in human glioblastoma cells. This shows that "acceptable" levels of radiation can cause human cancer cells to multiply faster. The authors note that "because of reported associations between cellular phone exposure and the occurrence of a brain tumor, glioblastoma, a human glioblastoma cell line was used" in their research.

E.M. Czerska, J. Casamento, J. T. Ning, and C. Davis, "Effects of Radiofrequency Electromagnetic Radiation on Cell Proliferation," [Abstract presented on February 7, 1997 at the workshop 'Physical Characteristics and Possible Biological Effects of Microwaves Applied in Wireless Communication, Rockville, MD] E. M. Czerska, J. Casamento Centers for Devices and Radiological Health, Food and Drug Administration, Rockville, Maryland 20857, USA; H. T. Ning, Indian Health Service, Rockville, Maryland 20857, USA; C. Davis, Electrical Engineering Dept., Univ. of Maryland, College Park, Maryland 20742, USA

[back] 6. Dr. Michael Repacholi (in 1997, currently the director of the International Electromagnetic Fields Project at the World Health Organization) took one hundred transgenic mice and exposed some to radiation for two 30 minute periods a day for up to 18 months. He found that the exposed mice developed lymphomas (a type of cancer) at twice the rate of the unexposed mice. While telecommunications industry spokespersons criticized the experiment for using mice with a mutation which predisposed them to cancer (transgenic) the researchers pointed out that "some individuals inherit mutations in other genes...that predispose them to develop cancer, and these individuals may comprise a subpopulation at special risk from agents that would pose an otherwise insignificant risk of cancer."

Dr. Repacholi stated "I believe this is the first animal study showing a true non-thermal effect." He repeated the experiment in 1998 using 50 Hz fields instead of the 900 MHz pulsed radiation (the type used by cellular phones) used in the original experiment and

found no cancer risk. He stated that this new data had implications for his original cellular phone study: "the control groups for both our RF and 50 Hz field studies showed no statistical differences, which lessens the possibility that the RF/MW radiation study result was a chance event or due to errors in methodology."

It is extremely important to note that Dr. Michael Repacholi was Chairman of the ICNIRP at the time its Statement on Health Issues Related to the Use of Hand-Held Radiotelephones and Base Transmitters was developed in 1996.

M. Repacholi et al., "Lymphomas in Eμ-Pim1 Transgenic Mice Exposed to Pulsed 900 MHz Electromagnetic Fields," Radiation Research, 147, pp.631-640, May 1997

[back] 7. Dr. Ross Adey (Veterans Administration Hospital at Loma Linda University in 1996) found what appeared to be a protective effect in rats exposed to the type of radiation used in digital cellular phones. The rats were exposed to an SAR of 0.58-0.75 W/Kg 836 MHz pulsed radiation of the TDMA type two hours a day, four days a week for 23 months, with the signals turned on and off every 7.5 minutes, so total exposure was 4 hours a week. Interestingly this effect was not present when a non-digital, analog signal was used. Rats exposed developed cancer less often. This study shows that low power fields of the digital cellular frequency can influence cancer development. Whether they would protect or promote in our children is a question for further study.

Ross Adey of the Veterans Administration Hospital at Loma Linda University, CA presented the results of pulsed (digital cellular) radiation on June 13, 1996 at the 18th Annual Meeting of the Bioelectromagnetics Society in Victoria, Canada. He presented the findings of the analog cellular phone radiation effect at the June 1997 2nd World Congress for Electricity and Magnetism in Biology and Medicine in Bologna, Italy. Reviews can be found in Microwave News issues July/August, 1996 and March/April 1997.

In recognition of his more than three decades of "fundamental contributions to the emerging science of the biological effects of electromagnetic fields," the authors of the November 2004 Report of the European Union's REFLEX Project (*Risk Evaluation of Potential Environmental Hazards From Low Frequency Electromagnetic Field Exposure Using Sensitive in vitro Methods*) chose to include Dr. Adey's personal views on Electromagnetic Field Exposure research as the Foreword to that report. To view the entire report,

see: http://www.itis.ethz.ch/downloads/REFLEX_Final%20Report_171104.pdf

The following is taken from Dr. Adey's Foreword found on pages 1-3 of the REFLEX Report:

The Future of Fundamental Research in a Society Seeking Categorical Answers to Health Risks of New Technologies

In summary, we have become superstitious users of an ever-growing range of technologies, but we are now unable to escape the web that they have woven around us.

Media reporters in general are no better informed. Lacking either responsibility or accountability, they have created feeding frenzies from the tiniest snippets of information gleaned from scientific meetings or from their own inaccurate interpretation of published research. In consequence, the public has turned with pleading voices to government legislatures and bureaucracies for guidance . . .

We face the problem brought on by the blind leading the blind. Because of public pressure for rapid answers to very complex biological and physical issues, short-term research programs have been funded to answer specific questions about certain health risks.

In many countries, and particularly in the USA, the effects of such harassing and troublesome tactics on independent, careful fundamental research have been near tragic. Beguiled by health hazard research as the only source of funding, accomplished basic scientists have diverted from a completely new frontier in physical regulation of biological mechanisms at the atomic level. Not only have governments permitted corporate interests in the communications industry to fund this research, they have even permitted them to determine the research questions to be addressed and to select the institutions performing the research.

[back] 8. Dr. A. W. Guy reported an extensive investigation on rats chronically exposed from 2 up to 27 months of age to low-level pulsed microwaves at SARs up to 0.4 W/Kg. The exposed group was found to have a significantly higher incidence of primary cancers.

A. W. Guy, C. K. Chou, L. Kunz, L. Crowley, and J. Krupp, "Effects of Long-Term Low-Level Radiofrequency Radiation Exposure on Rats." Volume 9. Summary. Brooks Air Force Base, Texas, USAF School of Aerospace Medicine, USF-SAM-TR-85-11; 1985

[back] 9. Drs. Henry Lai and N. P. Singh of the University of Washington in Seattle have reported both single- and double-strand DNA breaks in the brains of rats exposed to radiofrequency electromagnetic radiation at an SAR of 1.2 W/Kg. DNA is the carrier of the genetic information in all living cells. Cumulated DNA strand breaks in brain cells can lead to cancer or neurodegenerative diseases.

H. Lai and N. P. Singh, "Single- and Double-Strand DNA Breaks in Rat Brain Cells After Acute Exposure to Radiofrequency Electromagnetic Radiation," International Journal of Radiation Biology, Vol 69, No. 4, 513-521, 1996

[back] 10. Dr. Stanislaw Szmigielski has studied many thousands of Polish soldiers. He has found that those exposed to radiofrequency and microwave radiation in the workplace had more than double the cancer rate of the unexposed servicemen analyzing data from 1971-1985. He has presented further data suggesting a dose-response

relationship with soldiers exposed to 100-200 W/cm² suffering 1.69 times as many cancers as the unexposed, and those exposed to 600-1000 W/cm² suffering 4.63 times as many cancers. The level considered safe for the public according to FCC regulations is 1000 W/cm². Occupational exposure up to 5000 W/cm² is allowed.

S. Szmigielski, "Cancer Morbidity in Subjects Occupationally Exposed to High Frequency (Radiofrequency and Microwave) Electromagnetic Radiation," The Science of the Total Environment 180:9-17, 1996

[back] 11. Dr. Bruce Hocking found an association between increased childhood leukemia incidence and mortality in the proximity of television towers. The power density ranged from 0.2-8.0 W/cm² nearer and 0.02 W/cm² farther from the towers.

B. Hocking, I. R. Gordon, H. L. Grain, and G. E. Hatfield, "Cancer Incidence and Mortality and Proximity to TV Towers," Medical Journal of Australia 165: 601-605; 1996

[back] 12. Drs. Mann and Röscke investigated the influence of pulsed high-frequency RF/MW radiation of digital mobile radio telephones on sleep in healthy humans. They found a hypnotic effect with shortening of sleep onset latency and a REM (Rapid Eye Movement) suppressive effect with reduction of duration and percentage of REM sleep. "REM sleep plays a special physiological role for information processing in the brain, especially concerning consolidation of new experiences. Thus the effects observed possibly could be associated with alterations of memory and learning functions."

K. Mann and J. Röscke, "Effects of Pulsed High-Frequency Electromagnetic Fields on Human Sleep," Neuropsychobiology 33:41-47, 1996

[back] 13. Dr. Allen Frey has been researching RF/MW radiation for over 3 decades. Here is the abstract on a paper concerning headaches and cellular phone radiation. "There have been numerous recent reports of headaches occurring in association with the use of hand-held cellular telephones. Are these reported headaches real? Are they due to emissions from telephones? There is reason to believe that the answer is "yes" to both questions. There are several lines of evidence to support this conclusion. First, headaches as a consequence of exposure to low intensity microwaves were reported in the literature 30 years ago. These were observed during the course of microwave hearing research before there were cellular telephones. Second, the blood-brain barrier appears to be involved in headaches, and low intensity microwave energy exposure affects the barrier. Third, the dopamine-opiate systems of the brain appear to be involved in headaches, and low intensity electromagnetic energy exposure affects those systems. In all three lines of research, the microwave energy used was approximately the same—in frequencies, modulations, and incident energies—as those emitted by present day cellular telephones. Could the current reports of headaches be the canary in the coal mine, warning of biologically significant effects?"

A. H. Frey, "Headaches from Cellular Telephones: Are they Real and What Are the Implications?" *Environmental Health Perspectives* Volume 106, Number 3, pp.101-103, March 1998

[back] 14. Henry Lai's review of the literature concerning neurological effects of RF/MW radiation: Existing data indicate that RF/MW radiation of relatively low intensity can affect the nervous system. Changes in blood-brain barrier, morphology, electrophysiology, neurotransmitter functions, cellular metabolism, and calcium efflux, and genetic effects have been reported in the brain of animals after exposure to RF. These changes can lead to functional changes in the nervous system. Behavioral changes in animals after exposure to RR have been reported.

Even a temporary change in neural functions after RF/MW radiation exposure could lead to adverse consequences. For example, a transient loss of memory function or concentration could result in an accident when a person is driving. Loss of short term working memory has indeed been observed in rats after acute exposure to RF/MW radiation.

Research has also shown that the effects of RF/MW radiation on the nervous system can cumulate with repeated exposure. The important question is, after repeated exposure, will the nervous system adapt to the perturbation and when will homeostasis break down? Related to this is that various lines of evidence suggest that responses of the central nervous system to RF/MW radiation could be a stress response. Stress effects are well known to cumulate over time and involve first adaptation and then an eventual break down of homeostatic processes.

H. Lai, "Neurological Effects of Radiofrequency Electromagnetic Radiation Relating to Wireless Communication Technology," *Paper presentation at the IBC-UK Conference: "Mobile Phones-Is There a Health Risk?"* September 16-17, 1997, Brussels, Belgium

[back] 15. Blood-Brain-Barrier: The blood-brain-barrier (BBB) is primarily a continuous layer of cells lining the blood vessels of the brain. It is critical for regulation of the brain's activity. Lai notes that "Even though most studies indicate that changes in the BBB occurs only after exposure to RF/MW radiation of high intensities with significant increase in tissue temperature, several studies have reported increases in permeability after exposure to RF/MW radiation of relatively low intensities...Pulsed RF seems to be more potent than continuous wave RF." Pulsed RF/MW is the type used in digital cellular systems. Effects on the BBB were noted at the 0.2 W/cm² level, and even at SAR of 0.016-5 W/kg. These effects could lead to local changes in brain function.

H. Lai, *Ibid*

[back] 16. Cellular Morphology: RF/MW radiation induced morphological changes of the central nervous system cells and tissues have been shown to occur under relatively high intensity or prolonged exposure to the RF/MW radiation. However, there are several

studies which show that repeated exposure at relatively low power intensities caused morphological changes in the central nervous system. Again here pulsed (as in digital phone use) RF/MW radiation produced more pronounced effects. Certain drugs given to nonhuman primates sensitized them, for instance allowing eye damage to occur at very low power intensities. Dr Lai notes "Changes in morphology, especially cell death, could have an important implication on health. Injury-induced cell proliferation has been hypothesized as a cause of cancer." Some of these experiments were in the range of SAR 0.53 W/kg or even 0.26 W/kg.

H. Lai, Ibid

[back] 17. Neural Electrophysiology: Changes in neuronal electrophysiology, evoked potentials, and EEG have been reported. Some effects were observed at low intensities and after repeated exposure, suggesting cumulative effect. Energy density levels were as low as 50 W/cm².

H. Lai, Ibid

[back] 18. Neurotransmitters: Neurotransmitters are molecules which transmit information from one nerve cell to another. Early studies have reported changes in various neurotransmitters (catecholamines, serotonin, and acetylcholine) in the brain of animals only after exposure to high intensities of RF/MW radiation. However, there are more recent studies that show changes in neurotransmitter functions after exposure to low intensities of RF radiation. For example, effects were seen at 50 μ W/cm² in one experiment. U.S. and Canadian RF/MW radiation safety policies allow exposures of 1000 μ W/cm² at that frequency.

RF/MW radiation activates endogenous opioids in the brain. Endogenous opioids are neurotransmitters with morphine-like properties and are involved in many important physiological and behavioral functions, such as pain perception and motivation.

The response to RF/MW radiation depends on the area of the brain studied and on the duration of exposure. Exposure to RF/MW radiation has been shown to affect the behavioral actions of benzodiazepines (these are drugs such as Valium).

H. Lai, Ibid

[back] 19. Metabolic Changes in Neural Tissue: Several studies investigated the effects of RF/MW radiation exposure on energy metabolism in the rat brain. Surprisingly, changes were reported after exposure to relatively low intensity RF/MW radiation for a short duration of time (minutes). The effects depended on the frequency and modulation characteristics of the RF/MW radiation and did not seem to be related to temperature changes in the tissue.

Calcium ions play important roles in the functions of the nervous system, such as the release of neurotransmitters and the actions of some neurotransmitter receptors. Thus changes in calcium ion concentration could lead to alterations in neural functions. This is an area of considerable controversy because some researchers have also reported no significant effects of RF/MW radiation exposure on calcium efflux. However, when positive effects were observed, they occurred after exposure to RF/MW radiation of relatively low intensities and were dependent on the modulation and intensity of the RF/MW radiation studied (window effects). Some studies had SARs as low as 0.05-0.005 W/Kg.

H. Lai, Ibid

[back] 20. Cytogenetic effects have been reported in various types of cells after exposure to RF/MW radiation. Recently, several studies have reported cytogenetic changes in brain cells by RF/MW radiation, and these results could have important implication for the health effects of RF/MW radiation. Genetic damage to glial cells can result in carcinogenesis. However, since neurons do not undergo mitosis, a more likely consequence of neuronal genetic damage is changes in functions and cell death, which could either lead to or accelerate the development of neurodegenerative diseases. Power densities of 1 mW/cm² were employed, a level considered safe for the public by the FCC.

RF/MW radiation-induced increases in single and double strand DNA breaks in rats can be blocked by treating the rats with melatonin or the spin-trap compound N-t-butyl-phenylnitrone. Since both compounds are potent free radical scavengers, these data suggest that free radicals may play a role in the genetic effect of RF. If free radicals are involved in the RF-induced DNA strand breaks in brain cells, results from this study could have an important implication on the health effects of RF exposure. Involvement of free radicals in human diseases, such as cancer and atherosclerosis, has been suggested. Free radicals also play an important role in the aging process, which has been ascribed to be a consequence of accumulated oxidative damage to body tissues, and involvement of free radicals in neurodegenerative diseases, such as Alzheimer's, Huntington, and Parkinson, has also been suggested. One can also speculate that some individuals may be more susceptible to the effects of RF/MW radiation exposure.

H. Lai, Ibid

[back] 21. Dr. A. A. Kolodynski and V. V. Kolodynska of the Institute of Biology, Latvian Academy of Sciences, presented the results of experiments on school children living in the area of the Skrunda Radio Location Station in Latvia. Motor function, memory, and attention significantly differed between the exposed and control groups. The children living in front of the station had less developed memory and attention and their reaction time was slower.

A. A. Kolodynski, V. V. Kolodynska, "Motor and Psychological Functions of School Children Living in the Area of the Skrunda Radio Location Station in Latvia," *The Science of the Total Environment* 180:87-93, 1996

[back] 22. Dr. H. Lai and colleagues in 1993 exposed rats to 45 minutes of pulsed high frequency RF/MW radiation at low intensity and found that the rats showed retarded learning, indicating a deficit in spatial "working memory" function.

H Lai, A. Horita, and A. W. Guy, "Microwave Irradiation Affects Radial-Arm Maze Performance in the Rat," *Bioelectromagnetics* 15:95-104, 1994

NOTE: Dr. Lai's January 2005 compilation of published RF/MW radiation studies demonstrating biological effects of exposure to low-intensity RF/MW radiation is included as a Reference section at the end of this report.

[back] 23. Dr. Stefan Braune reported a 5-10 mm Hg resting blood pressure rise during exposure to RF/MW radiation of the sort used by cellular phones in Europe. The *Lancet*, the British medical journal where the report appeared, stated that "Such an increase could have adverse effects on people with high blood pressure."

S. Braune, "Resting Blood Pressure Increase During Exposure to a Radio-Frequency Electromagnetic Field," *The Lancet* 351, pp. 1,857-1,858, 1998

[back] 24. Dr. Kues and colleagues (of Johns Hopkins University and the Food and Drug Administration) found that placing timolol and pilocarpine into the eyes of monkeys and then exposing them to low power density pulsed RF/MW radiation caused a significant reduction in the power-density threshold for causing damage to the cells covering the eye and the iris. In fact the power was reduced by a factor of 10, so that it entered the "acceptable, safe" level of the FCC, 1 mW/cm²! Timolol and pilocarpine are commonly used by people suffering from glaucoma. This is a very important study, as it points to the fact that laboratory experiments under "ideal" conditions are rarely what one finds in real life. The "safe" level of RF/MW radiation exposure for healthy people is likely to be very different than for those of us who suffer from illness, take medications, or are perhaps simply younger or older than those in the experiments.

H. A. Kues, J. C. Monahan, S. A. D'Anna, D. S. McLeod, G. A. Luty, and S. Koslov, "Increased Sensitivity of the Non-Human Primate Eye to Microwave Radiation Following Ophthalmic Drug Pretreatment," *Bioelectromagnetics* 13:379-393, 1992

[back] 25. The World Health Organization states that "concerns have been raised about the safety of cellular mobile telephones, electric power lines and police speed-control 'radar guns.' Scientific reports have suggested that exposure to electromagnetic fields emitted from these devices could have adverse health effects, such as cancer, reduced fertility, memory loss, and adverse changes in the behaviour and development of children." Therefore, "In May 1996, in response to growing public health concerns in

many Member States over possible health effects from exposure to an ever-increasing number and diversity of EMF sources, the World Health Organization launched an international project to assess health and environmental effects of exposure to electric and magnetic fields, which became known as the International EMF Project. The International EMF Project will last for five years." "A number of studies at [frequencies above about 1 MHz] suggest that exposure to RF fields too weak to cause heating may have adverse health consequences, including cancer and memory loss. Identifying and encouraging coordinated research into these open questions is one of the major objectives of the International EMF Project."

World Health Organization Fact Sheet N181, "Electromagnetic Fields and Public Health, The International EMF Project," reviewed May 1998 and World Health Organization Fact Sheet N182, "Electromagnetic Fields and Public Health, Physical Properties and Effects on Biological Systems," reviewed May 1998,

[back] 26. The U. S. Food and Drug Administration in a January 14, 1998 letter to the House Telecommunications Subcommittee stated it "believes additional research in the area of RF is needed." In 1997 the FDA established the following priorities:

- Chronic (lifetime) animal exposures should be given the highest priority.
- Chronic animal exposures should be performed both with and without the application of chemical initiating agents to investigate tumor promotion in addition to tumorigenesis.
- Identification of potential risks should include end points other than brain cancer (e.g. ocular effects of RF radiation exposure).
- Replication of prior studies demonstrating positive biological effects work is needed. A careful replication of the Chou and Guy study (*Bioelectromagnetics*, 13, pp.469-496, 1992) which suggests that chronic exposure of rats to microwaves is associated with an increase in tumors, would contribute a great deal to the risk identification process for wireless communication products.
- Genetic toxicology studies should focus on single cell gel studies of DNA strand breakage and on induction of micronuclei.
- Epidemiology studies focused on approaches optimized for hazard identification are warranted.

Food and Drug Administration Recommendations quoted in Microwave News, March/April, 1997

[back] 27. The International Agency for Research on Cancer (IARC) is planning a multi-country, multi-million dollar study of cancer among users of wireless phones, beginning 1998. *Microwave News, January/February, 1998*

[back] 28. The Swedish Work Environmental Fund initiated a new epidemiological study on cellular phone radiation and brain tumors in 1997. *Microwave News, November/December, 1997*

[back] 29. The National Cancer Institute announced plans for a 5 year study of brain tumors and RF/MW radiation in 1993. *Microwave News, January/February, 1993*

[back] 30. The European Commission (EC) Expert Group on health effects of wireless phones called for a 5 year research program with a \$20 million budget, reported 1997. *Microwave News, January/February, 1997*

[back] 31. A report commissioned by New Zealand's Ministry of Health stated that "It is imperative that the scientific issues be clarified as soon as possible, as there is much at stake." It called for more research to examine the potential health effects of RF radiation. *Microwave News, November/December, 1996*

[back] 32. The National Health and Medical Research Council of Australia announced its sponsorship of a 5 year, \$3.5 million project on potential health effects of mobile phone technology in 1996. *Microwave News, November/December, 1996*

[back] 33. The Commonwealth Scientific Industrial Research Organization (CSIRO) of Australia concluded in 1995 that the safety of cellular telephones cannot be resolved "in the near future." Dr. Stan Barnett, a principal researcher of CSIRO, states that "My goal is to establish a national committee to approach this problem by coordinating relevant and focused research." He estimated a budget of \$3 million over a 3 year period would be necessary.

Commonwealth Scientific Industrial Research Organization, "Status of Research on Biological Effects and Safety of Electromagnetic Radiation: Telecommunications Frequencies," a report prepared by Dr. Stan Barnett, as cited in Microwave News, September/October, 1995

[back] 34. In Canada, Expert Panels are formed in response to requests from governments and other organizations for guidance on public policy issues where specialized knowledge is required. The Royal Society of Canada (RSC) is the only national academic organization, encompassing all fields of study in the sciences, arts and humanities that provides, through its Committee on Expert Panels, a service to Canadians by convening Expert Panels that produce publicly disseminated, arms-length, third party reviews. The most recent Expert Panel report addressing RF/MW radiation examines new data on dosimetry and exposure assessment, thermoregulation, biological effects such as enzyme induction, and toxicological effects, including genotoxicity, carcinogenicity, and testicular and reproductive outcomes. Epidemiological studies of mobile phone users and occupationally exposed populations are examined, along with human and animal studies of neurological and behavioural effects. All of the authoritative reviews completed within the last two years have supported the need for further research to clarify the possible associations between RF fields and adverse health outcomes that have appeared in some reports.

See: http://www.rsc.ca//index.php?lang_id=1&page_id=120.

[back] 35. The European Union effort to address this issue is in the study *Risk Evaluation of Potential Environmental Hazards from Low Energy Electromagnetic Field Exposure Using Sensitive in vitro Methods* (REFLEX). Exposure to electromagnetic fields (EMF) in relation to health is a controversial topic throughout the industrial world. So far epidemiological and animal studies have generated conflicting data and thus uncertainty regarding possible adverse health effects. This situation has triggered controversies in communities especially in Europe with its high density of population and industry and the omnipresence of EMF in infrastructures and consumer products. These controversies are affecting the siting of facilities, leading people to relocate, schools to close or power lines to be re-sited, all at great expense. The European Union believes that causality between EMF exposure and disease can never be regarded as proven without knowledge and understanding of the basic mechanisms possibly triggered by EMF. To search for those basic mechanisms powerful technologies developed in toxicology and molecular biology were to be employed in the REFLEX project to investigate cellular and sub-cellular responses of living cells exposed to EMF in vitro.

The REFLEX data have made a substantial addition to the data base relating to genotoxic and phenotypic effects of both ELF-EMF and RF-EMF on *in vitro* cellular systems. While the data neither precludes nor confirms a health risk due to EMF exposure nor was the project designed for this purpose, the value lies in providing new data that will enable mechanisms of EMF effects to be studied more effectively than in the past. Furthermore, the REFLEX data provide new information that will be used for risk evaluation by WHO, IARC and ICNIRP. For further information on REFLEX

see: http://europa.eu.int/comm/research/quality-of-life/ka4/ka4_electromagnetic_en.html

[back] 36. The Swedish Radiation Protections Institute (SSI) endeavors to ensure that human beings and the environment are protected from the harmful effects of radiation, both in the present and in the future. SSI has focused on epidemiological research on cancer and exposure from mobile phones and transmitters as well as experimental cancer research. In addition three selected topics were also discussed, namely blood-brain barrier, heat shock proteins, and precautionary framework. For further information on SSI see: http://www.ssi.se/forfattning/eng_forfattlista.html

[back] 37. In the United Kingdom, the National Radiological Protection Board (NRPB) was created by the Radiological Protection Act 1970. The statutory functions of NRPB are to advance the acquisition of knowledge about the protection of mankind from radiation hazards through research and to provide information and advice to persons (including Government Departments) with responsibilities in the United Kingdom in relation to the protection from radiation hazards either of the community as a whole or

of particular sections of the community. The NFPB believes that there is a need for better occupational studies rather than simply for more. In particular, the studies need to be of occupational groups for whom measurements show that there is genuinely a substantially raised exposure to RF fields. If the studies are to be more informative than those so far, a key requirement will be for improved exposure measurement (or improved estimation of exposure) for individuals, or at least for occupational groups. It would be desirable, as far as practical, that the studies should measure the intensity and timing of RF field exposures, and also that they should include some assessment of major RF field exposures from sources other than the current occupation. Ideally, exposure assessment needs to be anatomical site (organ)-specific, because some sources result in greatly differing doses to different parts of the body. It is a difficulty in these prescriptions, of course, that the appropriate exposure metric is unknown. For further information on NRPB see: <http://www.nrpb.org/index.htm>

[back] 38. On January 5, 2005, the EMF-Team Finland issued the Helsinki Appeal 2005 to members of the European Parliament. In it physicians and researchers call on the European Parliament to apply the Precautionary Principle to electromagnetic fields, especially in the radio- and microwave- frequency bands. They criticize the present RF/MW radiation safety standards that do not recognize the biological effects caused by non-thermal exposures to non-ionizing radiation [i.e., RF/MW radiation.] They also call for continued refunding of the REFLEX EMF research program. The text of the Helsinki Appeal 2005 is found at: <http://www.emrpolicy.org/news/headlines/index.htm>

[back] 39. On July 19, 1993 Dr. Elizabeth Jacobson, Deputy Director for Science, Center for Devices and Radiological Health, Food and Drug Administration criticized Thomas Wheeler, President of the Cellular Telecommunications Industry Association:

"I am writing to let you know that we were concerned about two important aspects of your press conference of July 16 concerning the safety of cellular phones, and to ask that you carefully consider the following comments when you make future statements to the press. First, both the written press statements and your verbal comments during the conference seemed to display an unwarranted confidence that these products will be found absolutely safe. In fact, the unremittingly upbeat tone of the press packet strongly implies that there can be no hazard, leading the reader to wonder why any further research would be needed at all.....More specifically, your press packet selectively quotes from our Talk Paper of February 4 in order to imply that FDA believes that cellular phones are "safe." ("There is no proof at this point that cellular phones are harmful.") In fact, the same Talk Paper also states, "There is not enough evidence to know for sure, either way." Our position, as we have stated it before, is this: Although there is no direct evidence linking cellular phones with harmful effects in humans, a few animal studies suggest that such effects could exist. It is simply too soon to assume that cellular phones are perfectly safe, or that they are hazardous--either assumption would be premature. This is precisely why more research is needed."

Full text of letter can be found in Microwave News, July/August, 1993

[back] 40. In 1993 the Director of the Office of Radiation and Indoor Air of the Environmental Protection Agency suggested that the FCC not adopt the 1992 ANSI/IEEE standard "due to serious flaws," among them (1) "the ANSI/IEEE conclusion that there is no scientific data indicating that certain subgroups of the population are more at risk than others is not supported by NCRP and EPA reports" and (2) "the thesis that ANSI/IEEE recommendations are protective of all mechanisms of interaction is unwarranted because the adverse effects level in the 1992 ANSI/IEEE standard are based on a thermal effect."

Letter from Margo T. Oge, Director, Office of Radiation and Indoor Air to Thomas Stanley, Chief Engineer, Office of engineering and Technology, FCC, dated Nov 9, 1993

[back] 41. A brief sampling of the CSIRO report:

Problems in studies of human populations published to date include imprecise estimates of exposure. As a result, such epidemiological studies may underestimate any real risk. The likelihood of epidemiological studies providing useful information is questionable, particularly if the biological end point cannot be predicted. Its value in the short term (less than 10 years) must be negligible unless there was an enormous increase in the rate of cancer growth. Interestingly, the incidence of brain tumors in the EC countries has increased substantially in recent years.

RF safety cannot be assessed in the absence of reported serious effects when so little research has been aimed at the problem. It is somewhat surprising, and rather disappointing, to find that although the literature contains many hundreds of publications, there are very few areas of consensus....At low levels the absence of clear thresholds and [the] presence of intensity and frequency windows have created questions rather than provided answers.

There is no doubt that the interpretation of bioeffects data has been clouded by a preoccupation with thermally mediated processes. In fact, development of the ANSI/IEEE standard is based only on well-established thermal effects, and ignores the more subtle non-thermal processes that are more difficult to interpret and apply to human health.

Commonwealth Scientific Industrial Research Organization, "Status of Research on Biological Effects and Safety of Electromagnetic Radiation: Telecommunications Frequencies," a report prepared by Dr. Stan Barnett, as cited in Microwave News, September/October, 1995

[back] 42. Statement from the October 25-28, 1998 "Symposium of Mobile Phones and Health - Workshop on Possible Biological and Health Effects of RF Electromagnetic Fields" held at the University of Vienna, Austria.

The preferred terminology to be used in public communication: Instead of using the terms "athermal", "non-thermal" or "microthermal" effects, the term "low intensity biological effects" is more appropriate.

Preamble: The participants agreed that biological effects from low-intensity exposures are scientifically established. However, the current state of scientific consensus is inadequate to derive reliable exposure standards. The existing evidence demands an increase in the research efforts on the possible health impact and on an adequate exposure and dose assessment.

Base stations: How could satisfactory Public Participation be ensured: The public should be given timely participation in the process. This should include information on technical and exposure data as well as information on the status of the health debate. Public participation in the decision (limits, siting, etc.) should be enabled.

Cellular phones: How could the situation of the users be improved: Technical data should be made available to the users to allow comparison with respect to EMF-exposure. In order to promote prudent usage, sufficient information on the health debate should be provided. This procedure should offer opportunities for the users to manage reduction in EMF-exposure. In addition, this process could stimulate further developments of low-intensity emission devices.

[back] 43. Statement from the June 7-8, 2000 International Conference on Cell Tower Siting Linking Science and Public Health, Salzburg, Austria. The full report can be found at: www.land-sbg.gv.at/celltower

- It is recommended that development rights for the erection and for operation of a base station should be subject to a permission procedure. The protocol should include the following aspects:
 - o Information ahead and active involvement of the local public
 - o Inspection of alternative locations for the siting
 - o Protection of health and wellbeing
 - o Considerations on conservation of land- and townscape
 - o Computation and measurement of exposure
 - o Considerations on existing sources of HF-EMF exposure
 - o Inspection and monitoring after installation

- It is recommended that a national database be set up on a governmental level giving details of all base stations and their emissions.
 - It is recommended for existing and new base stations to exploit all technical possibilities to ensure exposure is as low as achievable (ALATA-principle) and that new base stations are planned to guarantee that the exposure at places where people spend longer periods of time is as low as possible, but within the strict public health guidelines.
 - Presently the assessment of biological effects of exposures from base stations in the low-dose range is difficult but indispensable for protection of public health. There is at present evidence of no threshold for adverse health effects.
- o Recommendations of specific exposure limits are prone to considerable uncertainties and should be considered preliminary. For the total of all high frequency irradiation a limit value of 100 mW/m² (10 µW/cm²) is recommended.
- o For preventive public health protection a preliminary guideline level for the sum total of exposures from all ELF pulse modulated high-frequency facilities such as GSM base stations of 1 mW/m² (0.1 µW/cm²) is recommended.

[back] 44. Scientists attending the September 13-14, 2002 International Conference "State of the Research on Electromagnetic Fields – Scientific and Legal Issues," organized by ISPESL (National Institute for Prevention and Work Safety, Italy), the University of Vienna, and the City of Catania, held in Catania, Italy, agreed to the following:

- Epidemiological and *in vivo* and *in vitro* experimental evidence demonstrates the existence for electromagnetic field (EMF) induced effects, some of which can be adverse to health.
- We take exception to arguments suggesting that weak (low intensity) EMF cannot interact with tissue.
- There are plausible mechanistic explanations for EMF-induced effects which occur below present ICNIRP and IEEE guidelines and exposure recommendations by the EU.
- The weight of evidence calls for preventive strategies based on the precautionary principle. At times the precautionary principle may involve prudent avoidance and prudent use.
- We are aware that there are gaps in knowledge on biological and physical effects, and health risks related to EMF, which require additional independent research.

[back] 45. The Freiburger Appeal is a German based appeal by mainly medical practitioners who are concerned about the effects, they believe, from mobile phone technology including masts that are appearing in their patients. It started in Oct 2002 and with very little international publicity has got 50,000 signatories with at least 2000 medical signatures from across the world. Mast These physicians and scientists agreed to establish an international scientific commission to promote research for the

protection of public health from EMF and to develop the scientific basis and strategies for assessment, prevention, management and communication of risk, based on the precautionary principle.

Excerpt:

On the basis of our daily experiences, we hold the current mobile communications technology (introduced in 1992 and since then globally extensive) and cordless digital telephones (DECT standard) to be among the fundamental triggers for this fatal development. One can no longer evade these pulsed microwaves. They heighten the risk of already-present chemical/physical influences, stress the body-immune system, and can bring the body-still-functioning regulatory mechanisms to a halt. Pregnant women, children, adolescents, elderly and sick people are especially at risk.

Statement of the physicians and researchers of Interdisziplinäre Gesellschaft für Umweltmedizin e. V. (Interdisciplinary Association for Environmental Medicine) IGUMED, Sackingen, Germany, September 19, 2002. The Freiburger Appeal can be found at: <http://www.mastsanity.org/doctors-appeals.html>.

[back] 46. Report of the European Union's REFLEX Project (Risk Evaluation of Potential Environmental Hazards from Low Frequency Electromagnetic Field Exposure Using Sensitive *in vitro* Methods), November 2004. The Project studied ELF and RF exposures to various animal cell types. The report is found at: http://www.itis.ethz.ch/downloads/REFLEX_Final%20Report_171104.pdf

From the Summary: *[t]he omnipresence of EMF's in infrastructures and consumer products have become a topic of public concern. This is due to the fear of people that based on the many conflicting research data a risk to their health cannot be excluded with some certainty. Therefore, the overall objective of REFLEX was to find out whether or not the fundamental biological processes at the cellular and molecular level support such an assumption. For this purpose, possible effects of EMF's on cellular events controlling key functions, including those involved in carcinogenesis and in the pathogenesis of neurodegenerative disorders, were studied through focused research. Failure to observe the occurrence of such key critical events in living cells after EMF exposure would have suggested that further research efforts in this field could be suspended and financial resources be reallocated to the investigation of more important issues. But as clearly demonstrated, the results of the REFLEX project show the way into the opposite direction.*

[back] 47. From the Discussion section of the December 20, 2004 Second Annual Report of Sweden's Radiation Protection Board (SSI) entitled: *Recent Research on Mobile Telephony and Health Risks: Second Annual Report from SSI's Independent Expert Group on Electromagnetic Fields*. The complete report is available at: http://www.ssi.se/english/EMF_exp_Eng_2004.pdf

To date, little is known about the levels of radiofrequency radiation exposure in the general population from sources such as mobile phones being used by oneself or other people, mobile phone base stations, and radio and television transmitters. Measurements that have been performed have usually been made as a result of public concern about base station exposures or other specific sources, and have therefore been made at locations that could be assumed to have higher fields than would be the case if measurement locations were selected randomly. Furthermore, all measurements have been stationary, and there is today no knowledge about the level of exposure that an individual will have throughout the day.

There is need for information about the personal exposure to RF fields in the general population, to enhance the understanding of the relative importance of exposure from base stations close to the home, from radio and television transmitters, and from the use of mobile phones . . . Studies with personal RF exposure measurements of randomly selected samples of the general population are strongly encouraged.

[back] 48. Released January 11, 2005, Mobile Phones and Health 2004: Report by the Board of NRPB Documents of the NRPB: Volume 15, No. 5. Sec: http://www.nrpb.org/publications/documents_of_nrpb/abstracts/absd15-5.htm

From the Executive Summary:

The Board notes that a central recommendation in the Stewart Report was that a precautionary approach to the use of mobile phone technologies be adopted until much more detailed and scientifically robust information on any health effects becomes available.

The Board considers that it is important to understand the signal characteristics and field strengths arising from new telecommunications systems and related technologies, to assess the RF exposure of people, and to understand the potential biological effects on the human body.

[back] 49. The ICNIRP exposure guidelines are only designed to protect against "known adverse health impacts," according to Dr. Jürgen Bernhardt, ICNIRP's chairman. Bernhardt reviewed the updated limits, which cover the spectrum from 1 Hz to 300 GHz, in a presentation at the 20th Annual Meeting of the Bioelectromagnetics Society in St. Pete Beach, FL, on June 10. The limits protect against "short-term, immediate health effects" such as nerve stimulation, contact shocks and thermal insults, according to the guidelines, which appear in the April issue of *Health Physics* (74, pp.494-522, 1998). Despite "suggestive" evidence that power frequency magnetic fields can be carcinogenic, ICNIRP has concluded that this and other non-thermal health effects have not been "established." ICNIRP has long followed this approach to standard-setting. In his talk, Bernhardt noted that the guidelines include "no consideration regarding prudent avoidance" for health effects for which evidence is less than conclusive.

Additional References and Studies

The following references reporting biological effects of radiofrequency radiation (RFR) at low intensities through January 2005 were compiled on 12/27/04 by Henry C. Lai PhD, Research Professor of Bioengineering, University of Washington, Seattle, WA

Balode *Sci Total Environ* 180(1):81-85, 1996 - blood cells from cows from a farm close and in front of a radar installation showed significantly higher level of severe genetic damage.

Boscol et al. *Sci Total Environ* 273(1-3):1-10, 2001 - RFR from radio transmission stations (0.005 mW/cm²) affects immune system in women.

Chiang et al. *J. Bioelectricity* 8:127-131, 1989 - people who lived and worked near radio antennae and radar installations showed deficits in psychological and short-term memory tests.

de Pomerai et al. *Nature* 405:417-418, 2000. *Enzyme Microbial Tech* 30:73-79, 2002 - reported an increase in a molecular stress response in cells after exposure to a RFR at a SAR of 0.001 W/kg. This stress response is a basic biological process that is present in almost all animals - including humans.

de Pomerai et al. (*FEBS Lett* 22:543(1-3):93-97, 2003 - RFR damages proteins at 0.015-0.020 W/kg.

D'Inzeo et al. *Bioelectromagnetics* 9(4):363-372, 1988 - very low intensity RFR (0.002 - 0.004 mW/cm²) affects the operation of acetylcholine-related ion-channels in cells. These channels play important roles in physiological and behavioral functions.

Dolk et al. *Am J Epidemiol* 145(1):1-9 1997- a significant increase in adult leukemias was found in residents who lived near the Sutton Coldfield television (TV) and frequency modulation (FM) radio transmitter in England.

Dutta et al. *Bioelectromagnetics* 10(2):197-202 1989 - reported an increase in calcium efflux in cells after exposure to RFR at 0.005 W/kg. Calcium is an important component of normal cellular functions.

Fesenko et al. *Bioelectrochem Bioenerg* 49(1):29-35, 1999 - reported a change in immunological functions in mice after exposure to RFR at a power density of 0.001 mW/cm².

Hallberg O, Johansson O, (2004) concluded that continuous disturbance of cell repair mechanisms by body-resonant FM electromagnetic fields seems to amplify the carcinogenic effects resulting from cell damage caused e.g. by UV-radiation.

Hjollund et al. *Reprod Toxicol* 11(6):897, 1997 - sperm counts of Danish military personnel, who operated mobile ground-to-air missile units that use several RFR emitting radar systems (maximal mean exposure 0.01 mW/cm²), were significantly lower compared to references.

Hocking et al. *Med J Aust* 165(11-12):601-605, 1996 - an association was found between increased childhood leukemia incidence and mortality and proximity to TV towers.

Ivaschuk et al. *Bioelectromagnetics* 18(3):223-229, 1999 - short-term exposure to cellular phone RFR of very low SAR (26 mW/kg) affected a gene related to cancer.

Kolodynski and Kolodynska, *Sci Total Environ* 180(1):87-93, 1996 - school children who lived in front of a radio station had less developed memory and attention, their reaction time was slower, and their neuromuscular apparatus endurance was decreased.

Kwee et al. *Electro- and Magnetobiology* 20: 141-152, 2001 - 20 minutes of cell phone RFR exposure at 0.0021 W/kg increased stress protein in human cells.

Lebedeva et al. *Crit Rev Biomed Eng* 28(1-2):323-337, 2000 - brain wave activation was observed in human subjects exposed to cellular phone RFR at 0.06 mW/cm².

Magras and Xenos *Bioelectromagnetics* 18(6):455-461, 1999 - reported a decrease in reproductive function in mice exposed to RFR at power densities of 0.000168 - 0.001053 mW/cm². Irreversible sterility was found in the fifth generation of offspring.

Mann et al. *Neuroendocrinology* 67(2):139-144, 1998 - a transient increase in blood cortisol was observed in human subjects exposed to cellular phone RFR at 0.02 mW/cm². Cortisol is a hormone involved in stress reaction.

Marinelli et al. *J Cell Physiol*. 198(2):324-332, 2004 - exposure to 900-MHz RFR at 0.0035 W/kg affected cell's self-defense responses.

Micheloizzi et al. *Epidemiology* 9 (Suppl) 354p, 1998 - leukemia mortality within 3.5 km (5,863 inhabitants) near a high power radio-transmitter in a peripheral area of Rome was higher than expected.

Micheloizzi et al. *Am J Epidemiol* 155(12):1096-1103, 2002 - childhood leukemia higher at a distance up to 6 km from a radio station.

Navakatikian and Tomashevskaya "Biological Effects of Electric and Magnetic Fields, Volume 1," D.O. Carpenter (ed) Academic Press, San Diego, CA, pp.333-342. 1994 - RFR

at low intensities (0.01 - 0.1 mW/cm²; 0.0027- 0.027 W/kg) induced behavioral and endocrine changes in rats. Decreases in blood concentrations of testosterone and insulin were reported.

Novoselova et al. *Bioelectrochem Bioenerg* 49(1):37-41, 1999 -low intensity RFR (0.001 mW/cm²) affects functions of the immune system.

Park et al. *International Archives of Occupational and Environmental Health* 77(6):387-394, 2004 - higher mortality rates for all cancers and leukemia in some age groups in the area near the AM radio broadcasting towers.

Persson et al. *Wireless Network* 3:455-461, 1997 - reported an increase in the permeability of the blood-brain barrier in mice exposed to RFR at 0.0004 - 0.008 W/kg. The blood-brain barrier envelops the brain and protects it from toxic substances.

Phillips et al. *Bioelectrochem. Bioenerg.* 45:103-110, 1998 - reported DNA damage in cells exposed to RFR at SAR of 0.0024 - 0.024 W/kg.

Polonga-Moraru et al. *Bioelectrochemistry* 56(1-2):223-225, 2002 - change in membrane of cells in the retina (eye) after exposure to RFR at 15 μ W/cm².

Pyrpasopoulou et al. *Bioelectromagnetics* 25(3):216-227, 2004 - exposure to cell phone radiation during early gestation at SAR of 0.0005 W/kg (5 μ W/cm²) affected kidney development in rats.

Salford et al. *Environ Health Persp Online* January 29, 2003 - Nerve cell damage in mammalian brain after exposure to microwaves from GSM mobile phones signal at 0.02 W/kg.

Santini et al. *Pathol Biol (Paris)* 50(6):369-373, 2002 - increase in complaint frequencies for tiredness, headache, sleep disturbance, discomfort, irritability, depression, loss of memory, dizziness, libido decrease, in people who lived within 300 m of mobile phone base stations.

Sarimov et al. *IEEE Trans Plasma Sci* 32:1600-1608, 2004 - GSM microwaves affect human lymphocyte chromatin similar to stress response at 0.0054 W/kg.

Schwartz et al. *Bioelectromagnetics* 11(4):349-358, 1990 - calcium movement in the heart affected by RFR at SAR of 0.00015 W/kg. Calcium is important in muscle contraction. Changes in calcium can affect heart functions.

Somosy et al. *Scanning Microsc* 5(4):1145-1155, 1991 - RFR at 0.024 W/kg caused molecular and structural changes in cells of mouse embryos.

Stagg et al. *Bioelectromagnetics* 18(3):230-236, 1997- glioma cells exposed to cellular phone RFR at 0.0059 W/kg showed significant increases in thymidine incorporation, which may be an indication of an increase in cell division.

Stark et al. *J Pineal Res* 22(4):171-176, 1997 - a two- to seven-fold increase of salivary melatonin concentration was observed in dairy cattle exposed to RFR from a radio transmitter antenna.

Tattersall et al. *Brain Res* 904(1):43-53, 2001 - low-intensity RFR (0.0016 - 0.0044 W/kg) can modulate the function of a part of the brain called the hippocampus, in the absence of gross thermal effects. The changes in excitability may be consistent with reported behavioral effects of RFR, since the hippocampus is involved in learning and memory.

Vangelova et al. *Cent Eur J Public Health* 10(1-2):24-28, 2002 - operators of satellite station exposed to low dose (0.1127 J/kg) of RFR over a 24-hr shift showed an increased excretion of stress hormones.

Velizarov et al. *Bioelectrochem Bioenerg* 48(1):177-180, 1999 - showed a decrease in cell proliferation (division) after exposure to RFR of 0.000021 - 0.0021 W/kg.

Veyret et al. *Bioelectromagnetics* 12(1):47-56, 1991 - low intensity RFR at SAR of 0.015 W/kg affects functions of the immune system.

Wolke et al. *Bioelectromagnetics* 17(2):144-153, 1996 - RFR at 0.001W/kg affects calcium concentration in heart muscle cells of guinea pigs.

Return to Top of Document

The International Association of Fire Fighters recognizes IAFF Local 3368, Carpinteria-Summerland, California, who brought this issue to the attention of our membership through the Resolution 15, submitted through our biennial convention in August 2004. Additionally, the following local affiliates provided support for the passage of the resolution: Brookline, Massachusetts, San Diego, California, San Francisco, California and Vancouver, British Columbia. We also acknowledge the efforts of Dr. Henry C. Lai, University of Washington, Seattle, Washington; Dr. Magda Havas of Trent University, Peterborough, Ontario; Janet Newton, President of the EMR Policy Institute; and Susan Foster Ambrose for their technical support and continued passion to protect the health and safety of fire fighters and emergency medical personnel. Finally, we thank Dr. Leslie Plachta and the Safe Ossining Schools for their research efforts and their battle to stop siting cell towers on Ossining, New York schools.

RMD; 3/2005



Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil[☆]

Adilza C. Dode^{a,b,e,*}, Mônica M.D. Leão^c, Francisco de A.F. Tejo^d, Antônio C.R. Gomes^e, Daiana C. Dode^{c,f}, Michael C. Dode^e, Cristina W. Moreira^b, Vânia A. Condessa^b, Cláudia Albinatti^b, Waleska T. Caiassa^g

^a Minas Methodist University Center Izabela Hendrix, Belo Horizonte City, Minas Gerais State, Brazil

^b Municipal Government of Belo Horizonte, Municipal Health Department, Belo Horizonte City, Minas Gerais State, Brazil

^c UFMG—Universidade Federal de Minas Gerais-Belo Horizonte, Environmental and Sanitary Engineering Department, Belo Horizonte City, Minas Gerais State, Brazil

^d UFCC—Universidade Federal de Campina Grande, Center of Electrical Engineering and Informatics, Academic Unit of Electrical Engineering, Paraíba State, Brazil

^e MRE Engenharia (Electromagnetic Radiations Measurement—Engineering), Belo Horizonte City, Minas Gerais State, Brazil

^f Faculty of Medical Sciences, Medicine-Belo Horizonte, Belo Horizonte City, Minas Gerais State, Brazil

^g UFMG—Universidade Federal de Minas Gerais-Belo Horizonte, Urban Health Observatory, Belo Horizonte City, Minas Gerais State, Brazil

ARTICLE INFO

Article history:

Received 14 January 2011

Received in revised form 25 May 2011

Accepted 25 May 2011

Available online xxxxx

Keywords:

Assessment and management of impacts

and environmental risks

Non-ionizing electromagnetic radiation

Public health

Radio base station

Environmental electromagnetic pollution

Environmental electromagnetic

field monitoring

ABSTRACT

Pollution caused by the electromagnetic fields (EMFs) of radio frequencies (RF) generated by the telecommunication system is one of the greatest environmental problems of the twentieth century. The purpose of this research was to verify the existence of a spatial correlation between base station (BS) clusters and cases of deaths by neoplasia in the Belo Horizonte municipality, Minas Gerais state, Brazil, from 1996 to 2006 and to measure the human exposure levels to EMF where there is a major concentration of cellular telephone transmitter antennas. A descriptive spatial analysis of the BSs and the cases of death by neoplasia identified in the municipality was performed through an ecological-epidemiological approach, using georeferencing. The database employed in the survey was composed of three data banks: 1. death by neoplasia documented by the Health Municipal Department; 2. BSs documented in ANATEL ("Agência Nacional de Telecomunicações": Telecommunications National Agency); and 3. census and demographic city population data obtained from official archives provided by IBGE ("Instituto Brasileiro de Geografia e Estatística": Brazilian Institute of Geography and Statistics). The results show that approximately 856 BSs were installed through December 2006. Most (39.60%) of the BSs were located in the "Centro-Sul" ("Central-Southern") region of the municipality. Between 1996 and 2006, 7191 deaths by neoplasia occurred and within an area of 500 m from the BS, the mortality rate was 34.76 per 10,000 inhabitants. Outside of this area, a decrease in the number of deaths by neoplasia occurred. The greatest accumulated incidence was 5.83 per 1000 in the Central-Southern region and the lowest incidence was 2.05 per 1000 in the Barreiro region. During the environmental monitoring, the largest accumulated electric field measured was 12.4 V/m and the smallest was 0.4 V/m. The largest density power was 40.78 $\mu\text{W}/\text{cm}^2$, and the smallest was 0.04 $\mu\text{W}/\text{cm}^2$.

© 2011 Elsevier B.V. All rights reserved.

1. Introduction

Mobile phone radio base stations (RBSs) are now found in cities and communities worldwide. They can be found near or even on top of homes, schools, hospitals, daycare centers and offices. In Brazil, the number of mobile phone users is estimated to be over 200 million and there are more than 5 billion users worldwide. In the municipality of Belo Horizonte, the capital of the state of Minas Gerais, there are approximately 1000 base stations (BSs) with 128.77 accesses by

mobile phones per 100 inhabitants and in Brazil, there are 49,979 BSs licensed through April 2011 (ANATEL, 2011).

The non-ionizing electromagnetic radiation from the BSs is of low intensity compared to the current guidelines on human exposure limits. However, its emission is continuous. This raises concerns as to whether the health and well-being of people living or working close to the BSs are at risk Khurana et al., 2010; Alanko et al., 2008.

The emission of a BS is usually described by its effectively radiated power in watts (W), which describes the total amount of radiation emitted by the antenna of the BS. Their intensity, called the power density, is commonly measured in milliwatts per square centimeter (mW/cm^2) or microwatt per square centimeter ($\mu\text{W}/\text{cm}^2$) and it expresses the power per unit area impinging normally to the external surface of the subject. The immission (absorption) of the subject is measured by the specific absorption rate (SAR), which is reported in

[☆] All the authors declare that they have no conflicts of interest.

* Corresponding author at: Rua Desembargador Assis Rocha, 279, Bairro Belvedere, 30320-250, Belo Horizonte (MG), Brazil. Tel.: +55 031 3286 1892.

E-mail addresses: adilzadode@terra.com.br (A.C. Dode), monica@desa.ufmg.br (M.M.D. Leão).

Exhibit 7

watts per kilogram of body tissue (W/kg). The SAR reflects the power that is locally absorbed in a certain volume of biological tissue and is proportional to the square of the local magnitude of the electric field intensity. For ethical reasons, the SAR can only be assessed on animal models or inferred from virtual (computational) models of animal or human subjects (Lai, 2000).

Some scientific studies have shown evidence of increased numbers of cancer cases for people living less than 500 m from the BSs (Eger et al., 2004; Wolf and Wolf, 2004; Eger and Jahn, 2010).

In the Belo Horizonte municipality and in many other urbanized cities and communities in Brazil, the mobile phone network is deployed in regions of high demographic density close to homes and on the facades and roofs of public or private buildings. It is also common to have several antennas sharing the same support structure.

This situation motivated the research of Dode (Dode, 2003) in the Belo Horizonte municipality, where a methodology designed to assess the levels of electromagnetic radiation exposure of the dwellers was used, based on the technical specifications of a sample of the installed BSs. Those estimated data were then compared to measured *in situ* data for the same set of BSs. Fig. 1 illustrates the site of a typical BS (Base Station BH 20) in a residential area of the Serra neighborhood, in the Belo Horizonte municipality and Fig. 2 shows its geographical location. Fig. 3 represents the horizontal and vertical radiation patterns per sector of the same BS. This diagram has been obtained from the technical archives documented by the operators in the Secretaria Municipal de Meio Ambiente (Municipal Environmental Department), the official organization of the municipality that is responsible for the environmental licensing of the BSs.

Some studies have shown evidence of general risks to health and specific risks of cancer associated with the physical proximity of the transmitter antennas of the telecommunication network.

One of the first of these studies indicated an association between cancer growth and a residence near a transmitter antenna (Cherry, 1999). Later, Santini et al. (Santini et al., 2002) carried out a qualitative survey of 530 people living within 300 m of a certain BS. Despite the

subjective methodology, the study showed a peak of symptoms occurred at locations in the interval between 50 and 100 m from the BS, which coincided with the typical distances at which the main lobe reached the ground. In another study, also in France, Santini et al. (2003) surveyed dwellers living 300 m from the BS and others who lived farther away and found more complaints about irritability, depressive tendency, memory loss, problems with concentration, dizziness, within 100 m; headache, sleeping disorder, discomfort, skin problem within 200 m; and fatigue within 300 m, among those living closer to the BS and showed more variability in disease occurrence with distance. Again, this study contained some biases because it was subjective and therefore did not result in a conclusion about the relationship between cancer and the amount of radiation exposure.

Navarro et al. (2003) conducted a study of 145 people in Murcia, Spain, but only included 101 questionnaires in the analysis. Two groups of participants were formed: one that was living within 150 m of the BS and another beyond 150 m. The average measured power density was $1.1 \mu\text{W}/\text{cm}^2$ at locations within 150 m and $0.1 \mu\text{W}/\text{cm}^2$ beyond 150 m. This study also showed that complaints (insomnia, headaches, difficulty in concentration, discomfort) were greater at locations where the power density was higher, inside the 150 m range.

In Poland, Gadzicka (Gadzicka et al., 2006) also used a questionnaire to conduct a neurobehavioral clinical study involving 500 subjects. The most important finding was the incidence of frequent headaches in subjects living less than 150 m from the BS. However, the study was limited because of the lack of information about the technical characteristics of the BS and the measurements of electromagnetic exposure.

Eger et al. (2004) carried out research in the city of Naila, Germany, to examine whether people who live near mobile phone BSs were at any risk of becoming ill with malignant tumors. Their data bank consisted of records of patients from 1994 to 2004. While preserving the privacy of the information, the personal data of almost 1000 subjects were examined. The analysis showed that the number of newly developed cancer cases was significantly higher among those

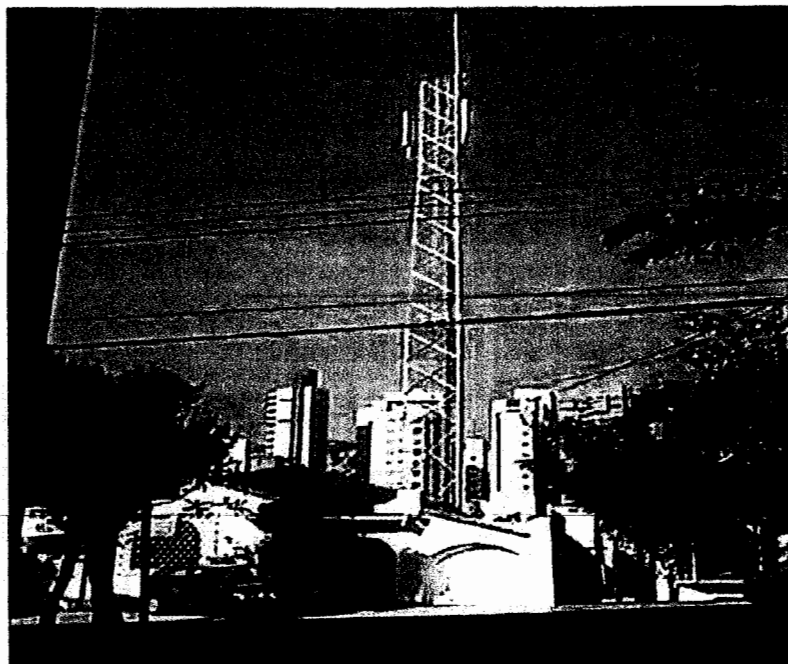


Fig. 1. BS site BH 20 in a residential area of the Serra neighborhood in Belo Horizonte municipality.

BS	Site BH 20 – Maxitel
Address	1373 Rua do Ouro Street - Bairro Serra neighborhood - Belo Horizonte municipality
Latitude	S 19° 56' 33,7"
Longitude	W 43° 55' 8,7"

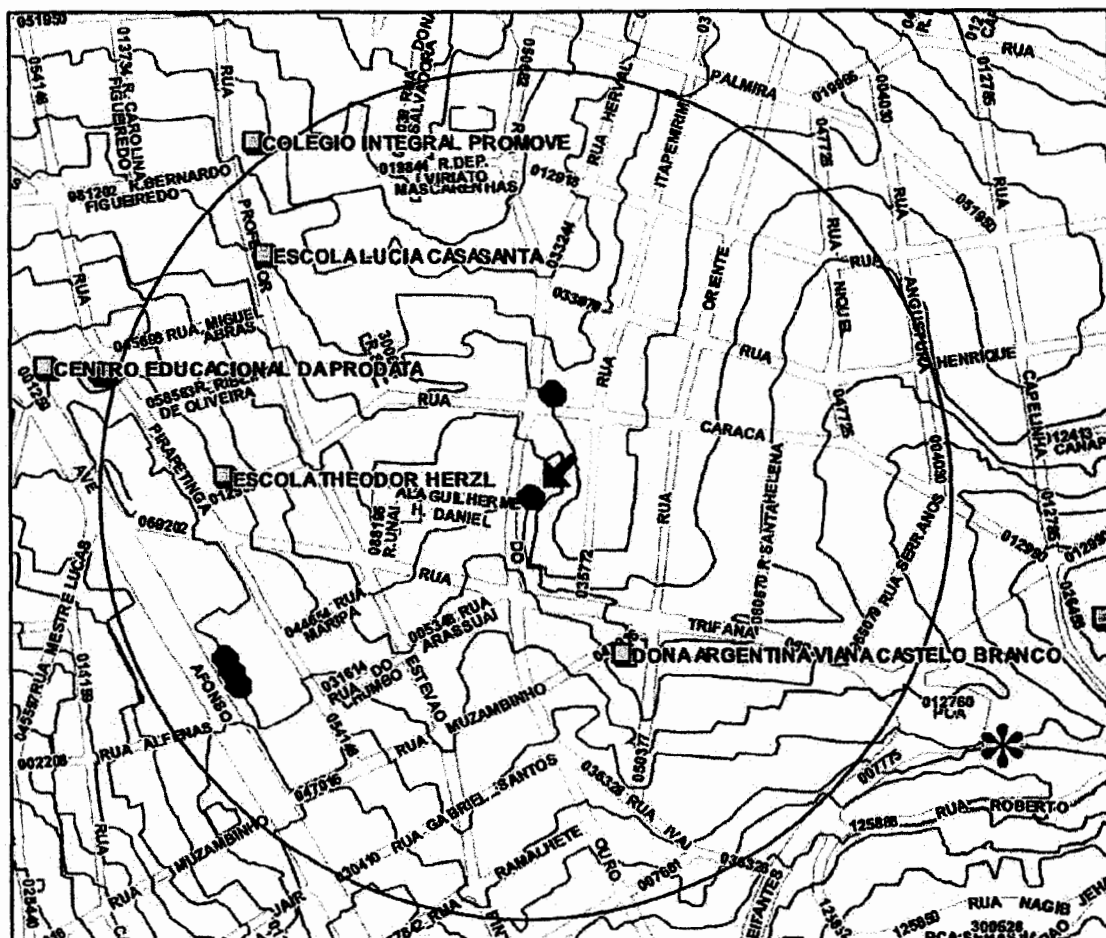
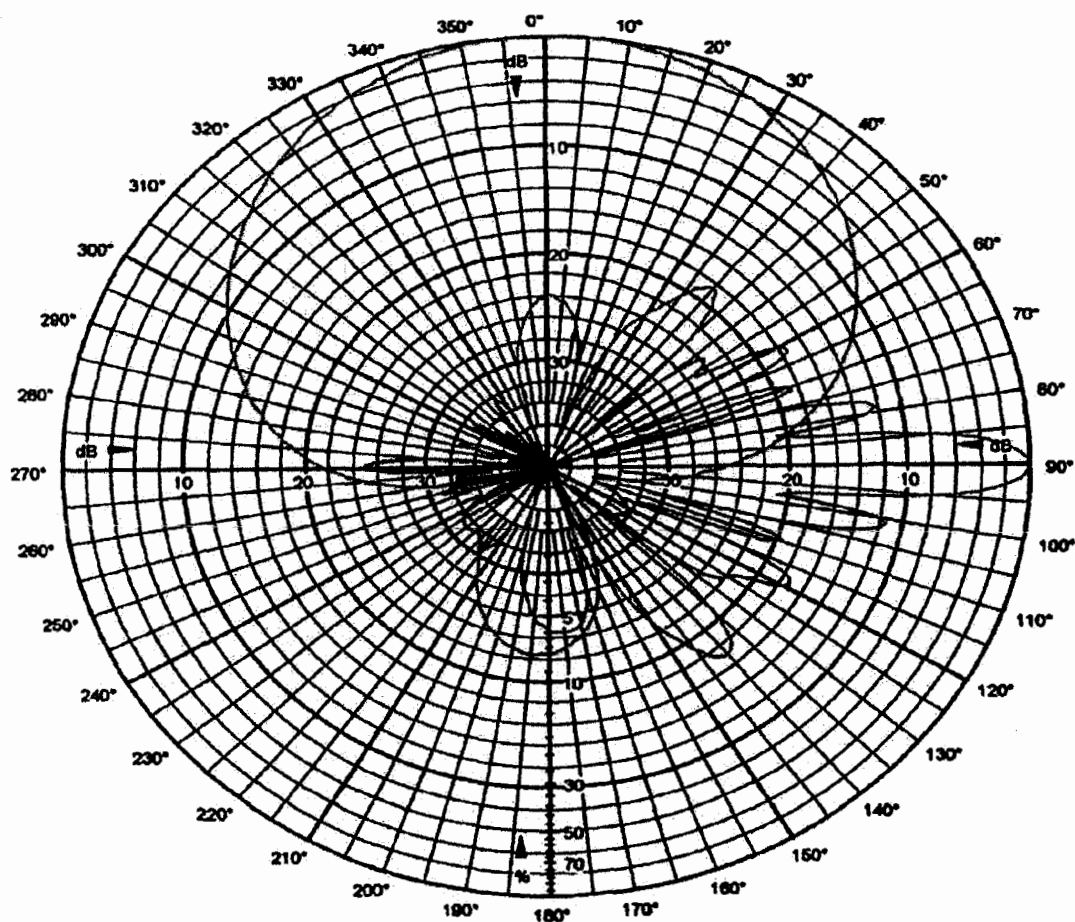


Fig. 2. Geographical location of BS Site BH 20 at 1373 Rua do Ouro Street, in the Serra neighborhood, Belo Horizonte municipality (Dode, 2003).

patients who had lived at distances within 400 m of the BS site, compared to the number of subjects who had lived beyond 400 m in the same period of time. The former subjects became sick eight years earlier, on average, than the latter subjects. The BS came into operation in 1993. From 1999 to 2004, that is, after five years' operation of the transmitting installation, the relative risk of suffering from cancer was three times higher for the subjects living within 400 m of the BS, compared to the dwellers beyond that distance. This study represents a milestone in the field because its results clearly demonstrate that the radiation from the BS may contribute to an increase in the clinical manifestation of the disease and the general development of cancer, even at exposure levels several orders of magnitude lower than the limits of the current guidelines.

Wolf and Wolf (2004) led a study in the town of Netanya, Israel, which showed an increase of 4.15 times in cancer incidence among subjects living within 350 m of the BS, compared to those who had lived

further away. The total number of participants ($n=622$, group A) were individuals who had lived for a duration of three to seven years near a mobile phone BS and were also patients of a health care clinic. The exposure took place one year before the beginning of the study, when the BS came into operation. A second group of individuals ($n=1222$, group B), who received medical care in a clinic near the BS and had environmental, socioeconomic and occupational characteristics similar to the first group was used as the control group. In group A, eight types of cancer had been diagnosed within a period of only one year. This rate was compared both to the rate of 31 cases per 10,000 people per year in the general population and the rate of two cases per 1222 people recorded in group B. A 95% confidence interval to each rate was calculated and the rate of cancer occurrence in group A was found to be significantly higher than the rates of group B and the entire population. The relative cancer rate was 10.5 among the exposed women of group A, 0.6 among the women of group B and 1.0 for the entire town of Netanya. Therefore, the cancer



KATHREIN	Date 21.06 1995	Horizontal and Vertical Radiation Patterns 870 MHz	Type 737656
	Name		

Fig. 3. Horizontal and vertical radiation patterns per sector of BS site BH 20 (KATHREIN MOBILCOM BRASIL LTDA. HUEMER E. and LENSIG KI., 1999).

Incidence in the women of group A was significantly higher ($p < 0.0001$) than the cancer incidence of group B and the city as a whole. A relative risk comparison revealed that there were approximately 4.15 more cases of cancer in group A than in the population as a whole. The results, although still not conclusive, indicated a necessity to revise the current exposure limits in favor of more protective levels. Both the estimated and measured power densities in the entire exposed area in Netanya were far below $0.53 \mu\text{W}/\text{cm}^2$, that is, approximately 800 times lower than the exposure limit of $425 \mu\text{W}/\text{cm}^2$ for the frequency of 850 MHz from the ICNIRP guidelines.

The aforementioned studies, which aimed to find evidences of an increase in cancer incidence with proximity to mobile phone BSs, warrant additional research, because the cellular phone technology is relatively new and the associated total amount of environmental radiation is far from negligible.

The inhabitants of the Belo Horizonte municipality and the scientific community in general are also concerned about the number

of already installed BSs and the proliferation of new wireless BSs, not only for telephony but also for television. The number of mobile phone BSs, which equaled 474 in 2003, had reached approximately 856 in 2006.

Thus, this research to study health was conducted in a broad environmental context, aiming to verify if there is a spatial correlation between the cellular telephony system BS location and the cases of death by neoplasia during the period between 1996 and 2006.

2. Materials and methods

2.1. Area of study

The Belo Horizonte municipality, with an area of approximately 300 km^2 of area, has a tropical climate and is located at an average altitude of 900 m (minimum of 800 m and maximum of 1200 m)

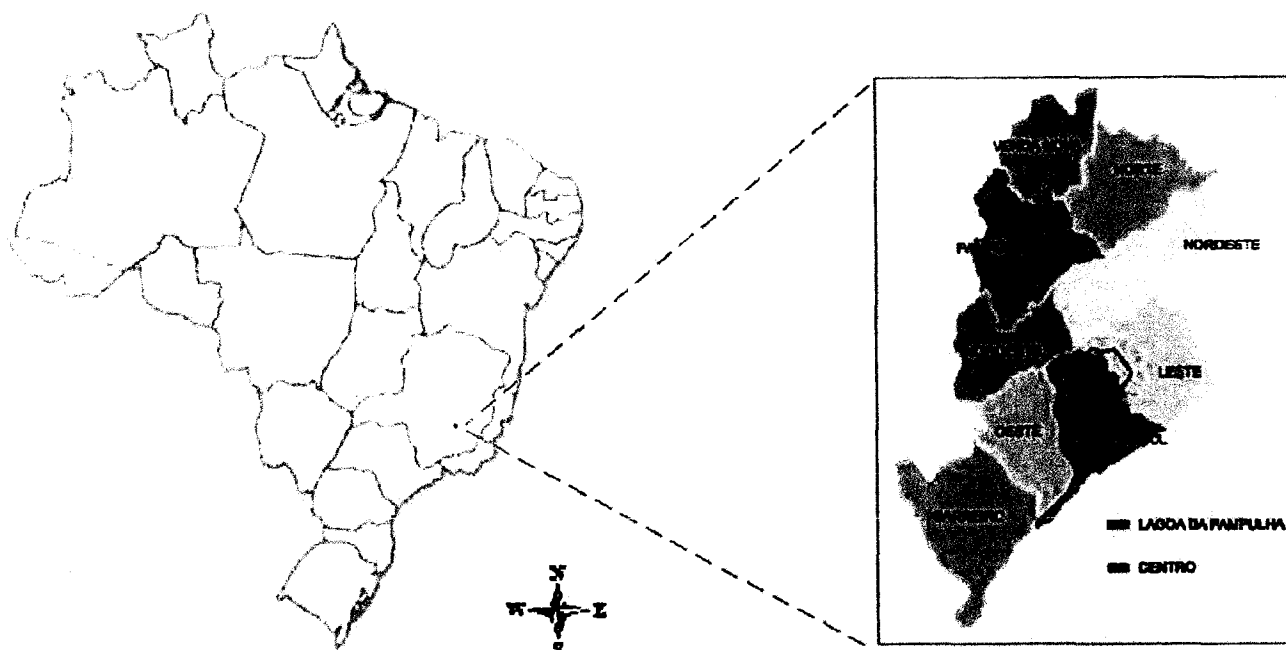


Fig. 4. The Belo Horizonte municipality and the nine SDs.

above sea level. The geology of the city includes several kinds of minerals and its soil of crystalline rocks is composed of dolomite, quartzite, phyllite and various schists. Constructed over many hills, the city is surrounded by a mountain named "Serra do Curral". The municipality is divided into nine regions or sanitary and administrative districts (SDs): "Centro-Sul" ("Central-Southern"), "Norte" ("Northern"), "Leste" ("Eastern"), "Oeste" ("Western"), "Nordeste" ("Northeastern"), "Venda Nova", "Pampulha" and "Barreiro". Fig. 4 shows the Belo Horizonte municipality and the nine SDs.

The municipality has 55 universities and colleges, 36 hospitals, and a subway system containing 19 stations and 29 km of track, which transports 145,000 passengers a day. The majority of households are served by potable water (99.3%), garbage collection (96.6%), sewage (93.2%), electric power (99.83%), and landline phones (81.43%) (UNDP, 2008) and 128.77 accesses by mobile phones per 100 inhabitants through April 2011 (ANATEL, 2011). With these data, one can conclude that much of the population possesses a cellular phone and more than 28% of the inhabitants have more than one. The city has road and railroad networks that link it to the main centers of the country, as well as three airports.

More than 80% of the municipal economy is focused on commerce, financial services, real estate activities and public administration. The metallurgical industries, including iron and steel metallurgy, and ore mining are located in the areas surrounding the metropolitan region but not in the Central-Southern region.

The city of Belo Horizonte has been selected by the Population Crisis Committee of the United Nations (UN, 2007) as the metropolis with the best quality of life in Latin America and was ranked 45th in the world. Its health system is considered very good, according to the Atlas of Human Development (2000)/United Nations Development Programme (UNDP, 2008).

The city had 2,238,332 inhabitants in 2003 and 2,258,096 in 2010 (IBGE, 2010), which suggests that the population in the city is stable. However, the city, as in any urban area in Brazil, has a concentrated

population, with a large number of people living in apartment buildings. This fact, along with the mountainous landscape, force mobile phone operators to install their BSs at strategic points in the city, mainly on top of towers and poles, as on the terraces of public or residential buildings, to ensure good coverage of the mobile phone network.

Of the nine SDs, the Central-Southern region is the richest region of the city and is the third largest in number of inhabitants with 249,862. There are plenty of commercial and service shops, several shopping centers, and many households with one or more families. This SD also has several hospitals, parks and leisure areas. Most of the dwellers are highly educated and belong to the middle and upper classes. The traffic is heavy because of the large number of vehicles that travel in that region. The Western region is less densely populated, has no skyscrapers and its inhabitants have low revenues. The Barreiro region is the most populated after the Central-Southern SD, and has many industries. The most populated region, with 338,753 inhabitants, is the Northwestern (IBGE, 2000).

2.2. Study design

This ecological study consists of an exploratory spatiotemporal analysis to determine whether there is an association between clusters of BSs and deaths by neoplasia in the Belo Horizonte municipality, in the southeastern part of Brazil. This design was chosen because of the possibility of using geographic areas as units of analysis, where each unit of analysis is composed of a group of individuals or communities. Therefore, it is possible to determine whether there is a correlation between a certain risk and the occurrence of certain grievances within the population. In this type of study, it is not possible to consider individual characteristics, such as food and life habits, activity level, smoking, self-medication, individual pathologies, or genetic factors (GORDIS, 2004).

The analysis was based on the following databases: 1. A database of deaths by neoplasia documented in the Mortality Information

System (SIM: "Sistema de Informação em Mortalidade"), provided by the City Health Department; 2. A database of the site register of BSs, provided by the Brazilian Telecommunications Agency (ANATEL); 3. A database of the city census, including demographic information provided by the Brazilian Institute of Geography and Statistics (IBGE).

The death, BS and population data were geocoded according to census tracts (CTs) or censitarian sectors (CSs), which are "territorial units defined by IBGE (IBGE, 2000) to orient the spatial distribution of a population". The definition of a CT is related to a specific geographical zone whose population can be counted by local

interviewers, taking into account the existence of geographical barriers, the population size and traffic flow. There were a total of 2563 CTs in the Belo Horizonte municipality (IBGE, 2000).

2.2.1. Cancer death variable

The main outcome that was studied was the number of deaths by neoplasia of Belo Horizonte municipality residents that occurred from 1996 to 2006, were reported to the City Health Department and were routinely confirmed by established criteria, under the responsibility of

Table 1
International classification of diseases – ICD-10.

Disease	ICD-10 – According to WHO ICD10 homepage		Bibliographical references
	Primary	Secondary	
Primary: Malignant melanoma of skin; Other malignant neoplasms of skin/Secondary malignant neoplasm of skin.	C43 and C44	C79.2	Eger et al., 2004.
Primary: Malignant neoplasm of breast/Secondary malignant neoplasm of other specified sites.	C50	C79.8	Eger et al., 2004; Wolf and Wolf, 2004; Bioinitiative Report, 2007; Guenel et al., 1996; Feychting et al., 1997; Wakeford, 2004; Mack et al., 1991; Beall et al., 1996; Benishvili et al., 2005; Hardell and Sage, 2007; Khurana, 2008; Hardell et al., 2007; Bioinitiative Report, 2007; Mack et al., 1991; Beall et al., 1996; Guenel et al., 1996; Wakeford, 2004.
Primary and secondary: Malignant neoplasm without specification of site.	C80	C80	Eger et al., 2004; Wolf and Wolf, 2004
Primary: Malignant neoplasm of ovary/Secondary malignant neoplasm of ovary.	C56	C79.6	Eger et al., 2004; Wolf and Wolf, 2004
Primary: Hodgkin's Disease/Secondary and unspecified malignant neoplasm of lymph nodes.	C81	C77	Wolf and Wolf, 2004.
Primary: Malignant neoplasm of bronchus and lung/Secondary malignant neoplasm of lung	C34	C78.0	Eger et al., 2004; Wolf and Wolf, 2004
Primary: Malignant neoplasm of kidney, except renal pelvis/Secondary malignant neoplasm of other sites.	C64	C79.0	Wolf and Wolf, 2004.
Primary: Malignant neoplasm of prostate/Secondary malignant neoplasm of other specified sites.	C61	C79.8	Eger et al., 2004.
Primary: Malignant neoplasm of pancreas; Pancreas, unspecified/Secondary malignant neoplasm of other and unspecified digestive organs.	C25 and C25.9	C78.8	Eger et al., 2004.
Primary: Malignant neoplasm of other and ill-defined digestive organs: Intestinal tract, part unspecified; Malignant neoplasm of small intestine; Malignant neoplasm of colon; Malignant neoplasm of rectosigmoid junction/Secondary malignant neoplasm of small intestine; Secondary malignant neoplasm of large intestine and rectum.	C26.0; C17; C18; C19	C78.4; C78.5	Eger et al., 2004.
Primary: Malignant melanoma of skin; Melanoma in situ/Secondary malignant neoplasm of skin	C43 and D03	C79.2	Eger et al., 2004; Hallberg, 2004; Johansson, 2006.
Primary: Malignant melanoma of skin/Secondary malignant neoplasm of skin.	C43	C79.2	Stang, 2001.
Primary: Malignant neoplasm of kidney, except renal pelvis; Malignant neoplasm of renal pelvis/Secondary malignant neoplasm of kidney and renal pelvis.	C64 and C65	C79.0	Eger et al., 2004.
Primary: Malignant neoplasm of stomach/Secondary malignant neoplasm of other and unspecified digestive organs.	C16	C78.8	Eger et al., 2004.
Primary: Malignant neoplasm of bladder/Secondary malignant neoplasm of bladder and other and unspecified urinary organs.	C67	C79.1	Eger et al., 2004.
Primary: Multiple myeloma and malignant plasma cell neoplasms; Lymphoid leukemia; Myeloid leukaemia; Monocytic leukemia; Other leukemias of specified cell type; Leukemia of unspecified cell type; Other and unspecified malignant neoplasms of lymphoid, haematopoietic and related tissue.	C90; C91; C92; C93; C94; C95 and C96		Eger et al., 2004.
Primary: Hodgkin's disease; Follicular [nodular] non-Hodgkin's lymphoma; Diffuse non-Hodgkin's lymphoma; Peripheral and cutaneous T-cell lymphomas; Other and unspecified types of non-Hodgkin's lymphoma/Secondary and unspecified malignant neoplasm of lymph nodes.	C81; C82; C83; C84 and C85	C77	Hardell et al., 2007.
Primary: Malignant neoplasm of brain/Secondary malignant neoplasm of brain and cerebral meninges.	C71	C79.3	Khurana, 2008; Hardell et al., 2007; Schoemaker et al., 2005.

the epidemiology officers of the city, accredited by federal and local health authorities (BRAZIL, 2011).

All deaths by neoplasia, based on death certificates, were provided. Then, they were re-selected according to a subset of the International Classification of Diseases (ICD) previously organized and extracted from a careful review of the scientific literature, linking cancer and non-ionizing electromagnetic radiation, as can be seen in Table 1.

Out of 22,493 deaths that occurred in the analyzed period (1996 to 2006), 7191 were initially eligible for the study. The selected death by neoplasia cases were grouped according to the CT of the residences, based on the residents' postal address. The data bank of SIM did not possess the address of the persons who died by neoplasia in 1998. So, about 780 deaths that occurred in that year could not be georeferenced. To identify the CT, the cartographic map was used, within the borders delimited by IBGE (IBGE, 2000). Fig. 5 shows the fluxogram of deaths by neoplasia in the period from 1996 to 2006.

The death cases were further analyzed according to age, gender, site of residence and year of occurrence and the death rates were determined as described below. After aggregation of the deaths and BS exposure (explained below) in the CT, differing numbers of deaths were determined, depending on whether the date of first exposure was taken to be the date of the first license of the BS (7191 deaths) or the date of the register of the BS (8082 deaths). We opted to work with the date of first license; an option that makes our analysis even more conservative.

2.2.2. Base stations

The BS database and their respective geographical locations were obtained from the ANATEL database (site: <http://www.anatel.gov.br>) and were further geoprocessed according to their CT in two distinct years: 2003 and 2006. In 2003, there were approximately 474 BSs, and in 2006, there were approximately 856 in the city. Clusters (the so-called "hotspots") were the identified in each SD. This explanatory analysis was carried out through thematic maps, using the software MAPINFO™, version 7.0, and the Kernel estimator.

2.2.3. Data processing and mapping of the BSs and deaths in the Belo Horizonte municipality

Eligible deaths by neoplasia were then plotted inside circles with radii varying from 100 m to 1000 m, centered at the location of the first transmitter antenna of the mobile phone network to which the resident was possibly exposed. This selection took into account the date of the death and either the date of registration or of the first

license of the given BS. To detect case conglomerates in space, the total amount (2563) of CTs and the corresponding nine DSs of the city were used again. Software was developed to calculate the shortest distance between the death and the antenna and to estimate the time of exposure of the deaths to the radiation of the antennas.

2.2.4. Death rates

The mortality by neoplasia rates per CT were determined from the neoplasia diagnoses in compliance with the ICD-10 during the period of the study, using the CT as defined by IBGE for the 2000 national census as the spatial analysis unit. The deaths in every CT were used as the numerator. The temporal unit was the calendar year. The death data were then georeferenced to the address of the subject's and the IBGE census data (IBGE, 2000) for each CT. The estimated population at risk was used as the denominator.

The accumulated incidence in the Belo Horizonte municipality was calculated by dividing the total amount of deaths in each region by region's entire population.

2.2.5. Estimates of the mortality rates according to distance and duration of exposure to the radiation of the BSs

To understand the spatiotemporal exposure to the radiation of the BSs, the duration of possible exposure corresponding to each death was estimated, using a proxy to the subject's residential addresses, in terms of the duration of his or her exposure to the first installed transmitter antenna of the mobile phone network. To estimate the number of days of exposure, the elapsed time period from the date of installation of the first antenna to the date of the death was calculated, in spite of the exposure to the radiation of other antennas that might have been installed afterward. Some subjects may have been exposed to many antennas at different times, but in this study we considered only the date of installation of the first antenna. The delimitation of the distance intervals of the BSs was then performed. Each interval with a radius of 100 m had a BS as its center, from which the distance was increased to 1000 m. For each 100-meter interval, the deaths that occurred within the elapsed period of time, as well as the estimated population living within that radius, was then observed. To obtain the population at risk, the estimates of all of the CTs were considered, even those which were only partially included within those radii. Therefore, the population at risk was conservatively overestimated.

To estimate the mortality rate within each radius, the number of deaths was divided by the estimated population included in the radius of each CT. For example, for the 100-meter radius, the 3569 deaths were divided by the 821,890 estimated exposed subjects living inside that radius. For the rates between 200 m and 1000 m, both the number of deaths and the included population were cumulatively considered. This was necessary because the subjects included in the 100-meter radius must be considered to perform the calculation inside the 200-meter radius (Fig. 6) (Table 5).

2.3. Environmental monitoring of the electromagnetic field (EMF)

In 2008, one began monitoring the environmental EMF in the CT with the largest concentration of antennas in the Belo Horizonte municipality. The survey used an electric field meter and isotropic probe, with a frequency range of 0.2 MHz to 3.0 GHz; a spectrum analyzer, with a frequency range of 10.0 MHz to 6.0 GHz; a datalogging multimeter; a GPS unit and a laptop. For the field measurements, the following guidelines were observed: IEEE, 1999, 1992; NCRP, 1993; ANATEL Annex to Resolution no. 303 (ANATEL, 2000a, 2000b), and the environmental field survey of two particular nearby BSs, carried out by Dode (Dode, 2003). The analyzed frequencies of the BSs were corresponded to the bands A, B, C and D. During the measurements, stronger electric field intensities were usually found when the probe was far from the ground. Approximately 400 points in the Central-Southern

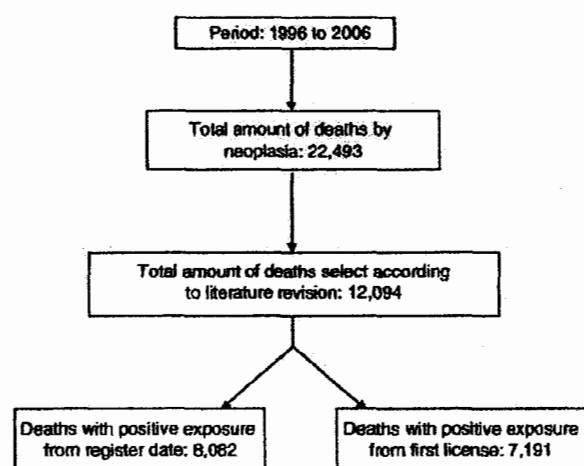
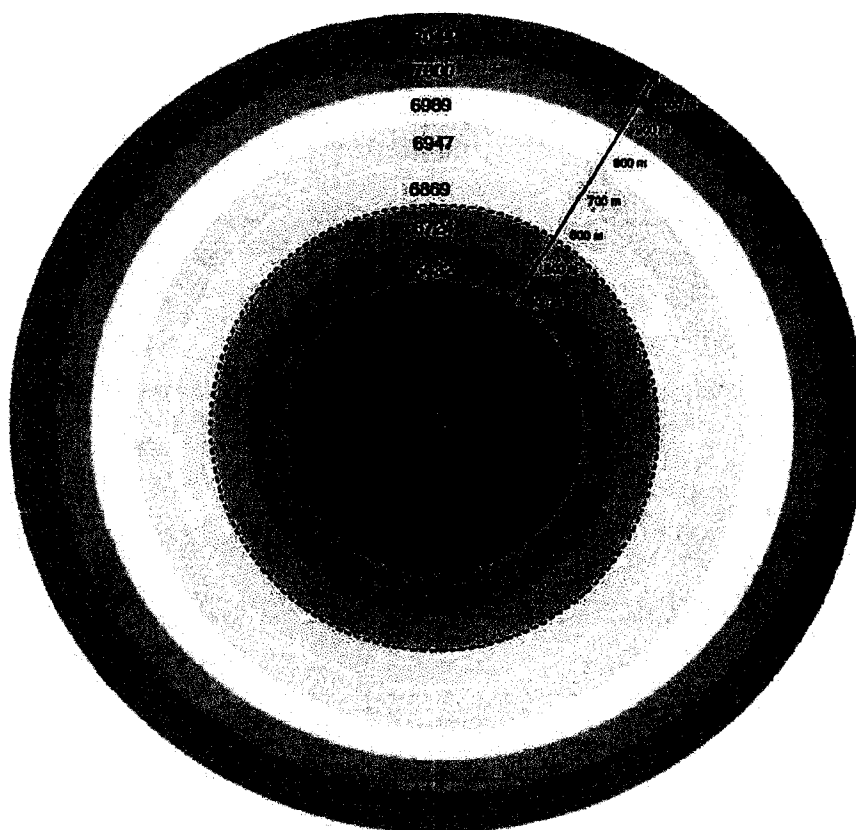


Fig. 5. Fluxogram of deaths by neoplasia in the period from 1996 to 2006.



Within 100 meters = 3,569 deaths

Within 200 meters = 3,569 + 1,408 deaths = 4,977 deaths

Within 300 meters = 4,977 + 973 deaths = 5,950 deaths

Within 400 meters = 5,950 + 482 deaths = 6,432 deaths

Within 500 meters = 6,432 + 292 deaths = 6,724 deaths and so on within 1000 meters

Beyond 1000 meters + 147 deaths

Total amount of = 7,191 deaths

Fig. 6. Total amount of deaths by neoplasia per 100-meter distance band, in census tracts inside a radius of up to 1000 m from the mobile phone transmitter antennas, in the Belo Horizonte municipality, from 1996 to 2006. Total: 7044 deaths.

region of the municipality, which were located in squares, parks, schools and households nearby BSs, were considered in the survey.

2.4. Ethical committees

Because this study includes data on human beings, it was approved by the ethical committees of the Institutional Review Boards of the Federal University of Minas Gerais and the Belo Horizonte City Health Department, with the purpose of accomplishing the Resolution 196/1996 of the Brazilian Health Ministry.

3. Results

3.1. Total deaths by neoplasia selected in the period from 1996 to 2006

Fig. 7 shows the geographic location of the cases of deaths by neoplasia that were confirmed in the literature and selected according to Table 1, totaling 7191 deaths. The detailed geographic description of

deaths location can be seen in Table 2. The Central-Southern SD contained the greatest absolute number of deaths, followed by the Northwestern and Eastern SDs.

3.2. Base station

All registered BSs that were georeferenced through 2006 are plotted in Fig. 8. The percentage of BSs installed through December 2003 was the greatest in the Central-Southern region, comprising 38.60% (182 out of 474); until December 2006, the percentage was approximately 39.60% (338 out of 856). The BS percentage by region in the Belo Horizonte municipality in 2003 and 2006 can be seen in Fig. 9.

3.3. Data processing and mapping of the base stations and deaths in the Belo Horizonte municipality

Fig. 10 portrays a sample of the georeferencing of the BSs and the deaths by neoplasia in downtown Belo Horizonte City located

Table 2
Description of the death coding and geographic location.

Deaths codification	Regions or sanitary districts									Total
	Barreiro	Central-Southern	Eastern	Northeastern	Northwestern	Northern	Western	Pampulha	Venda Nova	
C16	83	143	132	124	183	75	125	57	89	1011
C17	2	3	4	1	3	2	4	4	0	23
C18	1	2	2	2	1	1	3	0	1	13
C19	4	8	13	9	16	2	7	1	5	65
C25	30	155	88	74	137	23	77	42	39	665
C26	4	27	17	12	17	19	23	14	14	147
C34	88	300	194	140	233	89	187	75	99	1405
C43	0	0	0	0	0	0	0	0	1	1
C50	43	210	145	68	177	23	94	35	34	829
C61	42	174	131	84	186	51	122	56	58	904
C64	17	40	28	19	28	16	20	10	11	189
C65	0	1	0	1	0	0	1	0	3	6
C67	18	51	42	28	40	10	30	21	12	252
C71	37	105	54	37	94	23	63	30	28	471
C80	36	86	71	55	83	36	61	21	34	483
C81	5	19	8	4	9	3	9	3	5	65
C83	0	2	0	0	1	0	0	0	0	3
C84	0	0	0	0	0	0	1	0	0	1
C90	11	40	39	21	41	14	33	13	16	228
C91	4	11	6	10	12	3	15	7	7	75
C92	19	62	34	24	43	13	34	14	16	259
C93	0	1	0	0	1	0	0	0	1	3
C94	0	2	0	0	0	0	0	0	0	2
C95	7	17	10	4	18	7	12	4	12	91
Total	451	1459	1018	717	1323	410	921	407	485	7191

in Central-Southern region. A given BS can have three, six, nine, twelve or more antennas, depending on the requirements in the region.

To detect clusters of cases in space, the nine SDs in the Belo Horizonte and their 2563 CTs were used as units of analysis. In Fig. 11, there are CTs with 12, 13, 14 and even 18 deaths.

Table 3
Percentage of deaths by age and gender in Belo Horizonte municipality.

Age	Male	Female	Deaths total	Percentage%
00–04	10	16	26	0.36
05–09	13	10	23	0.32
10–14	12	8	20	0.28
15–19	11	8	19	0.26
20–29	34	34	68	0.95
30–39	80	120	200	2.78
40–49	247	322	569	7.91
50–59	535	559	1,094	15.21
60–69	920	686	1,606	22.33
70–79	1,217	797	2,014	28.00
80–89	708	550	1,258	17.49
90–99	136	158	294	4.08
TOTAL	3,923	3,268	7,191	

Table 4
Accumulated incidence rate of all deaths in the Belo Horizonte municipality.

Regions or sanitary districts	Population	Death number	Accumulated incidence rate/1000
Centro-Sul	249,862	1459	5.83
Leste	251,118	1018	4.05
Noroeste	338,753	1323	3.90
Pampulha	106,330	407	3.82
Oeste	249,059	921	3.69
Nordeste	248,406	717	2.88
Norte	153,821	410	2.66
Venda Nova	198,475	485	2.44
Barreiro	219,873	451	2.05
TOTAL	2,015,697	7191	

3.4. Death rate

The percentage of deaths by neoplasia per year in the Belo Horizonte municipality from 1996 to 2006, considering the start of exposure to be the date of the first license, is shown in Fig. 12. The accumulated incidence rate per 1000 residents for each SD is shown in Table 4. Again the Central-Southern SD presented the highest accumulated incidence rate, i.e., 5.83 incidents per 1000 inhabitants and the lowest rate was 2.05 incidents per 1000 inhabitants in the Barreiro SD.

The same trend was observed for both women and men with similar profiles during the studied years. As expected the incidence of death of women and men was higher in those older than 40, and in this group, the number of deaths was 3923 for men and 3268 for women. After the age of 40, the death rate (7.91%) grew for both sexes, as shown in Table 3. After the age of 60, the rate was even higher (22.33%).

Supplementary Graphics 1 shows the rate of death by neoplasia, according to ICD classification. The most significant causes were malignant neoplasm of bronchus and lung (C34), 19.55%; malignant neoplasm of stomach (C16), 14.05%; malignant neoplasm of prostate

Table 5
Mortality rates by neoplasia in the Belo Horizonte municipality, according to distance from the BS.

Distance (meters)	Deaths total	Population total	Mortality rate/10,000	Relative risk
Until 100	3569	821,890	43.42	1.35
Until 200	4977	1,237,368	40.22	1.25
Until 300	5950	1,602,869	37.12	1.15
Until 400	6432	1,796,604	35.80	1.11
Until 500	6724	1,934,032	34.76	1.08
Until 600	6869	2,030,093	33.83	1.05
Until 700	6947	2,055,325	33.80	1.05
Until 800	6989	2,086,712	33.49	1.04
Until 900	7000	2,107,277	33.21	1.03
Until 1000	7044	2,148,327	32.78	1.00
Null hypothesis	7,191	2,238,332	32.12	1.00

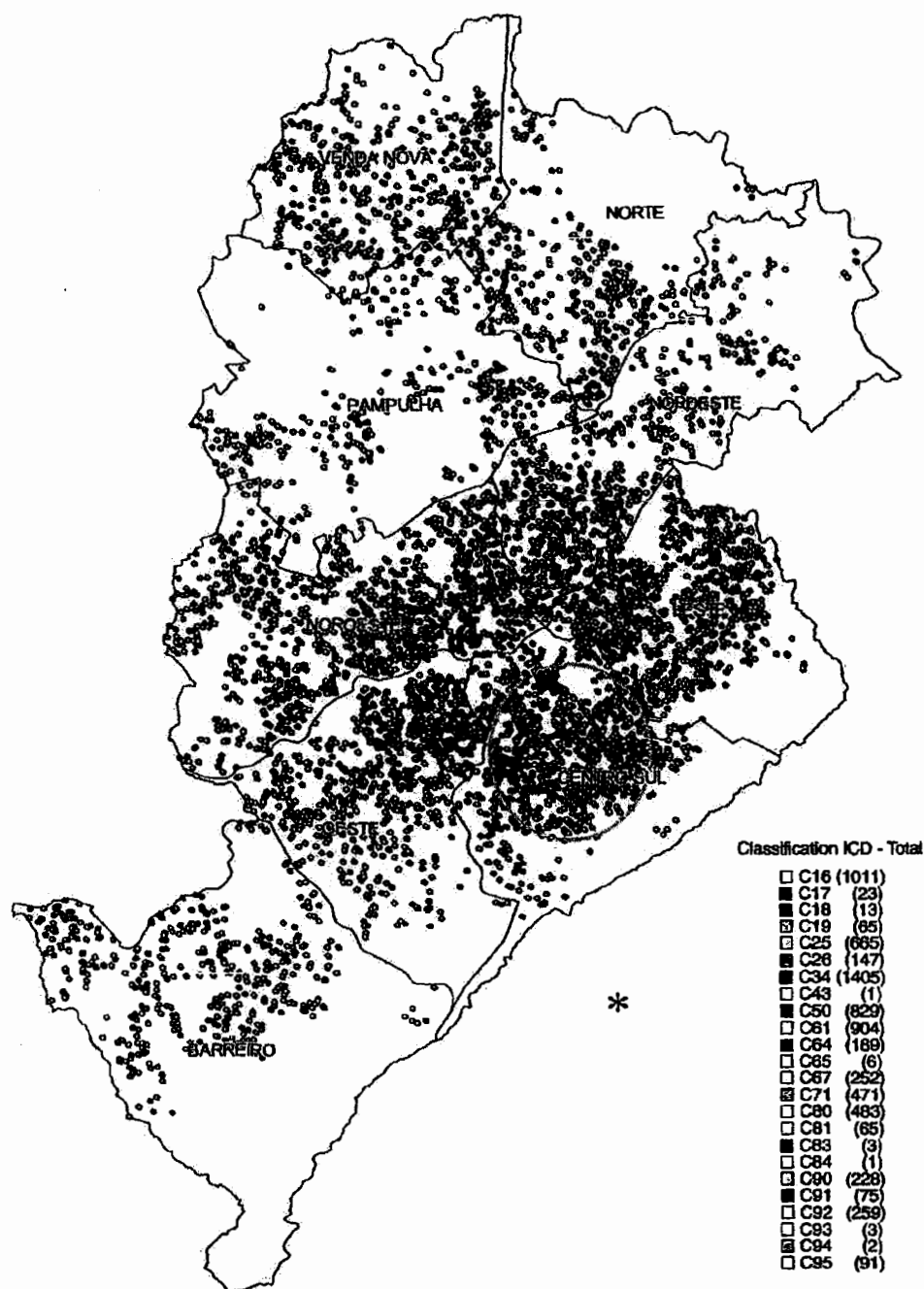


Fig. 7. Map of the total deaths by neoplasia in the Belo Horizonte municipality from 1996 to 2006, classified according to ICD. Total: 7191 deaths.

(C61), 12.57%; and malignant neoplasm of breast (C50), 11.53%. The largest absolute number of deaths was found in the Central-Southern region, followed by the Northwestern region. Also, the highest absolute numbers of lung cancer deaths (300 cases) and breast cancer deaths (210 cases) were found in Central-Southern SD (Table 2). The proportional mortality by gender can be seen in Figs. 13 and 14.

3.5. Estimates of the mortality rates by distance and time of exposure to BS

The mortality rates were estimated by correcting the population mortality by 10,000, according to the radius of distance from the BS within 1000 m. In the region within 100 m, the absolute number of

deaths was 3569 (a percentage of 49.63%), and the mortality rate was 43.42 persons per 10,000 inhabitants. Compared to with the total population mortality rate, the relative risk in this area was 1.35. In the area up to 200 m there was a growth of 1408 deaths, a total of 4977 deaths, a mortality rate of 40.22 persons per 10,000 inhabitants and a relative risk of 1.25 (Table 5). In this way, the estimates of mortality by neoplasia were calculated inside radii up to 1000 m from the BSs. The relative risks presented a decreased dose-response gradient with residents' distance from the first licensed BSs.

Fig. 15 shows the mortality rate by neoplasia according to the distance from the BS in the Belo Horizonte municipality, during the studied period. The accumulated mortality rates by neoplasia,

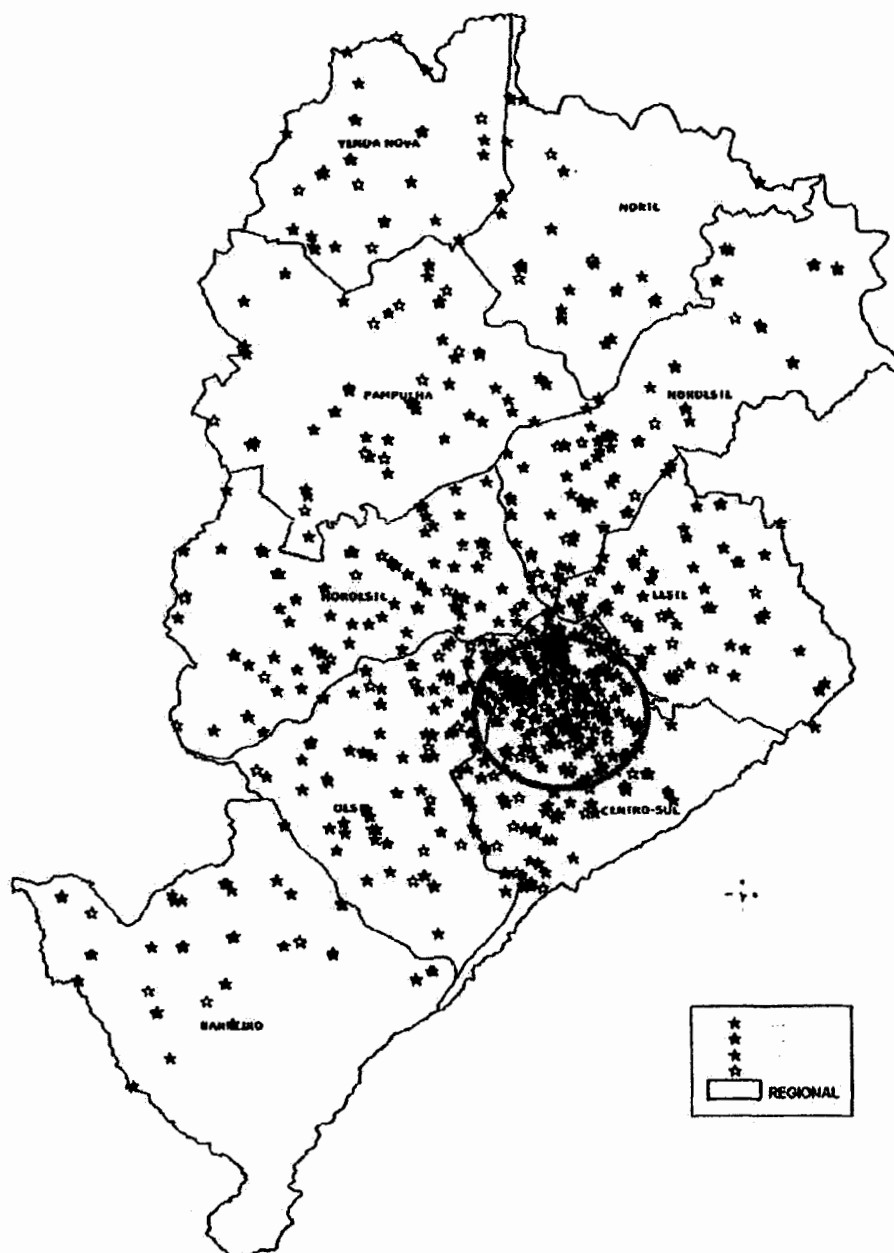


Fig. 8. Installed BSs in the Belo Horizonte municipality until 2006. Total amount=856.

determined by dividing the total number of deaths during the period ($n=7191$) by the total population living in the municipality (2,238,332), showed that there was a risk of dying of 32.12 per 10,000 inhabitants, as seen in Fig. 15. In this study, this figure represents the null hypothesis, i.e., the total number of deaths occurring in the period divided by the population, independent of the proximity to the BSs. Fig. 16 shows the distribution of the number of deaths by neoplasia versus duration of exposure since the date of operation of the first antenna in each analyzed CT.

3.6. Environmental monitoring of the electromagnetic field

The EMF results provided essential information for the assessment of risks to the health of the exposed persons in the community. A total of

400 points were measured in the Central-Southern region in 2008, where a major concentration of cellular telephony antennas was found. The mean intensity of the measured electric field was 7.32 V/m, varying from 0.4 to 12.4 V/m. It was common to find a stronger electric field at locations above the ground. The BS frequency bands ranged from approximately 800 MHz to 1800 MHz. In 2003, the power density varied from $0.898 \mu\text{W}/\text{cm}^2$ to $3.066 \mu\text{W}/\text{cm}^2$.

4. Discussion

Electric and EMFs interact with biological systems because they penetrate into organs and tissues, and the biological systems are ruled by delicate bioelectrochemical reactions that sustain the vital processes and receive the influence from those fields. As demonstrated in the literature

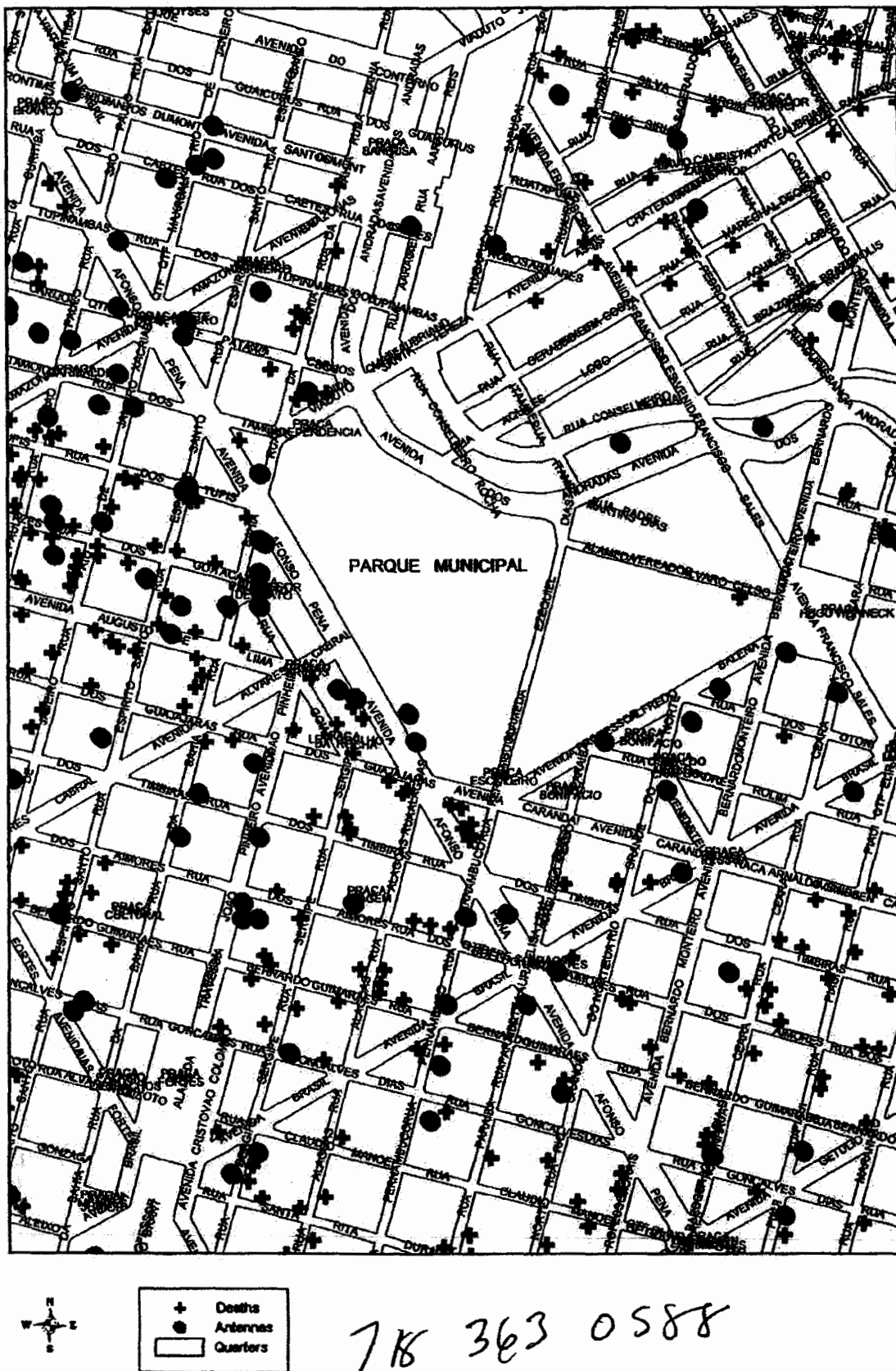


Fig. 10. Sample of geocoded deaths and RS locations in downtown Belo Horizonte City located in Central-Southern region.

Please cite this article as: Dode AC, et al, Mortality by neoplasia and cellular telephone base stations in the Belo Horizonte municipality, Minas Gerais state, Brazil, Sci Total Environ (2011), doi:10.1016/j.scitotenv.2011.05.051

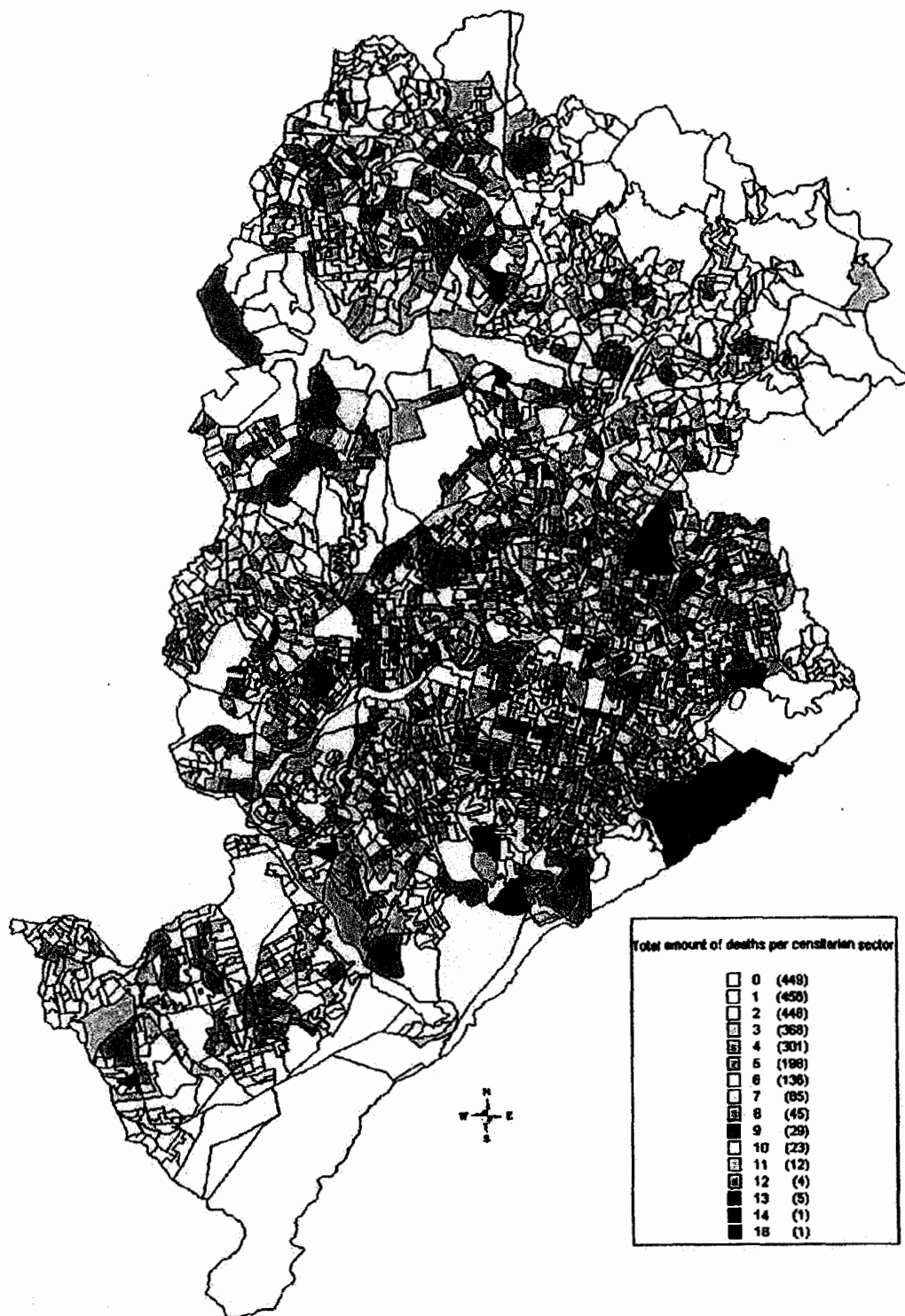


Fig. 11. Map of 7191 cancer deaths geocoded by CT.

In 2003, the largest electric field found during environmental monitoring of the BSs was 3.4 V/m and the greatest power density was 3.06 $\mu\text{W}/\text{cm}^2$. In 2008, the largest electric field found during environmental monitoring of the BSs was 12.4 V/m, and the greatest power density was 40.78 $\mu\text{W}/\text{cm}^2$ near the cellular

antennas in the 890 to 1800 MHz frequency band. These values were much larger than those reported in the Netanya study (approximately 0.53 $\mu\text{W}/\text{cm}^2$). The smallest values found in the measurements were a field intensity of 0.4 V/m and a power density of 0.04 $\mu\text{W}/\text{cm}^2$.

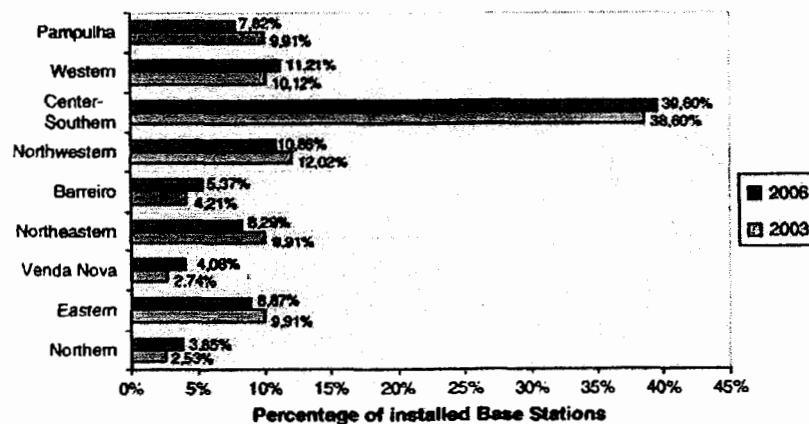


Fig. 8. BS percentage by Sanitary Districts in the Belo Horizonte municipality in 2003 and in 2006.

(Kundi and Hutter, 2009; Sage and Carpenter, 2009; Khurana 2008 BIOINITIATIVE REPORT, 2007; Cherry, 2006; Cherry, 2007; Hardell and Sage, 2007). exposure to electromagnetic radiation of low intensities for long periods of time is a determinant for the aggravation and the emergence of diseases in humans. Studies point to observations of environmental carcinogens as an alert to the scientific community (Hardell et al., 2007). Bioeffects and adverse health effects occur at frequencies much lower than RF and extremely low frequencies (ELF) without any heating effect.

Khurana et al. (2010) identified by searching PubMed ten epidemiological studies that indicate the occurrence of neurobehavioral effects or cancer. In eight of those studies, the population lived within 500 m of a BS. However, all exposures were under the accepted international guidelines. Therefore, it is suggested that those guidelines may be inadequate in protecting the health of human populations. Additionally, more comprehensive epidemiological studies are necessary to evaluate long-term exposure to RF from mobile phones BSs to understand its health impact.

This research bases on the ecological study that uses geographical areas as units of pre-existing data to identify areas of risk. The data is already aggregated, and one does not know about the genetic characteristics, life habits, food choices and other factors of each individual. The ecological studies frequently begin the epidemiological process, and the discoveries are considered to be an alert.

In the Belo Horizonte municipality, the mortality rate was concentrated near the antennas and was not diffuse over the whole city. At a distance of up to 100 m, the absolute number of deaths was 3569, 49.63% of all deaths, the mortality rate was 43.42 persons per 10,000 and the relative risk was 1.35. When one does not consider the distances from the BSs for all the entire population of the Belo Horizonte municipality (2,238,332 inhabitants), the mortality rate was 32.12 per 10,000 inhabitants, which is the null hypothesis.

In this research, we found a mortality rate for the residents living within 500 m of the transmitter antennas of a BS greater than 34.76 per 10,000 inhabitants. This rate decreased for residents living farther from the BS, as shown in Fig. 15.

We concluded that the relative risk of death by neoplasia, according to the distance from a BS in the Belo Horizonte municipality, from 1996 to 2006, was greater within a radius of up to 500 m from the BSs (Table 5). In the town of Netanya, Israel, in 2004, the authors also found an increase of 4.15 times in the cancer incidence of the residents of a zone up to 350 m from the BS, compared to those who lived outside that area (Wolf and Wolf, 2004). A retrospective study in Naila, Germany, showed that the risk of new cancer cases was three times greater among the patients who had lived at a distance less than 400 m from a cellular telephone transmitter antenna during the last ten years (1994 and 2004), compared to those who lived at greater distances (Eger et al., 2004).

In addition, only the deaths of those who were exposed since the first license date of the BS were included in the study, even though there were antennas that were installed in the register date (before the licensing date).

Also, we observed that the Central-Southern SD possessed the greatest antenna concentration in the city and the most electromagnetic contamination. This region contained 38.60% of the installed antennas in 2003 and 39.50% in 2006. Again, through georeferencing, we observed a greater concentration of specific cases of death by neoplasia in the region. The accumulated incidence rate per 1000 residents was the largest in Central-Southern SD, reaching 5.83; this rate was the lowest (2.05) in Barreiro region.

In the Central-Southern SD, there are no factories; it is a strictly residential area, with some services and commerce. No power lines, highways, airports or railroads exist in the area. However, many private vehicles come and go in the region, and its inhabitants possess higher social status and affluence. It contains many wooded streets and gardens. The Central-Southern SD has other aggravating exposures, including noise, gases, fumes, aerodispersoids, and hydrocarbonates, each of which also damage human health. Despite the presence of diverse and aggressive potential agents that may have influenced the quality of life and the health of the dwellers living in the area, the mortality rates remained concentrated near the antennas, with a dose-response gradient, and were not diffuse all over the city.

Age and sex did not appear to be a confounder in this study. In Belo Horizonte municipality, like all of Brazil, the population suffers from a demographic transition characterized by the aging of the population, and this is a possible confounder for all chronic degenerative diseases. Looking at the profile of the proportional mortality by age and gender throughout the 10 years studied, there is no specific trend for either men or women, and the highest percentage started at age 40 and increased to age 60. Irrespective of the year, the proportional mortality by gender and age remained stable during the period, suggesting there is no relevant change in the proportion of deaths by cancer when age is taken into consideration.

According to the ICNIRP guidelines, the human levels to the public at large (ICNIRP, 1998), for the frequency (f) band ranged from 400 to 2000 MHz, the electric field intensity E ($V \cdot m^{-1}$) equals $1.375 f^{1/2} V/m$, which equals $1.375 \sqrt{f} V/m$.

These values are according to the reference level patterns for the public at large when compared with the current Brazilian federal law which establishes the following limits: for a 900 MHz field intensity an electric field of 41.25 V/m and a power density of 451.34 $\mu W/cm^2$, for a 1800 MHz field intensity an electric field of 58.33 V/m and a power density of 902.49 $\mu W/cm^2$. These human exposure limits are exclusively based on thermal effects.

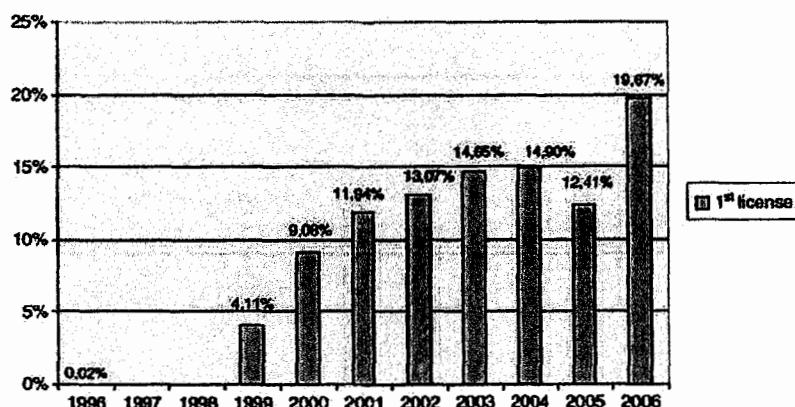


Fig. 12. Percentage of neoplasia deaths per year in the Belo Horizonte municipality, from 1996 to 2006, using the first license date.

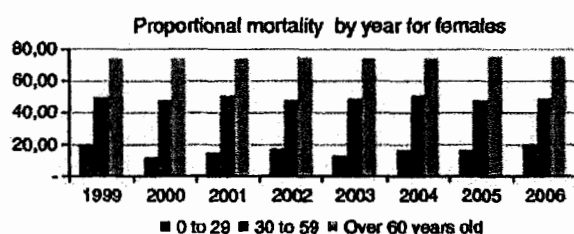


Fig. 13. Proportional mortality by year for females.

The major advantage of this ecological study is that it is the first epidemiological approach to determine the existence of a possible association between a determined exposure and a health outcome using the group characteristics.

The principal limitations of the present study concern the study design and the use of secondary data. By design, the group results could not be extrapolated to each person in the population. Although the data were well standardized and collected from official personnel in the City Health Department, they are subject to misclassification due to lack of information and errors in the entering of data and diagnosis. Finally, neither the life habits nor the genetic factors of the residents could be taken into account.

Despite these limitations, the present study has brought important contributions to the issue, the most important of which is the existence of a cluster of deaths by neoplasia associated with BS clusters. Although the direction of this relationship could not be specified, this work has demonstrated the existence of such clusters. Until more extensive studies are conducted, we urge the adoption of the Precautionary Principle and a revision of national policies toward stronger restrictions of the human limits associated with this

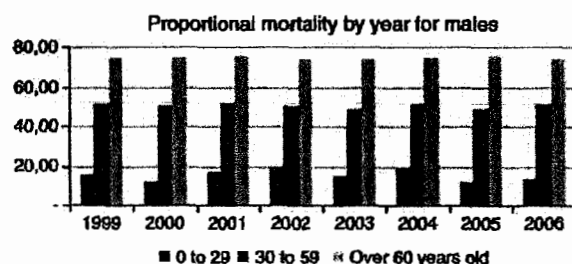


Fig. 14. Proportional mortality by year for males.

technology. The adoption of EMF and radiation levels similar to the more restrictive exposure limits of many other countries and towns would be one important public health provision. On this matter, we refer to the Porto Alegre Resolution.

The Precautionary Principle states that when there are signs of possible adverse effects to health or to the environment, although uncertain, the risks of inaction can be greater than the risks of acting, especially in relation to the control of human exposures to non-ionizing radiation. The Precautionary Principle reverses the burden of proof from those who suspect a risk on those who take the actions and affirm that only when new scientific discoveries will be recognized as the unique criterion to establish or to change guidelines. The principle asserts that precaution be maintained until new proven researches be done.

From May 18th to 19th, 2009, in Porto Alegre City, Rio Grande do Sul State, Brazil, occurred The International NIR (Non-ionizing Radiation) and Health Workshop ("Seminário Internacional sobre RNI, a Saúde e o Ambiente"), sponsored by the Federal University of Rio Grande do Sul. The purpose of the workshop was to present lectures as a basis to initiate discussions among Brazilian and foreign scientists and public health authorities on the potential biological and health consequences and the setting of exposure limits of non-ionizing electromagnetic fields/radiation (NIR).

The workshop also was under the sponsorship of the Brazilian Ministry of Health, as well as some other governmental and non-

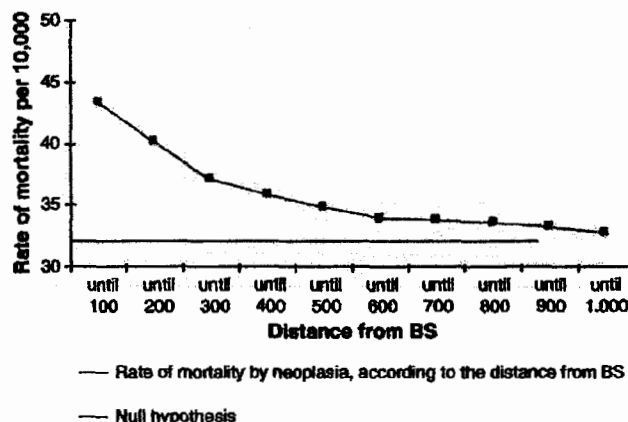


Fig. 15. Rate of mortality by neoplasia, according to the distance from the BS in Belo Horizonte municipality, from 1996 to 2006, and the null hypothesis.

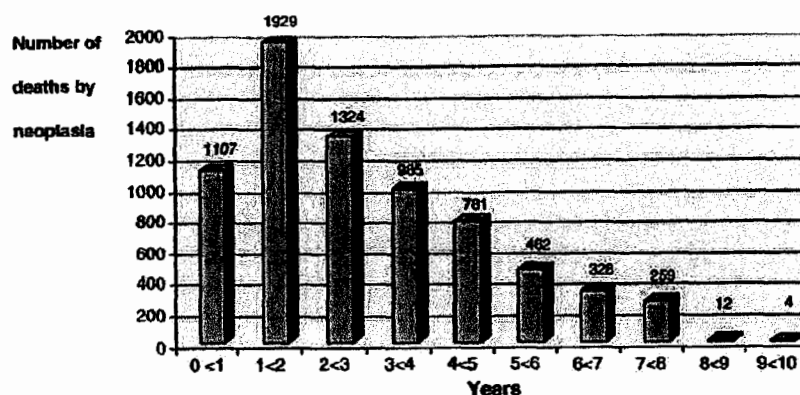


Fig. 16. Distribution of the number of deaths by neoplasia versus duration of exposure since the date that the first antenna in each analyzed CT came into operation.

governmental organizations. International researchers from several countries delivered talks on selected subjects.

Researchers, public health authorities, as well as authorities from the legislative, executive and judiciary governmental bodies from Brazil and other South American countries were also present.

Site: www.ufrgs.br/ppgee/rni.htm

After the event, the Porto Alegre Resolution was approved by the scientists from many countries and participants who have understood that the health protection, the well-being and the environment require the immediate adoption of the Precautionary Principle and some precautionary practices.

Site: http://www.icems.eu/docs/resolutions/Porto_Alegre_Resolution.pdf

5. Conclusion

This research showed the existence of a spatial correlation between cases of death by neoplasia and the locations of the BSs, in the Belo Horizonte municipality from 1996 to 2006.

The mortality rates and the relative risk were higher for the residents inside a radius of 500 m from the BS, compared to the average mortality rate of the entire city, and a decreased dose-response gradient was observed for residents who lived farther away from the BS. The major antenna concentration was located in the Central-Southern SD of the city, which also had the largest accumulated incidence (5.83/1000 inhabitants).

The measured values of the EMF, determined in 2008 and 2003, were substantially below the values allowed by the Brazilian federal law nr. 11934, May 5, 2009. Nevertheless, the values encountered in this study surpassed the limits of human exposure adopted by many other countries and cities in the world, including Italy ($10 \mu\text{W}/\text{cm}^2$); China ($6.6 \mu\text{W}/\text{cm}^2$); Switzerland ($4.2 \mu\text{W}/\text{cm}^2$); Paris, France ($1 \mu\text{W}/\text{cm}^2$); Salzburg, Austria ($0.1 \mu\text{W}/\text{cm}^2$); and Porto Alegre, Brazil ($4.2 \mu\text{W}/\text{cm}^2$).

New epidemiological studies must explore this issue with more timely and appropriate methodology to provide evidence that may confirm the relationship between risk and hazard at an individual level. Meanwhile, we strongly suggest the adoption of the Precautionary Principle until the limits of human exposure, as established in Brazilian Federal Law, can be re-evaluated.

Supplementary materials related to this article can be found online at doi:10.1016/j.scitotenv.2011.05.051.

Acknowledgements

We would like to thank Márcia Salvador Géo, Medical Doctor; Helvécio Miranda Magalhães Júnior, Medical Doctor; Luciano Assírio Bossi, Telecommunications Engineer; Graziella Lage Oliveira, Psychologist; Livia Daniella Pereira Dode, Production Engineer; and Aline Dayrrel Ferreira Sales, Epidemiologist for their kind and ever-present support.

References

- Alanko T, Hietanen M, von Nadelstah P. Occupational exposure to RF fields from base station antennas on rooftops. *Annals of telecommunications*. From the issue entitled "Health protection and RF exposure assessment: engineering aspects, 63." 2008. p. 125–32. Numbers 1–2. DOI: 01007/s12243-007-0001-6.
- ANATEL [online]. Available from: <www.anatel.gov.br> 21st April, 2011.
- ANATEL – "Agência Nacional de Telecomunicações": Telecommunications National Agency. Resolução no. 303 de 2 de julho de 2002 – Aprova o Regulamento sobre Exposição a Campos Elétricos, Magnéticos e Eletromagnéticos na Faixa de Radio-freqüências entre 9 kHz e 300 GHz. (Resolução nº. 303, July 2nd, 2002 – Approves the Regulation on Exposure to Electric, Magnetic and Electromagnetic Fields in the Radiofrequencies Band from 9 kHz to 300 GHz.); 2000a. [online]. Available from: <www.anatel.gov.br>.
- ANATEL – "Agência Nacional de Telecomunicações": Telecommunications National Agency. Anexo à Resolução no. 303 de 2 de julho de 2002 – Regulamento sobre Limitação da Exposição a Campos Elétricos, Magnéticos e Eletromagnéticos na Faixa de Radio-freqüências entre 9 kHz e 300 GHz. (Anexo to Resolução nº. 303, July 2nd, 2002 – Regulation on Exposure to Electric, Magnetic and Electromagnetic Fields in the Radiofrequencies Band from 9 kHz to 300 GHz.); 2000b. [online]. Available from: <www.anatel.gov.br>.
- Beall C, Ditzell E, Cole P, Brill I. Brain tumors among electronics industry workers. *Epidemiology* 1996;7:125–30.
- Benishvili D, Avinoach I, Baazov D, Zusman I. Household electromagnetic fields and breast cancer in elderly women. *May–June in Vivo* 2005;19(3):563–6. 2005. [online]. Available from: <<http://www.ncbi.nlm.nih.gov/pubmed/15875777>>. May 2nd, 2008.
- BIOINITIATIVE REPORT: A rationale for a biologically-based public exposure standard for electromagnetic fields (ELF and RF). [online]. 2007. Available from: <<http://www.bioinitiative.org>>. In 2010.
- BRAZIL. Ministry of Health. [online]. Available from www.saude.gov.br. 2011.
- Cherry N. Scientific evidence of the risk of adverse health effects from chronic exposure to low-level electromagnetic radiation – EMRAA. Electromagnetic Radiation Alliance of Australia. E-mail: emraa@sec.org.au. Sept. 1999.
- Cherry N. Health effects associated with mobile base stations in communities: the need for health studies. New Zealand: Lincoln University – Environmental Management and Design Division. 8 June 2000; 2007. [online]. Available on Dec. 2006. Sep.
- Dode, Adilza Condessa. Poluição ambiental e exposição humana a campos eletromagnéticos: estudo de casos no município de Belo Horizonte com ênfase nas estações radiobase de telefonia celular. (Environmental pollution and human exposure to electromagnetic fields: a case study in Belo Horizonte municipality emphasizing mobile phone base stations). Dissertação: Mestrado em Saneamento, Meio Ambiente e Recursos Hídricos – Escola de Engenharia, Universidade Federal de Minas Gerais, Belo Horizonte. (Thesis: Master Degree in Sanitation, Environment and Hydric Resources – Engineering School, Federal University of Minas Gerais, Belo Horizonte City, Brazil). p175. 2003.
- Eger H, Jahn M. Specific health symptoms and cell phone radiation in Selbitz (Bavaria, Germany) – evidence of a dose-response relationship. *Umwelt-Medizin-Gesellschaft* 2010;23:2.

- Eger H, Hagen Ku, Lucas B, Vogel P, Voit H. Einfluss der räumlichen Nähe von Mobilfunksendeanlagen auf die Krebsinzidenz. *Umwelt-Medizin-Gesellschaft* 2004;17:4.
- Feychting M, Forsen U, Floderus B. Occupational and residential magnetic field exposure and leukemia and central nervous system tumors. *Epidemiology* 1997;8:384–9.
- Gadzicka E, Bortkiewicz A, Zmyslony M, Szymczak W, Szyjowska A. Assessment of subjective complaints reported by people living near mobile phone base stations [Abstract]. *Biuletyn PTZE Warszawa* 2006;14:23–6.
- CORDIS L. *Epidemiologia*. Translation from English: 'Epidemiology'. 2. ed. Rio de Janeiro: Revinter; 2004. 302p.
- Guenel P, Nicolau J, Imbernon E, Chevalier A, Goldberg M. Exposure to 50-Hz electric-field and incidence of leukemia, brain tumors and other cancers among French electric utility workers. *Am J Epidemiol* 1996;144:1107–21.
- Hallberg JO. Malignant melanoma of the skin – not a sunshine story! *Med Sci Monit* Jul 2004;10(7):CR336–40. (Electronic publication ahead of print, 2004 Jun 29).
- Hardell L, Sage C. Biological effects from electromagnetic field exposure and public exposure standards; 2007. doi:10.1016/j.biophys.2007.12.004. [online]. Available from: <www.sciencedirect.com>. Dec.
- Hardell L, Carlberg M, Ohlson C-G, Westberg H, Eriksson M, Hansson Mildt K. Use of cellular and cordless telephones and risk of testicular cancer. *Int J Androl* 2007;30:115–22.
- IBGE – Instituto Brasileiro de Geografia e Estatística ('Brazilian Institute of Geography and Statistics'). *Censo Demográfico (Demographic Census) 2000*. [online]. Available from: <www.ibge.gov.br/censo>. Apr. 2008.
- IBGE – Instituto Brasileiro de Geografia e Estatística ('Brazilian Institute of Geography and Statistics'). *Censo Demográfico (Demographic Census) 2010*. [online]. Available from: <www.ibge.gov.br/censo>. May 2011.
- ICNIRP – International Commission on Non-Ionizing Radiation Protection. Guidelines for limiting exposure to time varying electric, magnetic and electromagnetic fields (up to 300 GHz). *Health Phys* 1998;74:494–522. April 1998.
- IEEE – Institute of Electrical Electronics Engineers Inc. IEEE – IEEE recommended practice for the measurement of potentially hazardous electromagnetic fields – RF and microwave. IEEE – C95.3-1991 (Revision of ANSI C95.3-1973 and ANSI C95.5-1981). New York, USA; 1992.
- IEEE – Institute of Electrical Electronics Engineers Inc. IEEE standard for safety levels with respect to human exposure to radio frequency electromagnetic fields, 3 kHz to 300 GHz. IEEE – C95.1. 1999 Edition (Incorporating IEEE Std C95.1-1991 and IEEE Std C95.1a-1998). New York, USA; 1999.
- Johansson O. Electrohypersensitivity: state-of-the-art of a functional impairment. *Electromagn Biol Med* 2006;25:245–58.
- KATHEREIN MOBILCOM BRASIL LTDA, HUENNER E., LENSIG KI-. *Guia prática de antenas ('Practical guide of antennas')*. Dinâmica Gráfica e Editora Ltda. 2ª Edição. São Paulo. 52p. 1999.
- Khurana VG. Mobile phones and brain tumours – ©; 2008. C. Khurana – All Rights Reserved. [online]. Available from: <www.brain-surgery.us>. Apr. 2008.
- Khurana VG, Hardell L, Everaert J, Bortkiewicz A, Carlberg M, Ahonen M. Epidemiological evidence for a health risk from mobile phone base stations. *Int J Occup Environ Health* 2010;16. no. 3. Jul/Sep.
- Kundi M, Hutter HP. Mobile phone base stations – Effects on wellbeing and health. *Pathophysiology* (2009) (PATPHY-597). doi:10.1016/j.pathophys.2009.01.008. Elsevier Ireland Ltd. 13 pp. Accepted 30 January 2009.
- Lai H. Biological effects of radiofrequency radiation from wireless transmission towers: a presentation at the "Cell Tower Forum: State of the Science/State of the Law" sponsored by the Berkshire-Litchfield Environmental Council on December 2, 2000, in Lakeville, CT, USA. [online]. Available from: <http://www.indymedia.ie/attachments/jul2007/henrylai_bioeffectsfromtowers1.pdf>. Apr. 2011. Apr. 2008.
- Mack W, Preston-Martin S, Peters JM. Astrocytoma risk related to job exposure to electric and magnetic fields. *Bioelectromagnetics* 1991;12:57e66.
- NATIONAL COUNCIL ON RADIATION PROTECTION AND MEASUREMENTS NCRP. – Report n° 119 – A practical guide to the determination of human exposure to radiofrequency fields. Maryland, USA: Bethesda; 1993. ISBN 0-929600-35-5.
- Navarro EA, Segura J, Portolés M, Gómez-Perretta C. The microwave syndrome: a preliminary study in Spain. *Electromagn Biol Med* 2003;Vol. 22(N° 283):161–9. USA.
- Sage C, Carpenter DO. Public health implications of wireless technologies. (PATPHY-603). *Pathophysiology* 2009. doi:10.1016/j.pathophys.2009.01.011. Elsevier Ireland Ltd. 14 pp. Accepted 30 January 2009.
- Santini R, Santini P, Danze JM, Le Ruz P, Seigne M. Enquête sur la santé de riverains de stations relais de téléphonie mobile: I/Incidences de la distance et du sexe. *Pathol. Biol.* (Paris) 2002;50:369–73.
- Santini R, Santini P, Danze JM, Le Ruz P, Seigne M. Enquête sur la santé de riverains de stations relais de téléphonie mobile: II/Incidences de l'âge des sujets, de la durée de leur exposition et de leur position par rapport aux antennes et autres sources électromagnétiques. *Pathol.Biol.* (Paris) 2003;51:412–5.
- Schoemaker MJ, Swerdlow AJ, Ahlbom A. et al. Mobile phone use and risk of acoustic neuroma: results of the Interphone case-control study in five North European countries. *Br J Cancer* 2005;93:842–8.
- Stang A. Federal Ministry for Education and Research of Germany. The possible role of radiofrequency radiation in the development of uveal melanoma. *Epidemiology* 2001; vol. 12(n° 1):7–12.
- UN – Population Crisis Committee of the United Nations. 2007.
- UNDP – United Nations Development Programme. In Amaral E. Thesis of Postgraduate degree in management and assessment of social projects in urban areas. Sociology and Anthropology Department, Human Sciences and Philosophy, Federal University of Minas Gerais – UFMG. 2008.
- Wakeford R. The cancer epidemiology of radiation. *Oncogene* 2004;23. 6404e28.
- Wolf R, Wolf D. Increased incidence of cancer near a cell-phone transmitter station. *Int J Cancer Prevention* April 2004;1(2).

<http://rparticle.web-p.cisti.nrc.ca/rparticle/RpArticleViewer? handler =HandleInitialGet&journal =er&volume=18&calyLang=eng&media=html&articleFile=a10-018.pdf>

Environ. Rev. 18: 369–395 (2010) | doi:10.1139/A10-018 | Published by NRC Research Press / Publié par les Presses scientifiques du CNRC

ARTICLE

Biological effects from exposure to electromagnetic radiation emitted by cell tower base stations and other antenna arrays

B. Blake Levitt^a and Henry Lai^b

^aP.O. Box 2014, New Preston, CT 06777, USA. (e-mail: bb1353355@gmail.com).

^bDepartment of Bioengineering, Box 355061, University of Washington, Seattle, WA 98195, USA.

Corresponding author: B.B. Levitt (e-mail: blakelevit@cs.com).

Received 30 April 2010. Accepted 6 August 2010. Published on the NRC Research Press Web site at <http://er.nrc.ca> on 5 November 2010.

"Biological effects from exposure to electromagnetic radiation emitted by cell tower base stations and other antenna arrays. It is clear that low-intensity RFR is not biologically inert. "Since most studies with RFR are short-term exposure studies, it is not valid to use their results to set guidelines for long-term exposures, such as in populations living or working near cell phone base stations."

Abstract: The siting of cellular phone base stations and other cellular infrastructure such as roof-mounted antenna arrays, especially in residential neighborhoods, is a contentious subject in land-use regulation. Local resistance from nearby residents and landowners is often based on fears of adverse health effects despite reassurances from telecommunications service providers that international exposure standards will be followed.

Both anecdotal reports and some epidemiology studies have found headaches, skin rashes, sleep disturbances, depression, decreased libido, increased rates of suicide, concentration problems, dizziness, memory changes, increased risk of cancer, tremors, and other neurophysiological effects in populations near base stations.

The objective of this paper is to review the existing studies of people living or working near cellular infrastructure and other pertinent studies that could apply to long-term, low-level radiofrequency radiation (RFR) exposures. While specific epidemiological research in this area is sparse and contradictory, and such exposures are difficult to quantify given the increasing background levels of RFR

from myriad personal consumer products, some research does exist to warrant caution in infrastructure siting. Further epidemiology research that takes total ambient RFR exposures into consideration is warranted. Symptoms reported today may be classic microwave sickness, first described in 1978. Nonionizing electromagnetic fields are among the fastest growing forms of environmental pollution. Some extrapolations can be made from research other than epidemiology regarding biological effects from exposures at levels far below current exposure guidelines.

Key words: radiofrequency radiation (RFR), antenna arrays, cellular phone base stations, microwave sickness, nonionizing electromagnetic fields, environmental pollution.

7. Biological effects at low intensities

Many biological effects have been documented at very low intensities comparable to what the population experiences within 200 to 500 ft (~60–150 m) of a cell tower, including effects that occurred in studies of cell cultures and animals after exposures to low-intensity RFR. Effects reported include: genetic, growth, and reproductive; increases in permeability of the blood–brain barrier; behavioral; molecular, cellular, and metabolic; and increases in cancer risk. Some examples are as follows:

- Dutta et al. (1989) reported an increase in calcium efflux in human neuroblastoma cells after exposure to RFR at 0.005 W/kg. Calcium is an important component in normal cellular functions.
- Fesenko et al. (1999) reported a change in immunological functions in mice after exposure to RFR at a power density of 0.001 mW/cm².
- Magras and Xenos (1997) reported a decrease in reproductive function in mice exposed to RFR at power densities of 0.000168–0.001053 mW/cm².
- Forgacs et al. (2006) reported an increase in serum testosterone levels in rats exposed to GSM (global system for mobile communication)-like RFR at SAR of 0.018–0.025 W/kg.
- Persson et al. (1997) reported an increase in the permeability of the blood–brain barrier in mice exposed to RFR at 0.0004–0.008 W/kg. The blood–brain barrier is a physiological mechanism that protects the brain from toxic substances, bacteria, and viruses.
- Phillips et al. (1998) reported DNA damage in cells exposed to RFR at SAR of 0.0024–0.024 W/kg.
- Kesari and Behari (2009) also reported an increase in DNA strand breaks in brain cells of rats after exposure to RFR at SAR of 0.0008 W/kg.
- Belyaev et al. (2009) reported changes in DNA repair mechanisms after RFR exposure at a SAR of 0.0037 W/kg. A list of publications reporting biological and (or) health effects of low-intensity RFR exposure is in Table 1.

Eger et al. (2004) took up a challenge to medical professionals by Germany's radiation protection board to determine if there was an increased cancer incidence in populations living near cell towers. Their study evaluated data for approximately 1000 patients between the years of 1994 and 2004 who lived close to cell antennas. The results showed that the incidence of cancer was significantly higher among those patients who had lived for 5 to 10 years at a distance of up to 400 m from a cell installation that had been in operation since 1993, compared with those patients living further away, and that the patients fell ill on an average of 8 years earlier than would be expected. In the years between 1999 and 2004, after 5 years operation of the transmitting installation, the relative risk of getting cancer had tripled for residents in proximity of the installation compared with inhabitants outside of the area.

10. Studies on exposure to cell tower transmissions

From the early genesis of cell phone technology in the early 1980s, cell towers were presumed safe when located near populated areas because they are low-power installations in comparison with broadcast towers. This thinking already depended on the assumption that broadcast towers were safe if kept below certain limits. Therefore, the reasoning went, cell towers would be safer still. The thinking also assumed that exposures between cell and broadcast towers were comparable. In certain cities, cell and broadcast tower transmissions both contributed significantly to the ambient levels of RFR (Sirav and Seyhan 2009; Joseph et al. 2010).

There are several fallacies in this thinking, including the fact that broadcast exposures have been found unsafe even at regulated thresholds. Adverse effects have been noted for significant increases for all cancers in both men and women living near broadcast towers (Henderson and Anderson 1986); childhood leukemia clusters (Maskarinec et al. 1994; Ha et al. 2003; Park et al. 2004); adult leukemia and lymphoma clusters, and elevated rates of mental illness (Hocking et al. 1996; Michelozzi et al. 2002; Ha et al. 2007); elevated brain tumor incidence (Dolk et al. 1997a, 1997b); sleep disorders, decreased concentration, anxiety, elevated blood pressure, headaches, memory impairment, increased white cell counts, and decreased lung function in children (Altpeter et al. 2000); motor, memory, and learning impairment in children (Kolodynski and Kolodynski 1996), nonlinear increases in brain tumor incidence (Colorado Department of Public Health 2004); increases in malignant melanoma (Hallberg and Johansson 2002); and nonlinear immune system changes in women (Boscol et al. 2001). (The term "nonlinear" is used in scientific literature to mean that an effect was not directly proportional to the intensity of exposure. In the case of the two studies mentioned previously, adverse effects were found at significant distances from the towers, not in closer proximity where the power density exposures were higher and therefore presumed to have a greater chance of causing effects. This is something that often comes up in low-level energy studies and adds credence

to the argument that low-level exposures could cause qualitatively different effects than higher level exposures.)

There is also anecdotal evidence in Europe that some communities have experienced adverse physical reactions after the switch from analog TV broadcast signals to the new digital formats, which can be more biologically complex

Three doctors in Germany, Cornelia Waldmann-Selsam, MD, Christine Aschermann, MD, and Markus Kern, MD, wrote (in a letter to the U.S. President, entitled *Warning — Adverse Health Effects From Digital Broadcast Television*)^[10], that on 20 May 2006, two digital broadcast television stations went on the air in the Hessian Rhoen area. Prior to that time that area had low radiation levels, which included that from cell phone towers of which there were few. However, coinciding with the introduction of the digital signals, within a radius of more than 20 km, there was an abrupt onset of symptoms for constant headaches, pressure in the head, drowsiness, sleep problems, inability to think clearly, forgetfulness, nervousness, irritability, tightness in the chest, rapid heartbeat, shortness of breath, depression, apathy, loss of empathy, burning skin, sense of inner burning, leg weakness, pain in the limbs, stabbing pain in various organs, and weight gain. They also noted that birds fled the area. The same symptoms gradually appeared in other locations after digital signals were introduced. Some physicians accompanied affected people to areas where there was no TV reception from terrestrial sources, such as in valleys or behind mountain ranges, and observed that many people became symptom free after only a short time. The digital systems also require more transmitters than the older analog systems and, therefore, somewhat higher exposure levels to the general population are expected, according to the 2009 SCENIHR Report (SCENIHR 2009).

Whether digital or analog, the frequencies differ between broadcast and cell antennas and do not couple with the human anatomy in whole-body or organ-specific models in the same ways (NCRP 1986; ICNIRP 1998). This difference in how the body absorbs energy is the reason that all standards-setting organizations have the strictest limitations between 30–300 MHz — ranges that encompass FM broadcast where whole body resonance occurs (Cleveland 2001). Exposure allowances are more lenient for cell technology in frequency ranges between 300 MHz and 3 GHz, which encompass cellular phone technology. This is based on the assumption that the cell frequencies do not penetrate the body as deeply and no whole-body resonance can occur.

There are some studies on the health effects on people living near cell phone towers. Though cell technology has been in existence since the late 1980s, the first study of populations near cell tower base stations was only conducted by Santini et al. (2002). It was prompted in part by complaints of adverse effects experienced by residents living near cell base stations throughout the world and

increased activism by citizens. As well, increasing concerns by physicians to understand those complaints was reflected in professional organizations like the ICEMS (International Committee on Electromagnetic Safety) Catania Resolution^[11], the Irish Doctors Environmental Association (IDEA)^[12], and the Freiburger Appeal^[13].

Santini conducted a survey study of 530 people (270 men, 260 women) on 18 nonspecific health symptoms (NSHS) in relation to self-reported distance from towers of <10 m, 10 to 50 m, 50 to 100 m, 100 to 200 m, 200 to 300 m, and >300 m. The control group compared people living more than 300 m (approximately 1000 ft) or not exposed to base stations. They controlled for age, presence of electrical transformers (<10 m), high tension lines (<100 m), and radio/TV broadcast transmitters (<4 km), the frequency of cell phone use (>20 min per day), and computer use (>2 h per day). Questions also included residents' location in relation to antennas, taking into account orientations that were facing, beside, behind, or beneath antennas in cases of roof-mounted antenna arrays. Exposure conditions were defined by the length of time living in the neighborhood (<1 year through >5 years); the number of days per week and hours per day (<1 h to >16 h) that were spent in the residence.

Results indicated increased symptoms and complaints the closer a person lived to a tower. At <10 m, symptoms included nausea, loss of appetite, visual disruptions, and difficulty in moving. Significant differences were observed up through 100 m for irritability, depressive tendencies, concentration difficulties, memory loss, dizziness, and lower libido. Between 100 and 200 m, symptoms included headaches, sleep disruption, feelings of discomfort, and skin problems. Beyond 200 m, fatigue was significantly reported more often than in controls. Women significantly reported symptoms more often than men, except for libido loss. There was no increase in premature menopause in women in relation to distance from towers. The authors concluded that there were different sex-dependent sensitivities to electromagnetic fields. They also called for infrastructure not to be sited <300 m (~1000 ft) from populations for precautionary purposes, and noted that the information their survey captured might not apply to all circumstances since actual exposures depend on the volume of calls being generated from any particular tower, as well as on how radiowaves are reflected by environmental factors.

Wolf and Wolf (2004) Wolf, R., and Wolf, D. 2004. Increased incidence of cancer near a cell-phone transmitter station. *Inter. J. Cancer Prev.* 1(2): 123–128. in the article at [http://rparticle.web-](http://rparticle.web-p.cisti.nrc.ca/rparticle/RpArticleViewer?_handler=HandleInitialGet&journal_ar&volume=18&ealyLang-eng&media=html&articleFile=a10-018.pdf#ref154)

[p.cisti.nrc.ca/rparticle/RpArticleViewer?_handler=HandleInitialGet&journal_ar&volume=18&ealyLang-eng&media=html&articleFile=a10-018.pdf#ref154](http://rparticle.web-p.cisti.nrc.ca/rparticle/RpArticleViewer?_handler=HandleInitialGet&journal_ar&volume=18&ealyLang-eng&media=html&articleFile=a10-018.pdf#ref154)

investigated increased cancer incidence in populations living in a small area in Israel exposed to RFR from a cell tower. The antennas were mounted 10 m high, transmitting at 850 MHz and 1500 W at full-power output. People lived within a 350 m half circle of the antennas. An epidemiologic assessment was done to

determine whether the incidence of cancer cases among individuals exposed to the base station in the south section of the city of Netanya called **Irus (designated area A)** differed from expected cancer rates throughout Israel, and in the town of Netanya in general, as compared with people who lived in a nearby area **without a cell tower (designated area B)**.

There were 622 participants in area A who had lived near the cell tower for 3 to 7 years and were patients at one health clinic. The exposure began 1 year before the start of the study when the station first came into service. A second cohort of individuals in area B, with 1222 participants who received medical services at a different clinic located nearby, was used as a control.

Area B was closely matched for environment, workplace, and occupational characteristics. In exposure area A, eight cases of different types of cancer were diagnosed in a period of 1 year, including cancers of the ovary (1), breast (3), Hodgkins lymphoma (1), lung (1), osteoid osteoma (1), and hypernephroma (1). **The RFR field measurements were also taken per house and matched to the cancer incidents.** The rate of cancers in area A was compared with the annual rate of the general population (31 cases per 10 000) and to incidence for the entire town of Netanya. There were two cancers in area B, compared to eight in area A.

They also examined the history of the exposed cohort (area A) for malignancies in the 5 years before exposure began and found only two cases in comparison to eight cases 1 year after the tower went into service. The researchers concluded that relative cancer rates for females were 10.5 for area A, 0.6 for area B, and 1.0 for the whole town of Netanya. Cancer incidence in women in area A was thus significantly higher ($p < 0.0001$) compared with that of area B and the whole city. **A comparison of the relative risk revealed that there were 4.15 times more cases in area A than in the entire population.** The study indicated an association between increased incidence of cancer and living in proximity to a cell phone base station. The measured level of RFR, between 0.3 to 0.5 $\mu\text{W}/\text{cm}^2$, was far below the thermal guidelines.