Cellphone Standard's Inquiry

by the

Australian Senate

- Thursday, 31 August 2000 -

STANDING COMMITTEE

ON THE

ENVIRONMENT, COMMUNICATIONS,

INFORMATION TECHNOLOGY
AND THE ARTS

This is an uncorrected copy of the
Transcript of

Dr Michael Repacholi's - WHO

appearance at the Australian Senate Inquiry
into cellphone and health standards.

Dr. REPACHOLI

I am here representing the International Electromagnetic Field Project of the World Health Organisation. I have made a special visit to Australia this time because Australia is a supporter of the international EMF project at WHO, and a very good supporter. I appreciate that very much. The reason I have come is to say what we are trying to do at WHO. WHO, as you know, normally deals with developing countries and diseases that occur in these countries.

However, this technology of mobile telephones has been growing so rapidly that it is now going straight into developing countries as well. They are missing the landline systems and going straight into mobile telecommunications so if there is any health problem then it is a global problem and we need to deal with it as soon as possible.

I established at WHO a program that would go through a series of logical steps to resolve this issue. The steps-and I will give a short presentation on this-are really to review the literature, identify the gaps in knowledge that we need filled so that we can make good health risk assessments, coordinate research world wide to ensure that those gaps are filled and then set up formal task forces, which WHO does for many physical, chemical and biological agents as a routine, to establish what the health effects are so that we use the normal criteria that WHO has for determining health effects of any physical, biological or chemical agent. I think that is the only reasonable way-in my view, anyway-to resolve this problem. I know that the public has tremendous concerns, and I empathise with those concerns, because the technology has been propagated into people's working and living environments without very much consultation. It is when such base stations are placed in schools, parents would ask, 'Are there any health effects?' and if we are in a period of debate about the science then that is not very reassuring for parents.

So what we have tried to do within this project is complete initial reviews, and a lot of the research that we found was necessary is taking time. It takes time to do this research; it cannot be done very quickly. And so we are in this research period that we hope will last probably about three years. Then we will be able to set up our formal health risk assessment committees and we will be publishing the results, and the project will conclude at WHO. It is a time-limited project; it is due to end in 2005. Maybe the best thing I could do is to give you my presentation.

SEN. ALLISON (CHAIR)

This is the presentation you have given us copies of?

Dr. REPACHOLI

Yes. [Overhead transparencies were then shown]

Dr. REPACHOLI

So we have at WHO the International EMF project, and it has already been going for some five years. It is a project that has a large number of international partners. All the international agencies that have any responsibility for non-ionising radiations are involved in this project, including organisations like the United Nations Environment Program; the International Commission on Non-Ionising Radiation Protection, which is the NGO that is formally recognised by WHO to deal with non-ionising radiations; the International Labour Office to deal with worker related concerns; the International Electrotechnical Commission to provide the technological input; the International

Agency for Research on Cancer, which is a WHO specialised agency that just does research and evaluation of carcinogens to determine whether any physical, chemical or biological agent is carcinogenic; NATO, which obviously has a military concern about exposure to their personnel; the International Telecommunications Union; and the European Commission. We currently have over 45 countries-national representatives-involved in the project, and we have specialised collaborating centres in the United States, UK, Japan, Sweden and Germany.

This provides essentially a schematic overview of what we are trying to do within the project. International reviews are conducted. As I said, they provide health status reports-what we know from the information we have available-and also identify research that is still necessary. We are currently coordinating we estimate approximately $100 million worth of research world wide. These are research organisations that have asked WHO what research is necessary so that WHO can make better health risk assessments. In this case, the Australian government, through its electromagnetic field project, has approached WHO and identified a number of projects that are currently ongoing. We are collecting a database of information and then we will go through the review and health risk assessment processes that will finally, hopefully, lead to standards.

We are also looking at the environmental impacts of electromagnetic fields. We have already held an international conference on this and we are currently writing up a review article that will summarise all of the information. It relates primarily to major development projects that emit large amounts of electromagnetic fields into the environment. We want to know what non-human impacts occur. We have the paper written and it is currently going through a review.process. It will be published and it will be available, for example, to organisations that need to do environmental impact statements for these major development projects.

We have a large information and training program. We have facts sheets on most things in 14 different languages so that people can look at these things in their own language and get the information they need.

We also have a standards procedure that I would like to say more about today because I know that the review is primarily addressing the Australian standard and what should be done about that. This standards harmonisation project has reviewed standards world wide and is providing working groups that will develop the framework for a global standard so that, once we have the framework, the health risk assessment process can come into the global standards. We also have a risk perception communication program through which we try to better understand public concerns about the issue and how scientists, government and the public can communicate better on it. We will produce documents that provide information about that. It is a fairly comprehensive program.

I will not go through this information because you have it in your notes, but it essentially outlines what I have just explained: the series of logical steps that we are going through to try to resolve this issue in the best possible way. We have conducted our reviews and we are currently promoting research. We have research coordination committees to identify what research is ongoing and what we still need so that we can promote what is needed in order to maximise available resources.

I would like to pause briefly to indicate that there are big differences between what is considered to be a biological effect that is found through scientific study and what is considered to be a health effect. First of all, WHO has a definition of health, as you might expect. It is defined as a state of complete physical, mental and social wellbeing and not merely the absence of disease or infirmity. We consider wellbeing within our

program-so people who consider themselves to be under some psychosocial stress because of electromagnetic fields are considered within the program.

Biological effects that are produced in scientific studies are generally measurable responses to EMF. For example, a biological effect could be a very small rise in temperature which has no significance to the body. It could be any one of a number of things that are easily compensated for within the body. In our Canberra environment, you go out into the cold and the body compensates. The body is responding to what is effectively a hostile environment all the time.

A health effect is a biological effect that produces a consequence which is outside the body's normal range of physiological compensation and is thus detrimental to the health or wellbeing of the person. This is something that the committees within WHO look at to find out whether there is a true health effect that could be produced by this biological effect. Obviously, you can do limited experimentation on humans. Short-term effects can be determined and that is expected to be coming up under the British program following the Stewart committee inquiry.

There will be substantial funding to get volunteers within the laboratory and find out exactly what occurs with exposure to telecommunication fields. With this criteria, we work through.

People probably have difficulty in understanding that it is not any one study that can produce a definitive result-it has to be replicated independently. These are criteria that WHO uses before it can accept a result. I will mention my own study because of the concerns that that has raised. So it has to be replicated independently and has to be shown to be good science, and that is very important. There are a lot of studies in this area which are very poor science and we can identify those relatively easily.

When we look at the evidence, though, we have to look at the strength of the evidence, because you can never prove that something does not happen-you cannot prove a negative.

You cannot say that there is no health effect possible. But, by the number of studies that are produced, you can produce a weight of evidence which indicates overwhelmingly that there is no effect or that there is an effect and that is what we have to realise when we develop the database on which standards are written. The health risk assessments are set up under WHO task groups which are identified by the executive director of WHO.

Let me briefly say something about my mouse study, which has given grief around the world.

I should give a little background to this, because it is important that this study was actually an add-on study to another long-term study that was produced, or that was being funded, on the 50 Hz fields. We had a very elaborate set-up for the 50 Hz exposures. Then we were approached by Telstra, which said, 'The model looks good and we would like to find out if there are any effects to this model of mouse which could occur from telecommunications frequency fields.' I was actually given a golden opportunity. I was told, 'Go and find the most sensitive model that you can possibly get to look at the incidence of cancer from a physical agent such as this.' The ???pim1 mouse is a transgenic strain of mouse where extra cancer genes are put into the DNA to make them predisposed to the cancer that you want. Transgenic animals are becoming very popular in science because if you want, for example, to look at asthma or some other ailment, you can insert the appropriate genes into the DNA to make it predisposed to get asthma and then you can expose it to whatever other physical or chemical agent you are going to be exposing them to.

These animals are extremely sensitive. Twenty per cent of these animals in this case were going to get lymphoma, which in fact was what we found, but we also found, of course, that if you expose them to GSM signals this doubled the incidence of cancer. There have been a number of criticisms of the study, that it did not go for long enough. We only did 18 months, and the reason for doing 18 months was because we did not want to have the diseases that occur with age. In the last six months you get all sorts of age related diseases occurring, which can confuse the results, so we wanted to have a look at 18 months when they were relatively healthy, and we could just concentrate on what we wanted to do.

The subsequent studies, however, are using now the two-year period, which is a national toxicological program-type assay with a full two years to look and see what happens over that period. And people criticise the 18 months because, while the cancers were increasing, so were the number of cancers in the controls, but there was a doubling here of the incidence, and they feel that maybe the controls would have caught up with the exposed group at the end of two years. I do not believe that myself. I think a real difference had occurred, but we have just got to await the results. The problem is that we only looked at one exposure, and to give a result credibility you like to see that increasing exposure will increase the effect. The dose response is something where, when you look at toxicology, you want to see that increasing the dose of chemical, for example, increases the effect: you get higher incidences of the cancer or whatever.

My study was not able to test that because it only had one point.

Senator HARRIS

Chair, can we ask questions as we go, or would you prefer not to?

Sen. ALLISON (Chair)

I would normally prefer not to, but it depends. Dr Repacholi, how much longer do you expect to be with that presentation because we are all getting a bit anxious to ask you questions.

Dr. REPACHOLI

Yes, I understand. I have only got about 11 slides or something like that.

Sen. ALLISON (Chair)

Okay, if you can perhaps try and not repeat what is already here because we have got it in front of us and can read it.

Dr. REPACHOLI

Sure, I understand. I am trying to just use this as a memory jolt. The study that is being held in Adelaide now is under a standard procedure that has been used for testing carcinogenicity in experimental animals. It is using the US national toxicology program-type protocols. So there are other difficulties. Obviously, it is a difficulty extrapolating mice to humans because of the different RF absorptions, and humans do not have these genetic changes.

The mechanisms to account for this are very difficult because I have no idea what has produced this effect, and we spent a long time looking at this before we finally finished our publication because we thought we had done something terribly wrong because it seemed that the result was quite dramatic. We knew that we had not overheated the

animals, but we did not know what else could have occurred, so that delayed the study-plus a few journals felt that it was too hot to handle so we got a few rejections on the publication.

I will just mention, as you probably know, that under the EMF projects at WHO IARC is going to conduct a huge mobile telephone study that will be done in probably 14, maybe more, countries where there will be 3,000 cases of brain tumour compared with 3,000 controls. This will be a huge, very sensitive study, and there is an Australian component of the study funded by the Australian government. The beauty of this study is that they are all working under the same protocol so we can pool the results and come up with a very sensitive result.

Uncertainty is something that the public and many others are unable to deal with very well. I do not want to labour this, but uncertainty exists. You will notice in the papers that I gave to the committee there is a publication from WHO, a backgrounded document, plus an article that we sent to Science about the precautionary principle. These things are looking at uncertainty and how it can be dealt with.

Normally, uncertainty is dealt with in a science based way by using safety factors that incorporate reductions in the exposure levels to account for the uncertainties and unforeseens.

We know that we have some uncertainty still. There are some results in the EMF area that we want to follow up, but we do know that if there is an effect it is going to be quite a subtle effect.

There are 5,000 to 6,000 publications now in this area that relate to EMF, and especially mobile telecommunications.

We have embarked on a standards harmonisation project. WHO does not develop standards, but it goes through its NGO, which is ICNIRP in this project. We have got the major standard setting countries in every country in the world involved in this project for standards harmonisation. The benefits are obvious. It increases public confidence. It reduces debate and fears. People are protected to the same high level and obviously with our globalisation of trade we would expect that there would be benefits to health care by having standards.

As for precaution, we know and understand that there is a growing movement to adopt precautionary approaches to manage health risks with scientific uncertainty. I have recently spent about an hour with the minister of health in Belgium. She was asking what she could do about precautionary measures. I will indicate what was the outcome from that.

WHO does not normally advise national authorities to set policies to go beyond established knowledge. We set health risk assessments based on the knowledge that we know. However, there was a ministerial conference in London recently and we were asked to look at the need to rigorously apply the precautionary principle in assessing risks and to adopt more preventive, proactive approaches to hazards. WHO has not caught up with that. The EMF project is certainly right in the middle of this and we feel that we want to provide some leadership in WHO for this.

The European Commission has provided a document on this, but I will not go into it. It has certain criteria for using the precautionary principle. If you use those criteria, the precautionary principle as it is should not be applied to EMF; but it does not mean to say that you cannot have precautionary measures, it is just that you cannot invoke an established principle like the precautionary principle.

What are the recommendations to member states? There is the need to address the health issue, which should be done through mandatory, science based standards. There is a need to address public concerns. We suggest that this should be through a separate policy of voluntary precautionary measures. Unfortunately, a few countries are now introducing additional ad hoc safety factors into the science based standards as a precautionary measure. This undermines hundreds of millions of dollars worth of science that went into developing the standards, for no apparent benefit to health.

These voluntary measures can be through increased research, encouragement of manufacturers to keep exposures to minimum needed for the technology, better risk communication, targeting audiences with honest and accurate information, public involvement in decision making, and the sighting of facilities to minimise public exposure and concerns.

People would generally be happy with those sorts of measures because it has their involvement and they do not feel taken out of the equation.

I have just summarised our most recent fact sheet into which I will not go. I will just say a couple of things that need to be said. There have been a number of reviews and none have indicated that there are health consequences from exposure to either the mobile phones or their base stations. There are gaps in knowledge where we are conducting research, and this research is going through. We recommend that governments have a role to play in setting health based standards and introducing additional precautionary measures, as they feel fit.

Individuals can be encouraged to take their own precautions if they have concerns about children. There was a lot of press following the Stewart inquiry about children being more sensitive. If people feel that this is the case-and there is no evidence for that, but it is a possibility-then hands-free kits or limiting times of calls are good ways to reduce exposures.

The one message I would really like to convey though is that motorists should be strongly discouraged from using mobile phones while driving. There is no doubt that-

Sen. ALLISON (Chair)

They get brain tumours, do they?

Dr. REPACHOLI

No, they are wobbling all over the road. Maybe I can leave it there. Thanks very much.

Sen. ALLISON (Chair)

Can I kick off by referring to the comment you made a moment ago that the standards that you are promoting for harmonisation are based on science. What precisely was the science that set those standards up in the first place? Can you give the committee examples of the sorts of studies that led to those standards?

Dr. REPACHOLI

There were studies that were done on primates. These tend to be very expensive studies, but primates have, essentially, very similar characteristics to humans. It is as far as you can go without actually exposing humans to radiofrequency fields. The basis of modern standards now are the studies that were done on-

Sen. ALLISON (Chair)

Can you give us a reference for those studies? Were they based on heat generated from-

Dr. REPACHOLI

Yes, there is no doubt they are heat based standards.

Sen. ALLISON (Chair)

Who conducted the studies?

Dr. REPACHOLI

There were a number of studies done, predominantly in the United States.

There is John D'Andrea.

Sen. ALLISON (Chair)

In what year were they done?

Dr. REPACHOLI

They were done some time ago.

Sen. ALLISON (Chair)

Can you be precise?

Dr. REPACHOLI

These were behavioural studies where they found that the primates had a change in behaviour or they were unable to do tasks as well as they should have.

Sen. ALLISON (Chair)

So were they in the 1920s, 1930s, 1950s?

Dr. REPACHOLI

No, most of those studies were done in the late 1970s and 1980s. There have been follow-up studies done, as you probably know, by Henry Lai. He is finding behavioural changes at levels which are at the lower end of what has been found before. The studies are essentially based on changes in behaviour or tasks in mazes where, for example, animals are put into a radial arm maze and food pellets are put at the end of each. Then you can train them to go around and pick up all the pellets quickly. In time they become very accurate or the timing can be done fairly precisely. Then you expose them and find out if they do it in the same time. They can forget that they have already been down a maze and they will go down that maze twice and so take a longer time to find the food pellets.

Sen. ALLISON (Chair)

So that behavioural study in the 1970s determined the current proposal in terms of exposure. Why did it take so long? Why didn't Australia adopt that back in the 1970s if that was so pivotal to setting standards?

Dr. REPACHOLI

They did not think of standards. Most countries did not think of standards. It was mostly the Soviet Union and the US that dealt with standards. Most European countries, until recently, did not look at standards for this area. The standards were introduced primarily because of the introduction of radar. In fact, as the stories of-

Sen. ALLISON (Chair)

Dr Repacholi, what I am trying to get at is this: what we understand to be the case is that Australian standards are likely to be relaxed, and they are to be relaxed in line with your recommendations for harmonisation. What I think the committee needs to understand is why it is that Australian standards should be relaxed to this harmonisation level. Another aspect of this is why the World Health Organisation should play a role. I am sure we can understand why the industry would want harmonisation, but why should that be of concern to the World Health Organisation?

Dr. REPACHOLI

There are two questions there. I was involved in the early attempts to develop an Australian standard. The standard was developed primarily on the international standard at the time and follows the international standard except in one region, called the microwave region. There was so much discontent about this that the level ended up being a negotiated level. It was not based on the science. Everything was based on the science up to that point, but the last part was not based on the science-it was negotiated between the unions and the government at the time.

Sen. ALLISON (Chair)

Is the new standard based on science?

Dr. REPACHOLI

Australia does not have a standard at the moment.

Sen. ALLISON (Chair)

The proposed new standard which would harmonise us with the United States and other countries.

Dr. REPACHOLI

Yes, because the shape of the standard relates to the absorption of energy.

You assume that a certain amount of energy is absorbed and will produce an effect.

Sen. ALLISON (Chair)

But what is the science that tells you what the effect is at that point? What I am trying to get at is: what informs the current proposal in terms of the science, precisely?

Dr. REPACHOLI

The studies that have been done have indicated that an SAR of four watt per kilogram

Sen. ALLISON (Chair)

Which studies are these?

Dr. REPACHOLI

These are all the animal studies, the ones that wer??

Sen. ALLISON (Chair)

From the seventies?

Dr. REPACHOLI

The seventies and eighties, yes. These are the early studies on primates. It was indicated that four watt per kilogram seemed to be a threshold, above which there were changes in behaviour.

Sen. ALLISON (Chair)

Unusual behaviour?

Dr. REPACHOLI

Yes. Below that, there did not seem to be any, unless the environmental temperatures were high and then that four watt per kilogram came down to one watt per kilogram.

Sen. ALLISON (Chair)

Given the sort of research work that has happened since the seventies, that seems to me to be rather imprecise and not terribly scientific, especially in terms of biological responses. It does not sound very sophisticated.

Dr. REPACHOLI

The problem is that behavioural changes are quite variable between peopl?3/4different people behave differently. It can be partly that. It is also the imprecision of the studies and imprecision in the dosimetry-knowing that you have, in fact, given four watt per kilogram to the animal and not 3.8 or whatever. There is a certain amount of imprecision there. This is why safety factors are incorporated: because of that imprecision and the variabilities that occur. Essentially, that threshold was noted some time ago. There was a factor of 10 reduction in the SAR to produce the occupational level and a factor of 50 reduction for general public levels. When you have a constant SAR over the spectrum, that dictates the shape of the curve. In other words, if you are going to get a constant 0.4 or 0.08 watt per kilogram, then you need to be exposed to

certain levels before you get that absorption. That is what dictates the shape of the international curv?3/4it is just the absorption. But what happened was that this part of the curve was just straightened out and it did not follow the science because, in fact, to produce this level, you need even lower absorption and you do not get the standard 0.08 watt per kilogram at that point.

Sen. ALLISON (Chair)

All of this is based on animal studies, behavioural studies with primates?

Dr. REPACHOLI

Yes, but you can extrapolate absorption of energy to humans because there has been a lot of work done on the dosimetry of mice, rats, guinea pigs, humans and monkeys.

You can use that data to extrapolate what the absorption would be in animals from the monkey studies.

Sen. ALLISON (Chair)

It would be useful for the committee to have the progress, if you like, of what you are talking about with the SAR and so on that actually leads you to the view that this is the right standard as opposed to some other standard. Given that Australia is facing a relaxation in its standards, this is a critical question.

Dr. REPACHOLI

It is not actually a relaxation, it is just a correction back to the science.

Sen. ALLISON (Chair)

Nonetheless, it is a relaxat ion, is it not?

Dr. REPACHOLI

There is a confusion in the Australian standard at the moment. It says that the standard is 0.08, but in fact it is not. The limits that came out were not 0.08. Down here it is about 0.01. If you stick to the basic standard it will not be a relaxation. If you stick to the limits that were identified to get that, then yes, it will seem like a relaxation.

Sen. ALLISON (Chair)

Can I ask you about the production of the fact sheets? What you have said to us tonight is that there remains quite a lot of uncertainty. Certainly you have identified a lot of work that still needs to be done in terms of the research. Don't you think it is a little premature to be producing fact sheets for people? The suggestion here is that part of the problem for the World Health Organisation is uncertainty. Is that a reasonable position to take?

Dr. REPACHOLI

We do not think there is a big uncertainty. We have a very large volume of literature and we can say something from that literature. There are thousands of studies, and these are what are reviewed. We have to be able to say something. We cannot wait until the end and think, 'Okay, now our database is full', and then make some recommendations. So these are interim recommendations as we go along. They are produced by an

international advisory committee which is composed of all the international organisations that I mentioned at the start of the presentation, plus the 45 national representatives that come along, and they review all of these studies. What we did was do our international review first and then collect all the information that we could, and then that goes through a review process through the international advisory committee. The latest fact sheet actually went to our director-general. She is personally interested in the EMF and so she signed it off-begrudgingly in some points, but she feels the process has been followed and this is what the international consensus is and so that is what WHO produces. But she is somewhat worried about EMF as well.

Sen. ALLISON (Chair)

Can I just ask you about your own study on mice? This is to be replicated, and thank you for explaining some of the method changes. Will you at any point in time be able to precisely replicate the previous study? That is, if you go from 18 months to two years, will you stop at the 18-month point and see whether in every respect the methodology is the same so that it can be a true replication?

Dr. REPACHOLI

I guess in those studies a true replication, and in this case they are using better dosimetry. We have mice, for example, just able to run around in the cages, which is what people normally do, which meant that the variation in the amount of the radio frequency field they absorbed varied quite a lot from 0.01 to four watts per kilogram in this case, which is not very helpful for development of standards. So the new studies are going to be putting the mice into tubes, holding them during the exposure, they have got a fixed orientation to the field, and then the RF absorption is well-known and precise. That is one change. They are also going to do the dose response by exposing the mice to different levels of RF-although we did, I think, incredibly good pathology because we had it checked at three levels, including going to the US National Cancer Institute and having them check our pathology.

Sen. ALLISON (Chair)

Can I interrupt there? Isn't the point of replication to use precisely the same methodology? Isn't that the problem with so much research, that it is not replicated and you need to do that replication in order to verify whether your first results have any validity or not? How can you change the methodology and still call it replication?

Dr. REPACHOLI

We tend to call it confirmation of a result. The reason is that in initial studies they may have done something that is not particularly helpful or there is a better way of doing it. If the result is a true result it should still occur in the animal. There is no reason to expect that you are still exposing the animal to radiofrequency fields using the same pulsing regimes, maybe different times, different orientations, but if there is going to be an effect it should still occur. We were very careful in reviewing the follow-up study in Adelaide, and there is another study being done in Europe, to make sure that, yes, what was done in the original study is going to either be confirmed or not confirmed in these studies. I feel confident in that; and I want that myself because it is my result and I want to make sure that they do it right. If there is any deviation from that, then it is going to be criticised, so they are going to waste millions of dollars and then end up being criticised for something that they should have done.

Sen. ALLISON (Chair)

What is the cost of that study?

Dr. REPACHOLI

The one in Adelaide is just over a million Australian dollars. The one in Europe is about-

Sen. ALLISON (Chair)

That million dollars comes from this government's $4.5 million?

Dr. REPACHOLI

Yes.

Sen. ALLISON (Chair)

What stage is it at at present?

Dr. REPACHOLI

They are probably two-thirds of the way through the exposures now.

Sen. ALLISON (Chair)

What time period is that?

Dr. REPACHOLI

They should be finished the study at the end of next year.

Sen. ALLISON (Chair)

So you are already at the 18-month point?

Dr. REPACHOLI

Not quite-they are about 15 months through at the moment.

Sen. ALLISON (Chair)

Are there any preliminary observations?

Dr. REPACHOLI

It is a blinded study, so the people doing the study do not know which group are exposed and which are not exposed. Only an independent person is able to say, at the end when all the statistical analyses are done, that this one was exposed and this one was not, because you have got to take out biases. I know people criticise scientists for not coming up with preliminary results, but, in many cases, preliminary results have come out and they have said, 'Wow, we have found a big effect,' and then at the end of the study there was no effect, it all washed out. So scientists generally want to have

their results peer reviewed and published.ECITA 12 SENATE-References before they announce them. That is quite standard in science. It is only in EMF that this has tended to sway away from the norm. It has been unfortunate, because a lot of people have come out with these preliminary results, there has been a lot of media and a lot of concern, and then there was nothing at the end.

Sen. ALLISON (Chair)

Telstra funded the last study. Do they also have any money in this project, or not?

Dr. REPACHOLI

Probably the Australian government leaned on them to put some money into it, but it all came from the government.

Sen. ALLISON (Chair)

What is the total value of the study?

Dr. REPACHOLI

I honestly do not know what the Australian government did, but I think they did want a contribution from industry as well. I am not privy to that information.

Sen. MARK BISHOP

Could you track back to the earlier discussion you were having with Senator Allison about the establishment of the Australian standard and could you put on the record for us how it was established, what it sought to achieve, your criticism of it and your view on the adequacy or otherwise of the current interim standard? I was intrigued by that discussion.

Dr. REPACHOLI

The original standard came out in the 1980s, when I was not back in Australia-I was in Canada at the time. Then I was asked to chair an Australian standards committee on radiofrequency field under WorkSafe. We used this as a basis, and this was where I found out what the history of that standard was. I tried at that stage to bring it back to a more solid, scientific basis, but was unsuccessful. Then there was the Standards Australia effort where we joined with New Zealand to try to develop a joint standard.

Sen. MARK BISHOP

Why do you assert that the original standard set was-and is- deficient in some respect?

Dr. REPACHOLI

It is not deficient from my viewpoint, but it does not follow the science. It partly follows the science in the absorption curve. As you increase the frequency, the absorption changes and, at this point, it departs from the normal absorption curve, which is well known and well established in science. The shape of the standard should follow the normal absorption curve for human beings. The negotiated point is the only point of departure from the science.

Sen. MARK BISHOP

What in your view are the consequences or effects of departing from what science suggests the standard should be?

Dr. REPACHOLI

There is no effect on health. It is just that, from my viewpoint, I would like to see something that is science based and take away the subjectivity or the various opinions of people. Healt h is not negotiable; it should be based on something that is substantiated so that you know what level of protection you are providing to people. That is one of my criticisms of increasing safety factors, for example. In this case, safety factors are incorporated maybe for base stations but not for mobile phones that cause a thousand times more exposure. If you are protecting against health effects, why would you address just one source of exposure and not airport radars or radio and television transmitters? As a person working in a technical health agency, I want to protect people's health against a physical agent. I am not protecting them against a base station; I am protecting them against radiofrequency fields. I encourage people to adopt a standard that looks at the protection of health.

Sen. MARK BISHOP

Is the current Australian interim standard linked to the science? Has the debate you are speaking about been resolved?

Dr. REPACHOLI

No. The Standards Association does not have a standard now, so there is no interim standard. I understand that the regulatory authority for mobile telecommunications is using the ICNERP standard as an interim standard because there is no Australian standard and they must have something to go on in the meantime.

Sen. MARK BISHOP

What is the ICNERP standard?

Dr. REPACHOLI

It is the international standard, which is science based. They use WHO's health risk assessments to derive the standard. Let me give some examples. It is a complex issue. For example, the Russians have standards that are about a thousand times below international standards. We are encouraging them to look at the whole of the literature, not just the Russian literature, in developing their standards. I was in Moscow recently and I asked whether these standards were being complied with. They said they were. But the question then is: how come anyone is using a mobile phone, because if you use a mobile phone you exceed the Russian standard by about 100 times.

Sen. ALLISON (Chair)

Is that not the case in Australia too? Do we test the mobile phones that are used here?

Dr. REPACHOLI

I have had assurances that they comply, but I would like to see testing of mobile phones. If you have a standard, you should determine compliance with it. I do not trust the manufacturers to say, 'Yes, we're doing it.' The problem at the moment is that there

is no standard protocol for measuremen?3/4you know, what size phantom and what the characteristics are of the measurement that you should take to determine compliance with this. That standard will be out at the end of this year. So there will be a standardised procedure and manufacturers should be made to show exactly what SAR they have for that phone under this standard procedure; that is not unreasonable. They should be made to comply with the standards.

I was also going to give an example here. A lot of the eastern European standards tended to be paper tigers in that they came out with a standard which, for the public, sounded very protective. But, in fact, they could not operate any technology with the standards that they had because, if they did any measurements, they would find that the standards were exceeded. So are you protecting health or are you using it as a political statement? I am sorry, I do not like political statements, but I like health statements. I like people to be protected to a known level, so that if you are going to increase the level of protection, which from WHO's view point is absolutely okay, why wouldn't you, if you have a chemical, say, 'This dose is okay but, if countries lower the dose, it will be more protective'? You know that chemicals may not have a cut-off. It is like ionising radiation. Any dose of ionising radiation is going to cause some harm, so what you have to do is minimise the harm and maximise the benefits. It is a trade-off. In this case, though, we have a threshold below which we do not find any effects but above which we do, and we want to make sure that we eliminate those effects. This is the basis for a health base standar?3/4to get well down, 50 times below the level at which health effects are starting to be seen. Most technologies are actually 1,000 or 10,000 times below. I mean, the base stations are some 10,000 times below the international standards, and still they get singled out. I know there is pressure by people, but the pressure is really because the base stations are ugly-looking things. They are in people's living environments-probably by schools-and people do not want anything happening to their children, which is absolutely right, so they pick on a technology. They do not worry about the paging transmitters, because the paging transmitters are much smaller, but they emit much higher levels than base stations. I just want to make sure that we protect health, and that is my primary concern in trying to follow the science. I think science does a good job, by and large, when it is given a chance.

- Part 2 –

Sen. TCHEN

I have to ask a few questions of Dr Repacholi about technical things. You were speaking about paging transmitters being more powerful than mobile phone base stations.

Is that in terms of frequency or in terms of power?

Dr. REPACHOLI

They operate at very similar frequencies, but the power that they have can be 10 time?3/4 sometimes 100 times-higher. If you have a pager and a mobile phone base station next to each other you, will get 100 times more field from a paging antenna.

Sen. TCHEN

And the strength of the field is related to the power rather than frequency?

Dr. REPACHOLI

Yes.

Sen. TCHEN

Earlier-and, again, I must confess my ignorance-when you were talking about the study of behavioural change, you said that it is triggered by thermal impact. In the laboratory animal experience the transmission was powerful enough to change the body temperature.

Dr. REPACHOLI

Yes, the core temperature of the animal was increased by one degree Celsius.

Sen. TCHEN

That is fairly powerful, isn't it?

Dr. REPACHOLI

That is quite powerful, yes. That said, following from that statement, there has been more recent research done by Allan Preiss and Dr Korvisto which is suggesting that there could be changes in reaction times, which are similar things, which could be a central nervous system effect. The problems with Preiss's study were that he found a reduced reaction time by using a mobile phone, which is an unusual thing-you would think the reaction time might be extended-and he did not control for a number of things. So we want to make sure that study is replicated but that we use a standard battery of tests to look at a person's reaction time and short-term behaviour. These sorts of things we can do very well in the laboratory provided they are done under well accepted conditions, and that is what will be happening, I guess, over the next year.

Sen. TCHEN

But the experiment you did with the pulsing 900 MHz field - the impact of that is not due to thermal reaction?

Dr. REPACHOLI

No, I do not think that was a temperature rise. Some people say it might have been a temperature rise, but I do not believe it.

Sen. TCHEN

The other thing that perhaps you can clarify for me is that you said we do not have an interim standard and then some of the time you talk about us having an interim standard.

Dr. REPACHOLI

It is my understanding that at the moment there is no Australian standard, but your regulatory authority for mobile telecommunications is using-not a standard, I guess-as its basis for compliance within the industry, the international standard.

Sen. TCHEN

And that international standard is based on possible harmful effects of thermal impact?

Dr. REPACHOLI

Yes. I should add that the EMF study at WHO is looking only at non-thermal effects. We are not interested in thermal. We only want to find out whether there are thermal effects that will change the basis for the standards. That is where all the research is directed now.

Sen. ALLISON (Chair)

Into thermal effects?

Dr. REPACHOLI

Non-thermal. No, we are not interested in thermal because that is pretty well established. We do not want to repeat what is established, but we do want to find out whether, in all these various studies on gene expression, reaction times, behaviour-all of these-there could be something there that can substantiated and have an impact on the standards. That is our prime mission.

Sen. TCHEN

Yes, I understand. From the result of your research is the WHO study qualitatively different from the existing international standard in terms of science? There is a qualitative difference, isn't there?

Dr. REPACHOLI

I do not understand.

Sen. TCHEN

Your research is now seeking to establish possible impact on human and other organisms of quite a different type of effect from thermal effect?

Dr. REPACHOLI

Yes, it is the same radio frequency fields, pulsing, and all of that, but at lower levels that would not produce heating. It all produces heating but not so significant as to produce any adverse effect that we know of. But we want to find out whether these lower non-thermal levels do produce any adverse consequence. That is really what we want.

Sen. TCHEN

Yes, I understand. That is what I said: you say there is a qualitative change.

Dr. REPACHOLI

Yes.

Sen. TCHEN

I can see that some of it may create a misunderstanding where WHO's actual desire is to harmonise international standards. Why is it necessary to harmonise? Why can't different countries have different standards provided they are all above a certain minium standard?

Dr. REPACHOLI

For example, some standards are above the international standards. The US, for example, is above the international standard in many areas. We feel that they are not incorporating sufficient safety factors.

Sen. TCHEN

I am sorry. When I was saying a higher standard, I meant a better standard or a more stringent standard.

Dr. REPACHOLI

Right.

Sen. TCHEN

I am sorry. I probably should clarify the term first. At the moment different countries have different standards, which are, let us say, of different qualities. WHO has a desire to harmonise it so that they are more or less measuring the same thing to the same level. Then we are likely to be faced with people who say, 'Why should we have everybody's standard? Why can't we have a better standard? We are Australians, so we should have a better standard.' I have heard that argument many times.

Dr. REPACHOLI

It is a very good question and it goes to the core of the problem. The problem has been that people are concerned when they see differences in standards between countries.

For example, if the Australian standard comes in at a certain level and the Russian standard is a 100 times lower, people say, 'Why aren't you going to the Russian standard?'

Sen. TCHEN

Because it obviously will be better and safer?

Dr. REPACHOLI

It depends on whether you believe in the science or not. If you do not believe the science, then you may think it is safer; if you do believe in the science, it is not safer. In fact why not go 100 million times lower?

Sen. TCHEN

That is what the precautionary principle basically said, 'If in doubt, do nothing. Unless you have 100 per cent certainty, you do nothing.' That is how it has been put to me.

Dr. REPACHOLI

Yes, we have different interpretations. One of the problems with different countries having standards is that you then have a boat race of people wanting to get lower and lower standards. Eventually, there will be a measurable cost in having a lower standard. Once a standard is there, you do not get it right up there again. But if you go in with science, then you can say, 'Okay, we know what the level of protection is that we have and we really want to make sure that we protect the population to that level.' The level, from what we understand in the science, is an absolute protection. There is no effect at the level of the standards that we can identify at this time. If you lower it further you incur a bigger and bigger cost. At what point are you going to say that that cost is providing benefit? There is not any benefit if you lower the levels; you are not getting any known health benefit. It is different with ionising radiation where the dose response goes right to zero and you can measure the cost in the population. In this case, here is the threshold below which we do not see an effect. You can lower it and lower it but you are not getting any benefit for health. But you could eventually not only incur cost but impede technologies which could be very beneficial to health, emergency services or all sorts of things that relate to health. Something that countries should seriously consider is that there is going to be a detriment eventually if they are just going to have paper tigers.

Sen. TCHEN

Is this increasing cost likely to be a linear increase or an exponential increase?

Dr. REPACHOLI

I do not know that you can say. It could be exponential. In fact, it usually is exponential because when you have to lower, there are some technologies that comply with a lower level. When you lower again, you could have an avalanche of technologies that cannot actually comply with the levels that you are setting. As a principle, WHO likes to see lower standards, but it has to be based on the science that you are actually providing more protection and that is where the problem occurs.

Senator HARRIS-You said earlier on that the Russian standards were far lower, and I am taking that as in rigour, or was it that they were lower in-

Dr. REPACHOLI

The exposure limits were lower.

Sen. HARRIS

So they were almost out of compliance no matter what they were doing?

Dr. REPACHOLI

Yes.

Sen. HARRIS

Would you have any knowledge of the high voltage transmission working procedures in Russia and whether they vary at all compared to anywhere else in the world; in other

words, the workers who are physically working on the high voltage transmission power lines?

Dr. REPACHOLI

I can only relate with the scientists we deal with in Russia. Their switch yard workers are fairly basic electrical switch yards. They were exposed to reasonably high levels, and I am sure they were exceeding their own standards. They had standards that actually came very close, at the low frequency range, to the international standards. It really relates to spark discharge and induction of currents within the body.

If you have got time I can briefly mention the basis of some of the standards. They did standards based on questionnaires of workers who were exposed to microwaves. Before being asked the questions the workers knew that if there were any effects then obviously they should get danger pay. There was some encouragement to say, 'Yes, I get all sorts of terrible things.' These were duly documented and they said they were working in that area. They documented all these problems. They said that must be hazardous and so they lowered the levels. In fact, the standards were lowered, but they still worked in the same conditions.

That sort of science is something that could not be replicated in the West. We use scientific methods which are somewhat more precise than that. Part of our standards harmonisation project is to have studies carried out in these countries under international scrutiny. The standards have to be at international standards that are acceptable. We feel this will assist the scientists knowing more about the dosimetry and what needs to go into the scientific method that we feel is acceptable to WHO. It is looking good. We are getting some good studies into China. We are about to get some into Russia.

Sen. HARRIS

That then explains something to me. My understanding is that their requirement is that they only have four hours of exposure per day.

Dr. REPACHOLI

To a high level, yes. They have categorised their exposures.

Sen. HARRIS

Do you know if there is any correlation world wide that would show that workers who work on power distribution show an abnormal increase in cancer of any sort at all?

Dr. REPACHOLI

There have been some studies. We are talking about a different frequency rate.

Sen. HARRIS

I realise that.

Dr. REPACHOLI

There are two sets of studies in the low frequency area that worry WHO at the moment. One is that there are some studies suggesting that workers seem to have lower heart rates. Some studies suggest increases in leukemia and brain tumours by working with

power frequency fields. But the most worrying to me is the residential studies where children living near powerlines seem to have a higher incidence of leukemia. That is what we are concentrating our research on now. When you switch currents you can get spikes in the wave form. The spikes can actually induce currents which exceed the signal to noise-

Sen. HARRIS

The ratio.

Dr. REPACHOLI

or the noise levels within the cell so that the cell actually detects the signal.

That could in some way lead to cancer. That is the avenue of research that we are looking at, at the moment.

Sen. HARRIS

You have pre-empted exactly the line I was taking. Would your studies with transgenic mice enable you to do subsequent generation studies? If you have male and female transgenic mice that have been exposed to the same exposure that your group was for the 18 months, could you allow them to mate, produce progeny, and then look at that progeny? Is there any work there?

Dr. REPACHOLI

There is a study being conducted on that, but not on transgenic mice.

Transgenic mice are very difficult mice because you have to keep them in sterile conditions and you cannot let them loose. Transgenic mice are heterozygous-in other words, they have to be mated to a special animal, which is not transgenic, to get transgenic animals and then they have to be tested to make sure that the trans gene was -....

Sen. HARRIS

Transferred.

Dr. REPACHOLI

It is not an easy thing, but the multi-generational studies do form part of the National Toxicology Program, and they have conducted some studies of rats in multi-generations and they did not find any effect in the subsequent generations. But, the problem is that they used sinusoidal fields, and that is my concern. In my study also we smoothed out the fields so that we knew precisely what the dosimetry was. If we had let the switching go and exposed them to switched fields, then we may have produced a result. We do not know, and that is what we are now encouraging in a few other countries.

Sen. HARRIS

Regarding the instance of EMF-and we go back to the low frequencies-relating to powerlines, are there any studies that look at the amount of draw on the line, for example, if you had 132,000 kVA and the draw on it was 100 millivolt amps, and that dropped down to 80, or 60, or 20? Do you know of any studies that actually look at the variation in the draw which has an effect on the field?

Dr. REPACHOLI

If you double the current you will double the size of the magnetic field, and it is the magnetic field that has been suggested as the causative agent for the increases in leukemia. In some of the epidemiological studies they went back to the line loadings that were occurring to determine historically what the exposures were to the line. The trouble is that the dosimetry is not simple. It is not like having a little ionising radiation monitor where you can measure the ionising radiation, and the darkness of the field produced is related to the dose.

Here, you have a fluctuating magnetic field that induces currents and electric fields within the body which could produce something, but these are changing all the time so you can go either to an average field or to a maximum field. Generally, we like to go to a maximum field so that we get the worst case condition.

Sen. HARRIS

In your studies relating to the 3,000 brain cancer cases, are you going to do any investigations about where the person was actually conceived or where they were during their teenage years? What I am directing towards now is whether there is a different effect for a human being depending on the age of the human being when they are exposed-in other words, on whether the cells are rapidly dividing.

Dr. REPACHOLI

This study will not be able to look at that. It will look at age differences in people who use mobile phones but it is not going to be looking at the point of conception and the effects on offspring of mobile telephone users. That will be a very different study. This one is a case control study. There will be large numbers and you will be able find out if there is any sensitive subgroup-generally for people down to maybe about 15 or 18, but not really below that because there are not significant numbers of mobile phone users down at that level. That said though, the Stewart inquiry recommended that there be studies that relate to sensitivity on children which is, I think, quite reasonable. But it is unethical, obviously, to get babies in there and to start examining them.

Sen. HARRIS

No, I am not implying that. What I was targeting was that if a percentage of those 3,000 cases were conceived and spent the first eight or nine years of their lives within 215 metres of a transmission line and those people subsequently move away to do whatever they do, and then you test them for the effects of brain cancers, would you be able to check if a greater percentage of people in that 3,000 actually end up with cancers that relate to-

Dr. REPACHOLI

Yes, that is being done. The low frequency fields are seen as a confounder to the study. If there is an effect, is it due to the fact that they were actually located near power lines? That is being done. Let me just briefly describe the study. They are going to get 3,000 cases of brain tumours and match them for age, sex and locality to an equivalent number of controls who do not have brain tumours. They investigate both groups to find out whether one group is using mobile phones more than the other group and for how long. If the brain tumour group are found to be significantly higher users of mobile phones, maybe that is a causative agent in the production of their brain tumours.

Sen. MARK BISHOP

Why is there any relationship between persons with brain tumours, persons not with brain tumours and the use of mobile phones in your study?

Dr. REPACHOLI

It is a standard case control study which is looking for associations for a number of different things.

Sen. ALLISON (Chair)

If you have already got the brain tumour, why would you keep using a mobile phone? Doesn't that confound your-

Dr. REPACHOLI

No, you look at the history prior to getting a brain tumour. I am sure they will not continue to use them; in fact, a lot of brain tumours act very quickly and people die very quickly. The brain tumour patient goes back and finds out what exposures they received to both low frequency and mobile phones and any other-

Sen. ALLISON (Chair)

What is the matching process? What do you match them for?

Dr. REPACHOLI

For example, if you have a person who has a brain tumour-maybe a female aged 50, living in Canberra-you would then get another female aged 50, living in Canberra, or in a similar locality, and then match what they did.

Sen. ALLISON (Chair)

Is that all: age and location?

Dr. REPACHOLI

Yes. They cannot do much better than that normally.

Sen. ALLISON (Chair)

Senator Harris's question about where you were born and whether you were close to a-

Dr. REPACHOLI

They can go back in the family history. The questionnaire is very detailed.

This is a standard procedure that IARC use for such studies. They are looking, for example, at Chernobyl accident workers who did the clean up to find out what their cancers were and whether they actually related to the radiation exposure. In this case, they look at all sorts of confounding factors that could relate to their brain tumours or any head and neck cancers. The study is looking at all head and neck cancers.

Sen. HARRIS

Are there any studies that are looking at the effects of accumulation of exposures? An example would be that in Australia, not so much in the cities but out in the country

areas, we invariably put our powerlines down the side of the road. We are now looking at putting our transmission towers for our mobile phones on the same road, so you have got continuity of signal. In North Queensland they use microwave links for telephone communication which again, because of their remoteness and the need to be able to get to them, primarily are in these corridors. Are there risks in us doing this and getting this accumulation of exposures?

Dr. REPACHOLI

There are some studies but there are not many looking at synergistic effects of low frequency and high frequency exposure and also EMF exposure and chemicals or EMF and some other agent in the environment. I do not think I would worry too much about rural areas because they tend to be some way away from the roads.

Sen. HARRIS

Wrong.

Dr. REPACHOLI

The farms are right next to the powerlines?

Sen. HARRIS

No, I am talking about someone like me who might do 10,000 kilometres in three or four weeks around the state, and for that continuous period I am primarily driving on a road that has mobile phone frequency and high power frequency on it. In the area where I am there are six transmission lines running for periods right beside each other. Are we, in putting all of our services down these same corridors, exposing a truck driver, for example, who spends 24 hours a day on the road? I will only spend infrequent bulk periods like that, but these people have that type of exposure for much longer periods. If there are any studies that are looking at this synergy of exposure, they would be most helpful.

Dr. REPACHOLI

There are some studies but we do not have any real results yet. Certainly we will be looking at that because of the concern about low and high frequency fields. Any of the studies are now looking at the other field as a confounder to make sure that one is not causing the other. There are studies exposing to both sets of fields so that we can find out if there is something occurring because of those two exposures.

Sen. ALLISON (Chair)

I will go back to one of the comments you made earlier about sorting out the bad science. You said there was a need to do that. Can you give us some idea as to what guidelines you use to sort out the bad science?

Sen. HARRIS

Sines as in waves!

Sen. ALLISON (Chair)

Research.

Dr. REPACHOLI

It is something that we get crit icised a lot, I know, but WHO has criteria for acceptance of scientific studies. I will just give you the main criteria. One is that any result has to be replicated independently by another laboratory first. Secondly-

Sen. ALLISON (Chair)

Just before we get off replication ...

Dr. REPACHOLI

... or confirmation-put confirmation in brackets after replication.

Sen. ALLISON (Chair)

The WHO takes no account of research which has not been replicated?

Dr. REPACHOLI

We would not say it does not take any account. It takes note; but when you do health risk assessments you cannot use it for the health risk assessments. With a significant result that has not been replicated there is a lot of pressure to get that replicated because it could produce something.

Sen. ALLISON (Chair)

What, in your experience, is the success rate of researchers being able to have their work replicated? Could you hazard a guess at the number of research projects that have been replicated?

Dr. REPACHOLI

We just went through the RAPID program, which is a program in the US conducted by the National Institute of Environmental Health Sciences. They tried to replicate a lot of the studies at the low frequency end, like the gene expression studies, behavioural studies and various other key studies that could impact on human health, and they were able to replicate one in 40.

Sen. ALLISON (Chair)

That was not quite my question. Say there have been 100 research studies-there have been many more than that, of course-but, of those 100, what percentage has been replicated?

Dr. REPACHOLI

Do you mean that people have tried to replicate the studies?

Sen. ALLISON (Chair)

I am trying to get a feel for the percentage. I ask this question because a number of the submissions that have been sent to the committee point to the extreme difficulty in getting funding for replication. Much of the work that is already out there cannot be replicated for a whole range of reasons. From your experience, are roughly half of the

research studies that show significant effects being replicated or is the number much smaller than that? Are all of the studies being replicated?

Dr. REPACHOLI

No. I would think only a very small percentage-maybe up to 20 per cent- have been replicated.

Sen. ALLISON (Chair)

What would you recommend in terms of public health policy and government policy in this field? Replication is clearly important if you are to determine whether the research is worthwhile. What steps would you suggest that a government ought to take to ensure that more than a very small percentage of studies are replicated?

Dr. REPACHOLI

WHO is actually doing the job for you in this case because WHO knows what the composition of a database should be to make good health risk assessments. It knows what types of studies it needs to be able to answer questions about, say, effects on DNA, on cancer or on various things that it is going to look at. So it has a database and it wants to accumulate solid information. We partially reviewed the literature, identified where the gaps were in the information base that we wanted and also looked at key studies that raised questions that were not normally part of this database. Those areas were then researched.

We made a very solid effort. We got on board all the researchers who had produced what we considered to be biological effects that could relate to health. They formed part of our review process and our working groups to identify what research was necessary, and we went along with those recommendations. We have a research agenda for radiofrequency fields that incorporates most of the major areas. The key areas have now been restudied to find out whether something is there. Some are still outstanding.

Sen. ALLISON (Chair)

They have already been restudied, not replicated. Is that something different?

Dr. REPACHOLI

For example, the DNA studies of Lai caused a tremendous amount of concern. In fields where we considered it was physically impossible to break DNA, Henry Lai was able to say, 'No, we did find breaking DNA.' There have been five studies now and every study has not been able to find any breaks in DNA. One of them was an exact-

Sen. ALLISON (Chair)

Five replication studies of Dr Lai's work?

Dr. REPACHOLI

One of them was an exact replication. Henry was there, he did everything and it still did not work.

Sen. ALLISON (Chair)

Let me get this clear: you are saying that every significant study or study that has shown significant effects has been replicated by the World Health Organisation-

Dr. REPACHOLI

Under our research coordination program.

Sen. ALLISON (Chair)

and was found to have no significance.

Dr. REPACHOLI

Yes. That was certainly the case with that study. We want to get replication or confirmation about another one: behavioural studies. We felt that this study, which purported to replicate, was not a good replication. It was done at the National Radiological Protection Board. They said that their study was an attempt to confirm Henry Lai's findings but we felt that it was not because they used lower power levels and fewer arms in their radial arm maze.

The replication or confirmation study was deficient in finding out whether the behavioural changes found by Lai were real. Therefore, we have asked for better studies in the behavioural area.

Sen. ALLISON (Chair)

This would be quite useful information for the committee. Is it possible to get a list of those studies that you have identified as being significant, as having a significant effect?

Dr. REPACHOLI

Sure.

Sen. ALLISON (Chair)

And those which you have determined were not worthy of replication, is it possible to do that? I mean the general areas, not the specifics.

Dr. REPACHOLI

You could not replicate every study that was out there. But some studies are not significant, or they are obviously flawed.

Sen. ALLISON (Chair)

How do you make the judgment that they are obviously flawed?

Dr. REPACHOLI

In one study there was a metal thermistor put into the cell to measure the temperature of the cell, and then RF exposure was given to the cell culture. The metal thermistor was being heated up by the radio frequency so it was an obvious deficiency in the study. They should use a non-perturbing probe into the cell culture. A study like that that has an obvious flaw. The experimenter did not realise that he was doing something wrong-

Sen. ALLISON (Chair)

Who did that work?

Dr. REPACHOLI

It was done in Belgium, by Maes. They have since admitted that it was an error. That sort of peer review is necessary to look at these studies. Many of the studies can be eliminated because they have obvious scientific deficiencies, methological flaws in their study protocol. Once it is published and you can see what they have done you can say, 'In general we would like to look at the area,' but you would not replicate that study because you would be replicating a flaw that would produce a result.

Sen. ALLISON (Chair)

Can I go through a few of the studies. As you can imagine, we have had a lot of submissions and some of them go to the detail of studies. There is a group of them that have quite specific links to carcinogenesis. Concerning the EMR exposure having the ability to reduce the secretion of melatonin, is this an area that WHO is interested in? What sorts of replication studies have you done?

Dr. REPACHOLI

We have asked for a study to be done in that area because of the results that are being suggested in the low frequency region.

Sen. ALLISON (Chair)

So that has not yet been done?

Dr. REPACHOLI

No, but there was a good review of this area done by the Royal Society of Canada. They concentrated a lot on melatonin because one of the panel members was rather interested in that. In our early reviews we asked for studies in this area. It was not one of our higher priority areas because none had been found previously, but there have been subsequently a couple of studies that have produced marginal results.

We call for research in an area and you get some results which are, say, maybe, or maybe not.

How do you interpret that? It is not a strong effect, it is a weak effect which could be occurring by chance. This is where you have to have a weight of evidence. If it is a weak effect then you have to have a number of studies to show a trend that that weak effect is continuing to occur.

Then you have got to identify whether that weak effect is going to have a consequence to health.

Melatonin levels are going to change when you go to the toilet in the night. When you turn on the lights, all of a sudden your melatonin productions drops because melatonin is very light sensitive. It is your circadian rhythm that is dictated by the production of melatonin and it is a day/night cycle. Light is a confounder. There are other things. Stress is a confounder too. If you wake up having a bad dream you can change your melatonin levels. There is a normal variation of melatonin within the body.

Sen. ALLISON (Chair)

You are not suggesting the science that has been done does not take that into account?

Dr. REPACHOLI

Some scientists do not take that into account.

Sen. ALLISON (Chair)

Are you prepared to name them?

Dr. REPACHOLI

No, but we know which studies have taken all the factors into account and we do not want to criticise scientists.

Sen. ALLISON (Chair)

Who is 'we'? What sort of qualifications?

Dr. REPACHOLI

We are an international panel of people who are expert in this area. I just act as secretariat; I do not put myself into these panels. I act as secretariat and we convene the best possible minds around the world for melatonin and cancer-people that really know something about this-and generally they are not in the EMF field. They will be people who have produced hundreds of really solid studies and progressed our knowledge in chemicals or in some other area, and we bring that knowledge in and then they look at these results and they say that is good or, no, they are doing things wrong. WHO is very good at being able to provide an umbrella to bring in really solid science.

Sen. HARRIS

Is it possible to have an understanding of how much of that science industry provides or is it totally free of an industry influence at all?

Dr. REPACHOLI

No, I think industry has got the message that they are the cause of the problem to start off with-it is their technology, their industry-and they are putting substantial amounts of money into this, there is no doubt. And within the European Union program they will be required to put up about half the funding. The European Union said, 'You had to find another funding agency that will provide you half the program and we will provide the other half,' and that is how they acted. I am sure that in the UK they are doing something similar.

They will ask industry to contribute to a government pot of money that will then be organised by an independent panel of scientists to develop the thing so that you keep the industry away from the scientists.

Sen. HARRIS

At arms-length.

Dr. REPACHOLI

We know about the tobacco industry but I think industry has learnt from that and they do not want to go through that again. That is my understanding. But we certainly have had industry saying early in the program, 'We have funded lots of projects but the people do not believe the results.' I say, 'What do you expect? If you were there dealing directly with the scientists then people will relate back to the previous experiences of other industry funding.' We recommended that that has to be a firewall. There has to be an independent panel that deals with the funding agency and the scientists-no jumping the wall.

Sen. HARRIS

Arms-length.

Dr. REPACHOLI

Absolutely.

Sen. ALLISON (Chair)

Do you think that is the case with standard setting, too, that it should be arms-length, should be independent?

Dr. REPACHOLI

Standard setting is not done by industry. We do not allow industry to participate in that. It is not only the standard setting but the WHO is also very hot on the health risk assessments. We have been told that thou shalt have no industry member on any health risk assessment panel and this really gets up the nose-

Sen. ALLISON (Chair)

No, standard setting was my question, not who is-

Dr. REPACHOLI

Standard setting, yes. Health risk assessments actually relate directly to standard setting. Once you have got the health risk assessments, the standards sort of flow from that and there is not much you can do with the standards.

Sen. ALLISON (Chair)

So why do you think it is that in Australia we have had so much industry representation on the standards setting committee?

Dr. REPACHOLI

It also happens in the US. I was just about to say that when WHO said that we shall not have any industry participating in our working groups the US said, 'We have to have a consensus standard where all stakeholders have to be represented.' I say that that is not going to happen in WHO. We cannot do that because we cannot have someone there having an influence on health effects for an industry that they derive benefit from.

Sen. ALLISON (Chair)

What about your yourself, Dr Repacholi, do you work for the telecommunications or electricity industry in any sense?

Dr. REPACHOLI

I have previously been on a court case for something in New Zealand.

Sen. ALLISON (Chair)

And you represented whom?

Dr. REPACHOLI

I told them I was representing international standards. If you want to know what international standards then I will go on.

Sen. ALLISON (Chair)

Who were you working for?

Dr. REPACHOLI

My expenses were paid by industry at that time.

Sen. ALLISON (Chair)

Which industry was that?

Dr. REPACHOLI

The power industry. And the telecommunications industry also had a court case.

Sen. ALLISON (Chair)

In what capacity did you appear for the electricity and telecommunications industry?

Dr. REPACHOLI

What I tell them is that I appear as an independent person. They can pay my expenses but I am only going to say what the international standards are, how they are derived and what the rationale for the standards are.

Sen. ALLISON (Chair)

But didn't you take the industry line in relation to those court cases?

Dr. REPACHOLI

I do not take any line. I just take the international standards line. There is not a line. I just follow the science.

Sen. ALLISON (Chair)

I thought you appeared on behalf of the industry?

Dr. REPACHOLI

My expenses were paid at that time by industry, because they wanted to know what the international standards were.

Sen. ALLISON (Chair)

You were the expert witness for industry?

Dr. REPACHOLI

Yes. But that said, I cannot do that anymore, because WHO will not allow anyone to participate in a court case or anything now-you have to be within the WHO legal guidelines.

Sen. ALLISON (Chair)

Can I ask a general question about standards. We have been talking a bit about electricity lines and mobile phones but what is your view of the appropriate standard for 24- hour exposure of the general population in terms of low frequencies?

Dr. REPACHOLI

For all of the frequencies?

Sen. ALLISON (Chair)

Yes.

Dr. REPACHOLI

They are fairly complicated standards but, in the radio frequency range, the 24-hour level is 0.08 watt per kilogram-that is the basic limitation. People should not be exposed to a level in excess of that.

Sen. ALLISON (Chair)

And the science which leads you to that figure?

Dr. REPACHOLI

For the radio frequency region it was the thermal effects that produced changes in behaviour-that was the basis of that standard.

Sen. ALLISON (Chair)

People who walk around in the streets are not affected. They do not have a thermal effect from -

Dr. REPACHOLI

That is right. They are exposed to levels, maybe 1,000 or 10,000 times below the standards.

Sen. ALLISON (Chair)

Nonetheless, how can you relate it when there is no thermal effect?

Dr. REPACHOLI

Then there is no effect.

Sen. ALLISON (Chair)

So what is the point in the standard?

Dr. REPACHOLI

There are levels at which people work in industry that can.

Sen. ALLISON (Chair)

No, my question is not about occupational exposure, it is about general public exposure.

Dr. REPACHOLI

If the levels are below the limits in the standard, that was not part of the science. The science evolved the limits from the studies that were produced. It just happens that the levels that were produced, or that are allowed, are within, in most cases, what is being exposed in the environment. People are exposed to levels much below that. Does that mean then that you should lower your standards or reduce the exposure limits because that is what is in the environment? If that is the case, then let us save hundreds of million of dollars of research, because you just go down to the level that the industry can conform to.

Sen. ALLISON (Chair)

I suppose our difficulty here is in understanding how standards are set, whether they are for general exposure or mobile phones, when the science seems to be very imprecise.

Dr. REPACHOLI

It is not so imprecise. We think that, from the information we have, if there is any effect, it must be very subtle-so subtle that it is very difficult to define good studies that have the precision to be able to detect this very subtle effect. This is why we have huge epidemiological studies now-to see if we can find those subtle effects.

Sen. ALLISON (Chair)

Can I just come back to some of the studies and ask you about whether WHO is interested in replicating them-the ones which show that EMF exposure may affect the immune system and reduce the body's cancer surveillance capability and, therefore, the ability to kill off transformed cells. Is that an area which is regarded as one of your key focuses?

Dr. REPACHOLI

No. That was a question that was asked a lot in the eighties. There were a tremendous number of studies on immune response following exposure to radio frequency fields and, unanimously, or almost unanimously-there are always a few outlyers-the overwhelming evidence was that there was no effect on the immune system.

Sen. ALLISON (Chair)

And that overwhelming evidence came from replication of studies that demonstrated that?

Dr. REPACHOLI

Yes, large numbers of studies. A couple of meetings, where they looked at immune responses, were held in Sicily. There is quite a large amount of literature on immune response, and there has not been anything to indicate that there are effects on the immune system. An obvious thing that people should look for is depression of the immune system causing an increase in cancer. We, in fact, are now looking at that for ultraviolet radiation, because it has been shown that ultraviolet radiation does suppress the immune system. This could lead to a couple of things: increases in affection, because of the depleting ozone layer and the increasing ultraviolet radiation, and a reduction in the efficiency of immunisation programs.

We recognise that. It is a sort of indirect cause of cancer so we are studying that.

Sen. ALLISON (Chair)

What about the studies that show cell proliferation and cell growth?

Dr. REPACHOLI

A lot of studies relating to cancer have been done. Cell proliferation is one of those effects that could be a pre-cancerous effect, so a lot of studies have been done on cell proliferation and cell growth.

Sen. ALLISON (Chair)

Is this one of your focus areas?

Dr. REPACHOLI

We have asked for a few more studies in that area, but not a lot. That was a lower priority area, because we already have a lot of studies in that area. In general, if you keep the temperature down you do not tend to get any increased cell proliferation. It tends to be a temperature effect. If the temperature is stable then there do not seem to be effects. There were some studies done by Stephen Cleary. He was in our review and on working groups looking at gaps in knowledge. He actually exposed cells to fairly high levels. What he did was try to keep the temperature down by cooling the medium. That way, you get a constant temperature but you expose. He claimed to have certain effects. But what was really found was that you cannot expose cells uniformly; you are going to get hot spots. So, while the overall temperature may seem the same, there is such an uneven distribution of temperature within the solution that it can cause pockets of cell proliferation which result in a small increase in cell proliferation because of that. We have got infra-red thermography of these cells, and you can see where the increases in temperature were.

Sen. ALLISON (Chair)

What about the work of Arhuus University in Holland? Are you familiar with that study?

Dr. REPACHOLI

Arhuus is in Denmark. Arhuus University?

Sen. ALLISON (Chair)

In Holland, in the Netherlands.

Dr. REPACHOLI

I do not know that one.

Sen. ALLISON (Chair)

Maybe it is in Denmark.

Dr. REPACHOLI

There is a very famous university in Denmark called Arhuus, yes, but I do not know which studies you are talking about.

Sen. ALLISON (Chair)

Sianette I think is her name. Anyway, you do not know of her?

Dr. REPACHOLI

No. [Note: The chair was obviously referring to Dr Sianette Kwee's work at the University of Aars, Denmark. Sianette Kwee is well-known in EMF scientific circles for having found cell changes with extremely low levels of RF, and her work should have been a major source of interest to the WHO.]

Sen. ALLISON (Chair)

What about the work of Dr Peter French here at St Vincent's Hospital?

Dr. REPACHOLI

Peter has been working on cells that could relate to asthma-effects that may cause asthma. They are still not replicated, and no-one has picked up on those results. They felt the results may not be significant.

Sen. ALLISON (Chair)

I am reminded that we are half an hour over time, so we might leave it there. We have a long way to go, obviously, in this inquiry, and there may be some questions we would like to ask you at the end of the process, rather than at the beginning, if you would be willing to answer them.

Dr. REPACHOLI

I would be happy to help. As I said Australia is one of my favourite funding agencies, and I feel I would like to provide information.

Sen. ALLISON (Chair)

Thank you very much for appearing today.

Dr. REPACHOLI

My pleasure.

Stewart Fist, 70 Middle Harbour Road, Lindfield, 2070, NSW, Australia.
Tel: +61 2 9416 7458 Fax: +61 2 9416 4582. E-mail: fist@ozemail.com.au