UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

Title: **PROTOCOL FOR STUDY OF THYROID DISEASE IN BELARUS AS A RESULT OF THE CHERNOBYL ACCIDENT - PUBLIC MEETING**

Location: **Rockville, Maryland**

Date: **Friday, September 9, 1994**

Pages: **1 - 46**

ANN RILEY & ASSOCIATES, LTD.
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UNITED STATES OF AMERICA

NUCLEAR REGULATORY COMMISSION

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PROTOCOL FOR STUDY OF THYROID DISEASE IN BELARUS AS A RESULT OF THE CHERNOBYL ACCIDENT

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PUBLIC MEETING

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United States Nuclear Regulatory Commission
One White Flint North
Rockville, Maryland

Friday, September 9, 1994

The above-entitled meeting convened, pursuant to notice, at 1:30 p.m., Ivan Selin, Chairman, presiding.

COMMISSIONERS PRESENT:

IVAN SELIN, Chairman of the Commission

KENNETH C. ROGERS, Commissioner

E. GAIL de PLANQUE, Commissioner

STAFF AND PRESENTERS SEATED AT THE COMMISSION TABLE:

DR. ANDREW BATES, Office of the Secretary

MARTIN MALSCH, Office of the General Counsel

JAMES TAYLOR, Executive Director for Operations

DR. PAUL SELIGMAN, Acting Deputy Assistant Secretary for Health, DOE

DR. BRUCE WACHHOLZ, Chief Radiation Effects Branch, Cancer Etiology Division, NCI

DR. HARRY PETTENGILL, Director, Office of International Health Studies, Office of the Environment, Safety and Health, DOE

DR. DAVID BECKER, Professor of Radiology and Medicine, Director, Division of Nuclear Medicine, Cornell University Medical Center, New York

DR. GILBERT W. BEEBE, Health Statistician, NCI

DR. SHLOMO YANIV, Radiation Protection and Health Effects Branch, RES

JAKE WECHSELBERGER, Office of the EDO

P R O C E E D I N G S

[1:30 p.m.]

CHAIRMAN SELIN: It's a particular pleasure for the Commission to welcome such a broad range of -- such a broadly representative panel for this very interesting topic that we have today, the briefing on the studies of the effects of iodine-131 as released by Chernobyl on the incidence of thyroid disease, particularly for cancer.

We are participating in a joint DOE and NCI study which will fill a major gap in the world's knowledge of radiation effect and could affect our own regulations. We're quite anxious to hear about this important study.

Copies of the viewgraphs are available.

Commissioners?

We're very pleased to welcome our distinguished panel today.

Mr. Taylor?

MR. TAYLOR: Good afternoon.

I'd like now to introduce those at the table. First, to my left, is Paul Seligman, who is the Deputy Assistant Secretary for Health.

Does that stop with that or the environment too?

DR. SELIGMAN: That's fine. That's fine.

MR. TAYLOR: From the Department of Energy, just recently assumed that position and we're looking forward to

working with him at the Department.

Next to him is Harry Pettengill, who is also from that office and we're very happy to have him here. He's the Director of the office under Dr. Seligman.

To his left is our own staff, Shlomo Yaniv and Jake Wechselberger, who are my principal assistants in this area.

To my right is Bruce Wachholz. I believe you may have met him before, from the National Cancer Institute, and he is responsible for these projects.

Next to him is Dr. Dave Becker, who is assisting us in this area and is a specialist in the thyroid area.

Next to him is Dr. Gil Beebe, who is assisting and is very active, I believe, potentially under the leukemia protocol. Is that right?

DR. BEEBE: Both.

MR. TAYLOR: With those opening remarks, I would like to note that we're very pleased to have this opportunity to have the group here. I've long regarded what you'll hear about today as very important, important scientifically in the area of health, important from the standpoint that what we've been able to achieve to this point and what we hope we can achieve in the years ahead will be the first really major health effects studies following the Chernobyl accident.

The fact that we have progressed to this point, as you will learn, has been principally due to cooperation from the Republic of Belarus and we do have a protocol signed, as the Commission knows, with Belarus and are proceeding with the finishing protocol, both in the thyroid area, finish a second protocol with the Republic of the Ukraine.

With those opening thoughts, I'll ask Dr. Harry Pettengill to continue.

DR. PETTENGILL: Thank you, Mr. Taylor.

Chairman Selin, Commissioners de Planque and Rogers, it's a pleasure for me to personally introduce the subject of today's briefing, health research in Belarus.

We at the Department of Energy feel that the information being discussed today marks significant progress on the part of the United States government to effectively partner with former Soviet scientists and medical personnel to better understand the health impacts the Chernobyl accident had on then resident populations.

If I could have the first slide.

[Slide.]

DR. PETTENGILL: Today's briefing will highlight the development and status of the study of thyroid disease in juvenile populations in Belarus. In addition, Dr. Wachholz will also discuss a similar study to be carried out in Ukraine and will provide preliminary information

regarding the intention to evaluate the incidence of leukemia in selective populations in these countries as well.

First, however, it might be beneficial to briefly summarize the history of the U.S. involvement and detail those actions which have led to the formulation of these health-related studies. Of course, the singular historic event which directly created the necessity of what we are discussing today is, of course, the catastrophic accident in Chernobyl on April 26th, 1986.

Although worldwide response with offers of assistance were immediate, political circumstances being what they were, the U.S. did not successfully negotiate a memorandum of cooperation under the auspices of the Peaceful Uses of Atomic Energy until 1988. This action, which we commonly refer to as the MOC, created what is universally known today as the JCCC, as I refer it to, the Joint Coordinating Committee for Civilian Nuclear Reactor Safety. The United States Nuclear Regulatory Commission is the designated U.S. executive agent to this memorandum of cooperation.

Initially, the Joint Coordinating Committee included ten specific working groups and this was later expanded to include 12 working groups. Our presence here today and my discussions will focus on Working Group 7.

From its inception, Working Group 7 was unique and significantly different than the other working groups. Working Group 7 was given the sole responsibility to evaluate both the health and environmental consequences of Chernobyl.

The DOE has a long history of involvement and support to the evaluation of impacts on workers and other populations from exposures to ionizing radiations. DOE has had extensive experience in responding to and supporting studies on an international scale as well. Examples include our involvement in studies of Japanese bomb survivors and our environmental and medical support to the Marshall Islands for nearly 50 years. The DOE therefore volunteered and was designated to oversee and manage Working Group 7 activities.

The Department of Energy initially set up two subgroups in Working Group 7, designated 7-1 and 7-2; 7-1 was to develop environmental assessment end of the business and 7-2 was designated to look at the biologic and health impact capabilities. The approach selected by the Department of Energy in those early days was to develop a wide range of pilot projects to test the feasibility to build on longer term health and environmental impact studies.

If I could have the next slide.

[Slide.]

DR. PETTENGILL: In 1991, in late 1991 and early 1992, the world, of course, witnessed the total dissolution of the Soviet Union. This event left the United States without formal arrangements for continuing work under the Joint Coordinating Committee with either Ukraine or Belarus. As an interim measure at that point in time, the then Assistant Secretary for Environment, Safety and Health at the Department of Energy led a delegation to the former Soviet Union countries in order to give reassurance of our interest to continue activities under Working Group 7.

By 1993, the United States had negotiated an agreement with Ukraine which in effect reconstituted the activities of the Joint Coordinating Committee there and set it up basically as a tripartite of the United States, the Russian Federation and Ukraine. Of course, annual meetings have been held since that time with those parties. In 1993, they were held in Kiev in Ukraine and '94, this year, in Moscow, Russia.

The Department of Energy, to effectuate its work in Belarus, signed a letter of arrangement with Belarus to continue ongoing Working Group 7 activities as a joint effort between us and them that were initiated under the auspices of the JCCC. This arrangement remains in force today and has not hampered our progress in impending health

studies.

If we could have the next slide.

[Slide.]

DR. PETTENGILL: In the fall of 1992, shortly after these activities, the Department of Energy undertook a review of all of its Working Group 7 research progress. Our desire was to identify and essentially eliminate non-productive and non-essential areas of research, to expand in areas of more essential research and to facilitate the progress of ongoing research beyond the then pilot phase work. As a result of this review, we decided to shift the emphasis of our activities towards direct health impact studies. We intend to develop and perform traditional epidemiologic studies on designated populations in all countries of the former Soviet Union. Environmental assessment aspects of Working Group 7 activities are now today more focused on dosimetry validation and on dose reconstruction methodologies to be utilized with the study populations.

Two near-term health outcomes reasonably expected in any sizeable population which has been exposed to moderate or higher levels of fission product releases are often thyroid disease and leukemia. Consequently, we have designed as an essential element of our program the inclusion of studies of thyroid disease in children and

leukemia in the clean-up workers that received higher doses. Early in the initiation of our Working Group 7 activities, the Department of Energy chose the National Cancer Institute to lead in the development of appropriate research protocols to study these specific health outcomes in both Belarus and Ukraine.

Dr. Wachholz, as Mr. Taylor indicated, is with us today. Dr. Wachholz is the Senior Program manager at the NCI for these important studies and will brief us all on the significant progress to date.

Thank you very much.

CHAIRMAN SELIN: Thank you, Dr. Pettengill.

DR. WACHHOLZ: Thank you, Mr. Chairman, Commissioners. It's a pleasure to have the opportunity to discuss these matters with you in collaboration with our colleagues and our sister agencies.

If I may have the first slide, please.

[Slide.]

DR. WACHHOLZ: I think that it's fair to say that this discussion will focus on health-related activities in both Belarus and Ukraine, as was indicated by Dr. Pettengill.

Next slide, please.

[Slide.]

DR. WACHHOLZ: In addition to the introductions

that were made previously with Dr. Becker and Dr. Beebe, to my right, I'd like to mention also that Dr. Andre Bouville is with us who is an expert in dosimetry and is with the National Cancer Institute.

Next slide, please.

[Slide.]

DR. WACHHOLZ: As indicated a few moments ago, the primary health effects end points were thyroid disease, especially thyroid cancer and specifically among children, and leukemia in clean-up workers. Although these were identified early on as one of several activities by the Department of Energy, as was indicated more recently, they have become the focus of the interagency activities.

Next slide, please.

[Slide.]

DR. WACHHOLZ: NCI's involvement commenced with some study groups in 1989 with the Department of Energy but a formal interagency agreement was initiated and signed in 1990. As a part of that agreement, the NCI was requested to work with our Soviet counterparts, our then Soviet counterparts to, one, develop protocols for and implement long-term follow-up studies of thyroid disease, especially cancer, and secondly to develop protocol for the study of leukemia, and that's among the cleanup workers.

In the other half of the agreement, the Department

of Energy agreed to provide financial support in the form of equipment and supplies associated with the need for these studies. NCI and DOE reached agreement on matching support for infrastructure and administrative expenses, and I'd just mention in addition to that being a financial support that at present there is on the order of about six and a half FTEs at NIH that are working on these activities. Of course you're familiar with the support from the Nuclear Regulatory Commission that was referred to earlier.

The first thing we did was form two working groups, recognizing that not all expertise resides in the government. We have a working group of ten physicians and scientists on the thyroid studies and the chairman of that group is with us today, Dr. Becker. I would just point out that there are five people on here who are not government employees and I would just like to mention for the record that they all have volunteered their time over the last three or four years, which amounts to months of time that they have taken out of their schedules to assist us in this effort.

The areas of expertise cover the range of disciplines, dosimetry, dose reconstruction, endocrinology, radiation, thyroid disease, nuclear medicine, laboratory techniques, epidemiology and statistics. We recently have been in the process of adding additional names to this as we

begin to implement the operational side of things overseas, bringing in people who are fluent in the Russian language and that can supplement and stay for periods of time in Minsk or in Kiev to work with us on-site.

Next slide, please.

[Slide.]

DR. WACHHOLZ: We have a similar group working with us on the leukemia studies. That group is chaired by Dr. Beebe, who is two chairs to my right. Again, what I said with regard to volunteers for the thyroid group pertains also to the leukemia group.

Next slide, please.

[Slide.]

DR. WACHHOLZ: The first question is why do we have an interest in the thyroid, especially in the area of Chernobyl? First of all, the risk of thyroid cancer from exposure to I-131 is not known. Secondly, should there ever be a major release of fission products, I-131 is likely to be a major source of exposure to the public. To date, there have been several accidental reactor releases of I-131 which are listed on the slide. They give you a comparison of the magnitude of I-131 released, 20,000 curies wind scale, 15 at TMI, compared to 30 million at Chernobyl.

At the same time, there were approximately a million or over a million children exposed from the releases

at Chernobyl. Of those children at the time of and shortly following the accident, there were something over 100,000 children whose thyroids were measured. One can question the uncertainty associated with those measurements. Different types of instruments, different types of shielding, calibration and so on, but nevertheless they are real measurements on real children.

I'd like to ask for the 35 millimeter slide, if I may, just to bring you to the geography here.

[Slide.]

DR. WACHHOLZ: This is a map of Chernobyl down in here. This is a map of cesium distribution and you have two major areas, obviously the area immediately around Chernobyl and area up in the area of Belarus, the Gomel area of Belarus. Some 70 percent of the fallout, as you know, occurred in Belarus, with other parts being mainly in Ukraine.

Next slide, please.

[Slide.]

DR. WACHHOLZ: What is the situation that exists there now? And this is the first of several viewgraphs or overheads that will give you reasonably up to date information. First of the number of thyroid cancers that have been identified in children. I should say persons who were children at the time of the accident. You can see that

in 1986 and 1987 you had very few. It began to build in 1990 and really had major impact in 1991, '92 and so on. For 1994, the number is through the end of June.

Now, the question has been raised both scientifically, medically in the international community and so on, is all this due to radiation? At this point I don't think anyone could say based on hard scientific data, yes, it's due to radiation or to I-131. However, the temporal and spatial distribution of the cases certainly is suggestive and the circumstantial evidence is very strong. Initially there were questions are these really cancers, are they diagnosing them correctly? Pathologists in the United States as well as in the UK, as well as in Switzerland, have gone over these slides and I would say with over 95 percent confirmation of the original diagnosis. So, yes, they in fact are thyroid cancers.

The next question is are they due to radiation? While the circumstantial evidence is very strong, one cannot exclude some contributing factors such as ascertainment, the fact that these children are being looked at more intensively and with more sophisticated equipment than was previously the case, as well as possibility of other contributing factors. That's one of the reasons for some of these studies, to sort this all out and come up with some hard numbers.

COMMISSIONER de PLANQUE: Bruce, of course there's always the question are you finding more because you're looking? But also the degree to which this was investigated, is there a trend with that, a trend in time with just the degree of looking?

DR. WACHHOLZ: Yes, you'd have to say that there's --

COMMISSIONER de PLANQUE: In other words, did they look for more in 1990 than they looked in 1987?

DR. WACHHOLZ: Well, the degree of sophistication with which they looked and the breadth with which they looked increased in the years following. For example, WHO provided considerable equipment and ultrasound diagnostic units and so on, which really did not begin until about three years after the accident. So, after that, then you began to get these large increases. So, the answer to your question in the yes or no is yes. The extent to which that's a major contributing factor we have to sort out.

COMMISSIONER de PLANQUE: Can you give us any idea on the latency period?

DR. WACHHOLZ: Well, this was one of the reasons there were so many questions at the very beginning as to are these real. Dr. Becker may wish to amplify on this, but the expected time frame for the appearance of these was considered to be an absolutely minimum of about five years,

maybe longer. When they began to be reported in 1989, three years after the accident, and then 1990, four years, people's eyebrows went up and, "Are these real? Are they real cancers?" There were many speculations at that time as to whether they were real or not and that's why I say we as well as others have gone through all the pathology. But yes, there are questions on the latency. But I think at this point it's reasonably accepted that these cancers are real and, yes, they did occur earlier than expected.

Next slide, please.

[Slide.]

DR. WACHHOLZ: The next slide is in part a repeat of what you just saw. However, it does put it in the context of comparison with adult thyroid cancers and you have to look at the vertical axis on either side for the comparison. To the left is the numbers for adults, to the right the numbers of children. This is presented only to show that there is an increase also in adults, although our interest is primarily if not exclusively in children. If you look at the increase, it's perhaps a three times increase for adults, whereas with regard to children it's 40, 50, 60, 70 times higher. There are reasons for this. I'll be glad to go into them, if you wish. Otherwise, we can move along.

Next slide, please.

[Slide.]

DR. WACHHOLZ: The situation in Ukraine shows a similar pattern, although the numbers and magnitude is a little different. They had a slightly higher baseline to start, but then it's a much larger country, 50 some million versus roughly 10 million. The increase showed itself about the same time frame, in 1989, '90. The magnitude is not quite as great as in Belarus.

[Slide.]

DR. WACHHOLZ: To put this in context of what this means per 100,000 children, the next slide shows the incidence in Belarus, which you can see goes from very low, about a tenth per hundred thousand to roughly 3.4 over the same time period and more or less mimics the absolute numbers.

[Slide.]

DR. WACHHOLZ: And the next slide shows the same information in Ukraine, going from a baseline of .06 or .07 to .4 plus.

Now, what kind of studies would one project to take advantage of this unfortunate situation? We have proposed, and are in the process of initiating, case control studies and cohort studies. Case control studies, very briefly, we have to identify representative controls, individuals for each of the specific cases and in the case

of Belarus the time frame which the study began was March of 1992, at which time there were 119 thyroid cases of children with thyroid cancer. We have identified two controls for each case. So, we have something on the order of 500 children in the case control study. Later on I will give you a status report on the condition of each of these studies.

With regard to Ukraine, we began the case control study in 1993 and that is still in the process of being determined. With regard to the cohort studies, which really is the major effort and the long-term effort which we anticipate will continue for a minimum of 15 to 20 years, assuming all the signs are favorable. Cohort studies are fixed population which is the cohort and dosimetry is carried out, dose reconstruction is carried out on every individual in the cohort and you follow the cohort for the occurrence of any health consequences.

In Belarus, there's a cohort identified in approximately 15,000 children. In Ukraine there's a cohort identified of approximately 70,000 children. The reason for doing these and the end point is the risk estimates for cancer, for nodules, for hypothyroidism as a function of dose to the thyroid, as a function of age at the time of exposure and with regard to the gender of the child.

Next slide, please.

[Slide.]

DR. WACHHOLZ: The objective of the thyroid cohort study more specifically is dose and time related morphologic and functional changes in thyroid glands of children exposed to radiation, risk estimates for nodules in cancer, as I indicated. In addition, comparison of the relative effectiveness of I-131 with that of x-ray and gamma radiation in inducing thyroid nodules in cancer and the risk estimates of the induction of hypothyroidism as a function of dose with regard to sex and age.

Next slide, please.

[Slide.]

DR. WACHHOLZ: Now, what do these studies consist of? Very broadly and generally, three components. First of all, sampling. How are you going to identify the cohort, first of all with regard to children that had measurements of their thyroid at that time. I indicated earlier this had a variety of techniques associated with it and we have to sort that out. Secondly, the sampling consists of those persons who are children or in utero at the time of the accident in 1986. Thirdly, although some might not include this as a criterion, we find that we have to make the point that this is a fixed cohort. You don't add children to it as time goes by just because someone outside the cohort has a cancer.

With regard to the medical and clinical side, this would be a proactive study. We would do annual or biennial follow-up examinations of each child with regard to the anatomy and function of the thyroid, with respect to palpation, with respect to ultrasound analyses, with respect to laboratory tests, blood hormones and such that are associated with thyroid function, fine need biopsy as indicated by both the ultrasound scans as well as laboratory tests, and obviously if necessary proceed to surgical procedures and other treatment.

On the other side is the dose reconstruction effort which relies upon the measurements, but it also includes other factors such as I-131 fallout maps that are being developed in both countries, and individual information on exposure history of the individual such as their residents, where they lived, how long, where they moved to, when they moved, their food supply, where it originated, how much did they consume, et cetera.

COMMISSIONER de PLANQUE: Bruce, would most of the dose from iodine-131 be from fallout iodine as opposed to any kind of direct immediate --

DR. WACHHOLZ: The short answer to your question is yes.

COMMISSIONER de PLANQUE: I realize it's complex.

DR. WACHHOLZ: I'm sure you realize as well as I

do that I'll turn to Dr. Bouville if you want a more complete answer.

COMMISSIONER de PLANQUE: That's fine. I just wanted to make sure that was correct.

DR. WACHHOLZ: Am I correct on that, Dr. Bouville?

DR. BOUVILLE: Yes.

DR. WACHHOLZ: Thank you.

[Slide.]

DR. WACHHOLZ: On the next slide you have the initial estimates of the dose distribution of the 100,000 plus children that were measured at the time or shortly after the time of the accident. Like I say, there are a lot of uncertainties associated with this, so please take the estimated seriously. In Belarus there were nearly 30,000 children measured and in Ukraine over 75,000. You can see the distribution of doses with several hundreds if not thousands of children up in the areas of one grade or more.

COMMISSIONER de PLANQUE: And the bin sizes are real enough given the uncertainties?

DR. WACHHOLZ: I'm sorry?

COMMISSIONER de PLANQUE: The bin sizes are real enough given the uncertainties?

DR. WACHHOLZ: May I defer to Dr. Bouville?

COMMISSIONER de PLANQUE: Sure.

MR. TAYLOR: Would you like to go up to the

microphone?

DR. BOUVILLE: That's, of course, a point that we're going to need to investigate in depth and estimate some of those according to various iterations. It will be more in more detail as time goes on. My feeling for the time being is that the average uncertainty is about a factor of two.

COMMISSIONER de PLANQUE: Thanks.

[Slide.]

DR. WACHHOLZ: With regard to dose reconstruction, the next visual identifies the basic components that would go into this. In addition to the thyroid measurements with regard to the cohort studies, there are the case control studies where by and large you do not have thyroid measurements and the doses there would have to be estimated based on the cesium contamination deposition on the surface. In both the case control and the cohort studies, there would be an effort made to include the other factors that are identified here, namely through the food chain, especially the primary one, iodine-contaminated milk, but also the other sources of contamination, iodine-contaminated other food stuffs as well as inhalation of the iodines and external exposure from the cesium. These would all be done on an individual basis, so I'm sure you can appreciate with tens of thousands of children this is not a small

undertaking.

[Slide.]

DR. WACHHOLZ: What is the status of these several studies currently? First of all, with regard to the case control study in Belarus that as I say began in 1992, all of the cases and the control subjects have been selected; the pathology has been reviewed for almost all of the cases. The information regarding individual characteristics has been received from most of the subjects at this point. The individual dose reconstruction has yet to be completed. The analyses with the data that is in existence is in process, what shall I say, binationally. It's being done in parallel both in Belarus and in the United States. And a publication is in the initial stages of preparation and is well underway.

[Slide.]

DR. WACHHOLZ: With regard to the case control study in Ukraine -- I should say first that we expect that publication and the analyses to be complete by the end of this calendar year.

With regard to the case control study in the Ukraine, that was begun last year. At this point we have partial identification of cases. There are some 50 plus cases at this point that have been identified. We are currently in the process of identifying additional cases

and, of course, the control subjects to go with them. Dose reconstruction has yet to be carried out. Confirmation of pathology is underway as we speak. One of their pathologists is in the United States right now and that activity is ongoing.

[Slide.]

DR. WACHHOLZ: With regard to the larger effort, the cohort studies with regard to Belarus, we expect that to begin in 1994. The research protocol has been completed and the scientific peer review at NCI and NIH was completed last year.

Institutional review board approvals were received earlier this year. You may not be familiar with what is meant by institutional review boards. Anybody who has the opportunity to go through this unfortunate experience will know what I'm referring to. But these are more commonly known as human use committees, and that anything funded by the federal government must be approved by one of these institutional review boards. In the case of activities in a foreign country, an institutional review board counterpart must be established in the other country and function as does one of these boards in the United States.

In the case of NCI, we have institutional review boards. We established one and assisted them in going through the process in Minsk. Both the Belarussian one and

the NCI one were then forwarded to NIH and they are the arbiters of last resort. We received their approval earlier this year, in April.

You are aware that Belarus and the U.S. subsequently signed an agreement to implement the research protocol and some people in this room were present at that ceremony. In the meantime, we have been in the process of developing a very extensive and voluminous operations manual that covers specific guidance, directions and techniques, everything from laboratory tests to diagnostic activities to dosimetry. The purpose of this is to, one, have a straightforward guideline with regard to what should be done, how it should be done, procedures and so on because we realize over the period of time that we're talking about there are many people that are going to be involved, not all of whom are involved presently and there needs to be some continuity in terms of procedures with regard to that.

We have worked with our Belarussian colleagues to identify equipment that would be needed and we've worked on a three year time scale. We've met with them several times. We've met amongst ourselves several times and I think we're coming to closure on that, at least for the initial list of needed equipment.

Arrangements are in progress to obtain the services of and establish a person in Minsk to work with us.

A bilingual individual who's a physician and has been working with us over the last few months in the year to establish that contact on-site in Minsk. In addition, there are the usual activities of exchanges of experts in both directions. People have been here for training in various disciplines. They have identified a management team to carry out the study and we will work with them, but I would call your attention to the bottom item, the advisory committee. The protocol calls for a binational advisory committee in Belarus or with regard to the Belarussian study, half comprised of people they nominate, half comprised of people we nominate, not necessarily limited to citizens of the two countries. We would look to that to provide real time assistance on whatever difficulties may arise.

Next slide, please.

[Slide.]

DR. WACHHOLZ: With regard to the counterpart, the cohort study in Ukraine, the research protocol was completed early this year. It was reviewed scientifically by NCI and NIH and the comments have essentially been resolved. I hope to resolve the last one next week, next Monday, and I don't think that should lead to any difficulties. As soon as we do that, we will submit the document to our institutional review board at NCI. In Ukraine they have yet to establish

an institutional review board for this activity, and I will be assisting them to do so next week when I'm over there.

In addition, while that's been in the process, there has been active exchange of experts. As I indicated, their chief pathologist is in the States right now and they have been here for training in everything from endocrinology and ultrasound to epidemiology. They also have identified a management team to carry out the study in the Ukraine and, similarly to Belarus, there is an advisory committee that's called for by the protocol.

[Slide.]

DR. WACHHOLZ: The next slide indicates what this comes down to, at least in terms of financial support and I would urge you not to focus on specific numbers so much because I have no doubt these will change as circumstances evolve and needs are known or changes in procedures are agreed upon. But it gives you some idea of the order of magnitude of carrying out the study in terms of equipment and supplies. The bottom category, training, workshops and so on, that is the part that's matched funding between DOE and NCI.

Next slide, please.

[Slide.]

DR. WACHHOLZ: One can ask the same question with regard to leukemia. Why are we interested in working with

this group of people over there? First of all, the risk of leukemia from low doses or low dose rates is essentially unknown.

Secondly, other populations have been exposed to different circumstances in terms of radiation exposure. The Japanese one was very acute, as you know. Occupational are very low exposures, and the clean-up workers associated with Chernobyl cover a fairly wide range of exposures. And while there are some 600-plus thousand clean-up workers collectively, our focus is on Ukraine, which has some 100,000 to 150,000 clean-up workers within that country.

COMMISSIONER de PLANQUE: Bruce, there's been some talk over the years that the doses measured for the clean-up workers by their dosimeters are somewhat in question. Could you give us any sense of your latest reading of that?

DR. WACHHOLZ: Yes, some of the uncertainty that had been attributed to differences between the reported doses versus estimated doses by other means, such as biological dosimetry. Fairly recently we were informed that there had been some laboratory errors in the conduct of some of the biological dosimetry, and perhaps the reported doses are not as erroneous as had previously been anticipated. That's not to say that they're correct, just the multiplier between the two is perhaps smaller than was previously anticipated.

COMMISSIONER de PLANQUE: Was there any problem with the recorded doses being what they were in order to avoid exceeding any limits, occupational limits?

DR. WACHHOLZ: All I have to go on is probably the same things that you've heard.

COMMISSIONER de PLANQUE: Okay. No new information on that?

DR. WACHHOLZ: I don't. Dr. Bouville, do you have any hard information on that?

DR. BOUVILLE: No, no hard information.

COMMISSIONER de PLANQUE: Okay. Thanks.

DR. WACHHOLZ: Next slide, please.

[Slide.]

DR. WACHHOLZ: The objectives of the leukemia study are indicated here: to provide risk coefficients following exposure to low to moderate doses of radiation and to compare this information with the information that has been obtained from the studies in Japan; to assess the time response function and the influence of dose rate on the occurrence of leukemia among these workers; and to investigate the pathogenesis of radiogenic leukemia and provide for future studies of molecular biology; and to use the data, if possible, as an estimator for future leukemia and perhaps solid tumor excess among the clean-up workers in order to give them some perspective of what could be

anticipated in terms of public health issues among that group.

[Slide.]

DR. WACHHOLZ: What are these studies? They are, first of all, provided into two phases and you'll see a fair amount under phase I and very little under phase II. And that's intentional, because, until we have an opportunity to become involved in this and familiar with the information, the data, it seems premature to even identify, much less commit to a long-term epidemiological study.

So, the first phase is an 18 month activity which will be comprised of several parts. First of all, what are the sources of information with regard to the clean-up workers? First of all, it's they themselves and the information they provide in terms of where they were, how long they were there, what circumstances and so on, as well as the access to the several registries that exist in Ukraine, Chernobyl registry, cancer registry, leukemia registry and so on.

There are the dosimetric aspects to which you've already made mention. Not only the physical dimension of badges, radiation fields and information from the individuals, but several potential providers of information of biological dosimetry, such as the fluorescent in situ hybridization technique, glycophorin-A, electron

paramagnetic resonance, and make provision for storage of blood and bone marrow in case there are other indicators that need to be developed in the future that may be reasonably specific for these particular end points as a function of radiation exposure.

The third component, of course, is more along the lines of the medical and clinical diagnostic activity ascertainment, the identification of the cases, and one that sometimes is overlooked. But, namely review of the cases in terms of terminology because words don't always mean the same thing when you cross languages or cultures and we have to ensure that when they say something we understand what it is they mean, and vice versa as well.

Other activities are sort of indeterminate at this time, but they could provide such things as other tumors and general health.

And as I indicate, phase II would not be addressed and decisions made until well into phase I as to how that's going.

[Slide.]

DR. WACHHOLZ: What's the status of this particular activity in Ukraine? The scientific research protocol is in process. There was a workshop in the United States last February and March and a draft protocol was prepared and agreed to at that time. Several of us, Dr.

Beebe and myself and several others, are leaving tomorrow to go to Kiev to discuss the revisions of that leukemia protocol and we anticipate that there would probably be another meeting between the principals of the two countries before the end of the year, at which time we would certainly hope to have a final protocol.

The guesstimated budget for an activity of this nature is something on the order of $3 million over a period of about ten years.

[Slide.]

DR. WACHHOLZ: Finally, I'd like to on the next slide just identify the principals that we are working with overseas.

First of all, in Belarus, the Minister of Health, some of you met Dr. Kazakov either in Minsk or earlier this year in Washington. As you know, there have been changes in government in both countries in the last month or so and as a consequence of that there are new ministers of health in both countries. We have not yet had the opportunity to meet either. They've only been there like two or three weeks and we have not been there in the last two or three weeks.

In addition, the Director of the Institute of Radiation Medicine, the primary institute in Belarus with which we work, is Dr. Stozharov, and the Deputy Director for Clinical Activities has been Dr. Larisa Astakhova to this

point.

[Slide.]

DR. WACHHOLZ: Similarly, in Ukraine we've been dealing with the minister of health as well as directors of the various research entities. You may have met or heard of the former Minister of Health, Dr. Yurij Spizhenko. He is no longer minister of health, but he is a member of parliament and at present he is Chairman of the Public Health Issues of the Parliamentary Committee, so he is still very prominent and active in the health issues in Ukraine, but the newly appointed Minister of Health is Vladimir Bobrov.

In addition, you see the principals that we work with, the Director of the Ukraine Scientific Center for Radiation Medicine, Dr. Romanenko; the Director of the Institute of Endocrinology and Metabolism, Dr. Tronko; and in the area of dose reconstruction and dosimetry, Dr. Likhtarev, who is the Chief of the Department of Dosimetry and Radiation Hygiene, and that is in the Ukraine Center for Radiation Medicine.

I would mention only that with regard to particular of the leukemia studies that there are a number of other institutes that also are involved, the Institute of Oncology, Institute of Hematology, registries, et cetera.

I think this concludes my summary statement of

what has occurred, what the situation is, what our anticipated plans are and where we stand with respect to those plans. I and my colleagues will be pleased to answer any questions you might have. I realize this has been a superficial summary, but I hope it gives you some idea of the extent of our efforts and our hopes for the future.

Thank you very much.

CHAIRMAN SELIN: Thank you very much, Dr. Wachholz.

This is the latest in a number of cooperations and it's very interesting. The presentation is really almost entirely on how we're going about doing the study. Could you talk a little bit about what kind of results you might expect to get out of the study, a little bit about the medical side, perhaps even a little bit about just the basic radiology side?

DR. WACHHOLZ: I'll make a comment or two and then I'll defer to Dr. Becker for the medical perspective and techniques and so on.

In terms of what we hope to get out of it ultimately is a risk per -- I guess I have to say risk per grey area, risk per sievert now. It's so easy to say risk per rem -- for thyroid cancer and the other thyroid diseases from I-131, assuming we can separate out the contribution of I-131 from the other confounding contributors. We don't

have that information. We have it for x-rays and gamma rays. We don't have it for isotopes like I-131, which would certainly be the problem should there be a major accident.

I sometimes use the statement at NCI that if there is ever to be large scale exposure of the public it's not going to be from x-ray machines that have gone berserk but from something that's going to affect large numbers of people, and I-131 is a prime candidate for that. We have not had the opportunity, however tragic it is, the opportunity to study large numbers of people, especially children, that have been exposed to a wide variety of doses.

CHAIRMAN SELIN: Let me ask the question a little differently. Is there a model that's going to be tested or is this basically exploratory? Do you have a hypothesis? Do you have a pretty good idea of what you would expect to find and see? If that's what's going to turn up or will this be basic data on long-time exposure to the isotopes so that it's hard to say what kind of results to expect at this point?

DR. WACHHOLZ: Well, if you say is there a specific hypothesis to be tested, I guess the hypothesis is does I-131 lead to thyroid cancer.

CHAIRMAN SELIN: That basic?

DR. WACHHOLZ: That basic, yes.

Dr. Becker, would you like to -- or, Dr. Beebe --

DR. BEEBE: I just wanted to add to that we have a specific model suggested by NCRP, namely to the effect that, and I think it's guess work, the effectiveness factor, as they call it, for I-131 might be about one-third of what it is for gamma and x-ray. So we're sort of shooting at that, but what we're considering is anything in the range of one to one-tenth of the effectiveness. That's really the critical thing. After all, we know that radiation, gamma and x-ray, produce thyroid cancer, but we don't know about I-131.

COMMISSIONER de PLANQUE: I would assume the dose effect or the dose response will also be of interest, assuming, in addition --

DR. BEEBE: Yes. Not just yes or no, but --

COMMISSIONER de PLANQUE: Right. It's not just yes or no, but do you wind up with a linear dose relationship or what is it?

DR. BEEBE: We hope to have an estimate of that particular parameter and all the detail that goes with the dose response function for I-131 in children and then the age variation and other factors.

CHAIRMAN SELIN: Following up on that, is this a large enough sample to try to look at the linear hypothesis when you get down to the smaller doses?

DR. BEEBE: I think so, particularly Ukraine. I

think that Belarus is more questionable from that standpoint, but Belarus is certainly big enough to test this factor suggested by NCRP, I think. But we've got a sample three times as large in Ukraine.

CHAIRMAN SELIN: What do the host governments hope to get out of this arrangement? I'm sure they're very interested in the basic scientific work, but is there some direct relevance to their treatment or to their health planning that they would hope to get out of this?

DR. WACHHOLZ: I think there are probably several answers to that question. Certainly they look upon this, I think, as assisting them in their public health care of the population, especially their children. And of course, when we're looking at children yearly with regard to function and anatomy of the thyroid, that's of great interest to them that that effort be carried out. And I think they are very anxious to work with Western scientists and Western physicians to ensure the conduct and quality of these studies both medically and scientifically. I wouldn't underestimate their interest in the scientific dimensions, but certainly there is a public health dimension that is equally important in their perspective.

CHAIRMAN SELIN: Where are the Russians on this?

DR. WACHHOLZ: I think I'll defer that question to Dr. Pettengill.

With regard to the activities in Belarus and Ukraine, let me say that with regard to Ukraine there is no association with the Russians.

With regard to Belarus, there is active cooperation between the Institute of Radiation Medicine in Minsk and the Institute of Biophysics in Moscow. There are three scientists in Moscow at the Institute that are actively working on this project with us and with their counterparts in Belarus, so, in that sense, yes, the Russians are involved.

If your question is specific with regard to studies in Russia, we do not at this time have active studies in Russia, and I'll defer to Dr. Pettengill who I'm sure can speak to that a little more.

DR. PETTENGILL: Yes, Mr. Chairman, under Working Group 7 activities we have been collaborating with the Russian Federation as well. The level of work and the status of those studies are much behind when compared to Belarus and Ukraine and I would offer that that appears to be more the circumstance of the Russian consideration rather than ours. The impacted populations in Russia and the Bryansk area certainly did suffer some exposure, but significantly less than Belarus and those areas of Ukraine.

Currently what we have is another institute that developed a proposal which we have funded, the Fred

Hutchinson Cancer Research Institute, which is working directly with the authorities in the Russian Federation and they're developing feasibility analyses on the ability to do a comprehensive epidemiologic review for both thyroid and leukemia in the Bryansk area.

COMMISSIONER ROGERS: I was just curious as to a couple of your comments. One, that one of the purposes of this study is to find out if cancers are induced by iodine-131. But then you also say you were surprised to see the incidence of these cancers appearing so early, three to four years after the event, which seemed to imply that you had a model in mind. So, how do you bring those together?

DR. WACHHOLZ: Yes. How do you make them compatible with each other? The expectation of latency was based on external exposure of x-ray and gamma ray studies that have been done of children that received exposure of the thyroid in the course of treatment for varying diseases. And in that context you had a minimum latency of at least five years if not longer, and so that was the "expected latency" with regard to iodine if there were cancers resulting from the iodine exposure.

COMMISSIONER ROGERS: And is that just with x-rays or --

DR. WACHHOLZ: Yes.

COMMISSIONER ROGERS: But iodine-131 puts out half

gammas and half betas.

DR. WACHHOLZ: We have no basis for identifying a period of time as latency for I-131. That was based strictly on the external --

COMMISSIONER de PLANQUE: This is uptake rather than external exposure.

COMMISSIONER ROGERS: Yes, but also it's a combination of beta particles --

COMMISSIONER de PLANQUE: Well, yes, but having it in the thyroid is different from having it --

COMMISSIONER ROGERS: Yes, sure.

COMMISSIONER de PLANQUE: -- incident from externally.

DR. WACHHOLZ: The majority of the exposure comes from ingestion, for children particularly, of contaminated milk.

COMMISSIONER ROGERS: Yes.

DR. WACHHOLZ: Dr. Becker may --

DR. BECKER: If I might comment, we have a large experience using I-131 both diagnostically and therapeutically around the world and our experience to date has not indicated any significant deleterious consequences from the diagnostic use of I-131, although it has mostly been used in adults and not in children, and this experience appears to be in children.

There is considerable skepticism as to what the potential is for this causing any problems since we continue to use I-131 in small amounts. In the past it was used in much larger amounts, as a matter of fact in considerably larger amounts in most of the population in these areas we are involved with. But we have ongoing areas, as you know, in the Marshall Islands and out West where there are fallout concerns that are persisting and these are very acute questions that we have to deal with.

In treating patients with radioiodine, we are faced with the great concern about the deleterious consequences. In this country, most patients with hyperthyroidism are treated preferentially with I-131. This is not true in Europe, for instance, where most patients are treated with antithyroid drugs, and radioiodine is used much less frequently. The reasons for this variation are not clear, but they differ geographically. For instance, in England and in Brussels radioiodine is used frequently. It's rarely used in Germany and Scandinavia and Italy, and the reasons for these are not clear but probably relate to medical practice and other more difficult issues to define.

COMMISSIONER ROGERS: Thank you.

COMMISSIONER de PLANQUE: I'm not quite sure how you ask this question, so maybe you'll help me in formulating the question. Devising the protocol for a study

like this is not easy. I'm wondering how much you were able to draw from the protocols used in other studies like, particularly, the RERF studies or any of the other major studies that have been used or did you pretty much have to start from scratch and treat this as a unique situation?

DR. BEEBE: Well, you draw as far as principles, but my experience with the A-bomb survivors I suppose gave me a kind of structure for this, particularly since we had the so-called MB-200 or adult health study and a similar study of children where we had longitudinal studies with bringing the children in for examination every two years. So, you know, there is experience and there are models that we could adapt to a degree, but it's a unique experience.

DR. WACHHOLZ: I would say also we drew heavily on experience with regard to exposure in other situations such as the fallout studies in Utah and downwind from the Nevada test site in terms of dose reconstruction. The Department of Energy and the Defense Department collaborated in supporting a rather large epidemiological study in Utah on thyroid disease and leukemia and it was not dissimilar to this except obviously in terms of numbers and complexity and so on, but, nevertheless, it was the same basic type of activity to relate exposures of individuals to health observations among populations, so there were bits and pieces that could be brought to bear.

And then the clinicians in our group certainly have been involved in studies, both diagnostic and therapeutic as Dr. Becker makes mention, and there has been for some years thyroid toxicosis study at the National Cancer Institute, so these several things sort of all were drawn upon to develop a protocol of this nature along with the colleagues from overseas as to what the realities were --

COMMISSIONER de PLANQUE: What's feasible.

DR. WACHHOLZ: -- in those countries, yes.

COMMISSIONER de PLANQUE: Okay.

DR. BECKER: But, as you imply, this situation is a little different in that we are dealing with countries that have not had access to Western medicine, and many of the approaches taken in preparing a protocol have required first convincing the people that there was another way of doing things. It has taken three years and more to get the protocol to this point and a lot of these things that have held it up have been nonmedical issues, but very complicated and difficult ones.

COMMISSIONER de PLANQUE: Okay.

DR. WACHHOLZ: You have the scientific interaction. You have the cultural interaction. You have the language. So it's taken longer than would normally be the case if you sat down in Washington to design a protocol.

COMMISSIONER de PLANQUE: And that's tough enough.

You mentioned numbers of people involved, but it was a little scattered. Can you give me any rough feel what the overall manpower is for the project?

DR. WACHHOLZ: In the U.S. or --

COMMISSIONER de PLANQUE: Well, both, if you can, or split it out. Just ballpark. And if you can't do it now, that's okay.

DR. WACHHOLZ: Well, on the U.S. side at this point, I'd say it's in the dozens.

COMMISSIONER de PLANQUE: Okay.

DR. WACHHOLZ: In terms of professional staff over there, that's a little more difficult because the Institutes of Endocrinology and Radiation, they go out into the various clinics and poly-clinics throughout the country and we really don't know in terms of numbers how many people this involves. In terms of principals in the major cities, again, I'd say you're talking about one to two dozen of the senior people that we're working with in each country.

COMMISSIONER de PLANQUE: Okay. Thanks. Been very useful.

CHAIRMAN SELIN: Thank you very much. I've been hearing about this work so frequently from the EDO, who's really very pleased with the progress that's been made, and it's very nice to hear the professional side as well as the

managerial side.

DR. WACHHOLZ: Well, up until now there's been a lot of paperwork and a lot of planning. The interesting part is just beginning, as is the challenging part.

CHAIRMAN SELIN: Thank you very much.

DR. WACHHOLZ: Thank you for the opportunity.

[Whereupon, at 2:39 p.m., the above-entitled meeting was concluded.]

CERTIFICATE

This is to certify that the attached description of a meeting of the U.S. Nuclear Regulatory Commission entitled:

TITLE OF MEETING: PROTOCOL FOR STUDY OF THYROID DISEASE IN BELARUS AS A RESULT OF THE CHERNOBYL ACCIDENT - PUBLIC MEETING

PLACE OF MEETING: Rockville, Maryland

DATE OF MEETING: Friday, September 9, 1994

was held as herein appears, is a true and accurate record of the meeting, and that this is the original transcript thereof taken stenographically by me, thereafter reduced to typewriting by me or under the direction of the court reporting company

Transcriber: Carol Lynch

Reporter: Peter Lynch

U.S. RESPONSE TO CHERNOBYL: PROGRESS AND STATUS ON HEALTH RESEARCH

BELARUS

September 9, 1994

Harry J. Pettengill

BACKGROUND
JCC\CNRS - WORKING GROUP 7

- Chernobyl Accident on April 26, 1986
- Memorandum of Cooperation (MOC) under the Peaceful Uses of Atomic Energy Agreement signed in 1988
- Joint Coordinating Committee for Civilian Nuclear Reactor Safety (JCC\CNRS)
- Working Group 7: Health and Environmental Consequences
- Working Group 7 Pilot Projects

BREAK-UP
FORMER SOVIET UNION

- JCC\CNRS Structure Reorganized after the Former Soviet Union Break-up

- Continuation of Existing Working Group 7 Activities with Ukraine and Russian Federation; Tripartite JCC\CNRS Meetings in Kiev, Ukraine-1993; and Moscow, Russia-1994

- Letter Arrangement Signed with Belarus in April 1992

  - DOE and Belarus Ministry of Health to Continue Working Group 7 Activities Begun Under the Auspices of JCC\CNRS

THE CHERNOBYL HEALTH RESEARCH FOCUS

- Working Group 7 Research Directions Re-evaluated
- Decided to Shift Emphasis in Working Group 7 Towards Health Impacts
- Perform Traditional Epidemiologic Studies
- Environmental Focus on Dosimetry and Dose Reconstruction
- Expected Near-Term Health Outcomes
  - Thyroid Disease
  - Leukemia
- National Cancer Institute-Project Managers for Studies of Thyroid Disease and Leukemia in Belarus and Ukraine

CHERNOBYL

HEALTH-RELATED COOPERATIVE SCIENTIFIC RESEARCH PROGRAMS

BETWEEN

THE UNITED STATES

AND

BELARUS - UKRAINE

September 9, 1994

Bruce W. Wachholz, Ph.D.

(301) 496-9326

NCI WORKING GROUP MEMBERS PRESENT

David V. Becker, M.D.

Gilbert W. Beebe, Ph.D.

Andre C. Bouville, Ph.D.

Bruce W. Wachholz, Ph.D.

RECOMMENDATIONS

- Thyroid Disease - Especially Cancer in Children
- Leukemia - Clean-up Workers

DOE - NCI

- DOE-NCI Interagency Agreement Signed 1990
- NCI Requested to Work with Soviet Counterparts to:
  - Develop Protocols for and Implement Long-Term Follow-up Studies of Thyroid Disease, Especially Cancer
  - Develop Protocol for Study of Leukemia
- DOE to Provide Financial Support
  - Equipment/Supplies
  - NCI-DOE Matching Support for NCI Expenses
  - Some Funding Provided from NRC
- Two Working Groups Formed

U.S. NATIONAL CANCER INSTITUTE
WORKING GROUP FOR THYROID STUDIES

David V. Becker, M.D., Chairman

Lynn R. Anspaugh, Ph.D.

Gilbert W. Beebe, Ph.D.

Andre Bouville, Ph.D.

A. Bertrand Brill, M.D., Ph.D.

Jacob Robbins, M.D.

Roy E. Shore, M.D., Dr.P.H.

Lester Van Middlesworth, M.D., Ph.D.

Bruce W. Wachholz, Ph.D.

Jan Wolff, M.D., Ph.D.

U.S. NATIONAL CANCER INSTITUTE
WORKING GROUP FOR LEUKEMIA STUDIES

Gilbert W. Beebe, Ph.D., Chairman

Lynn R. Anspaugh, Ph.D.

John D. Boice, Jr., Sc.D.

Andre Bouville, Ph.D.

Scott Davis, Ph.D.

Stuart C. Finch, M.D.

Geoffrey R. Howe, Ph.D.

Ronald Jensen, Ph.D.

L. Gayle Littlefield, Ph.D.

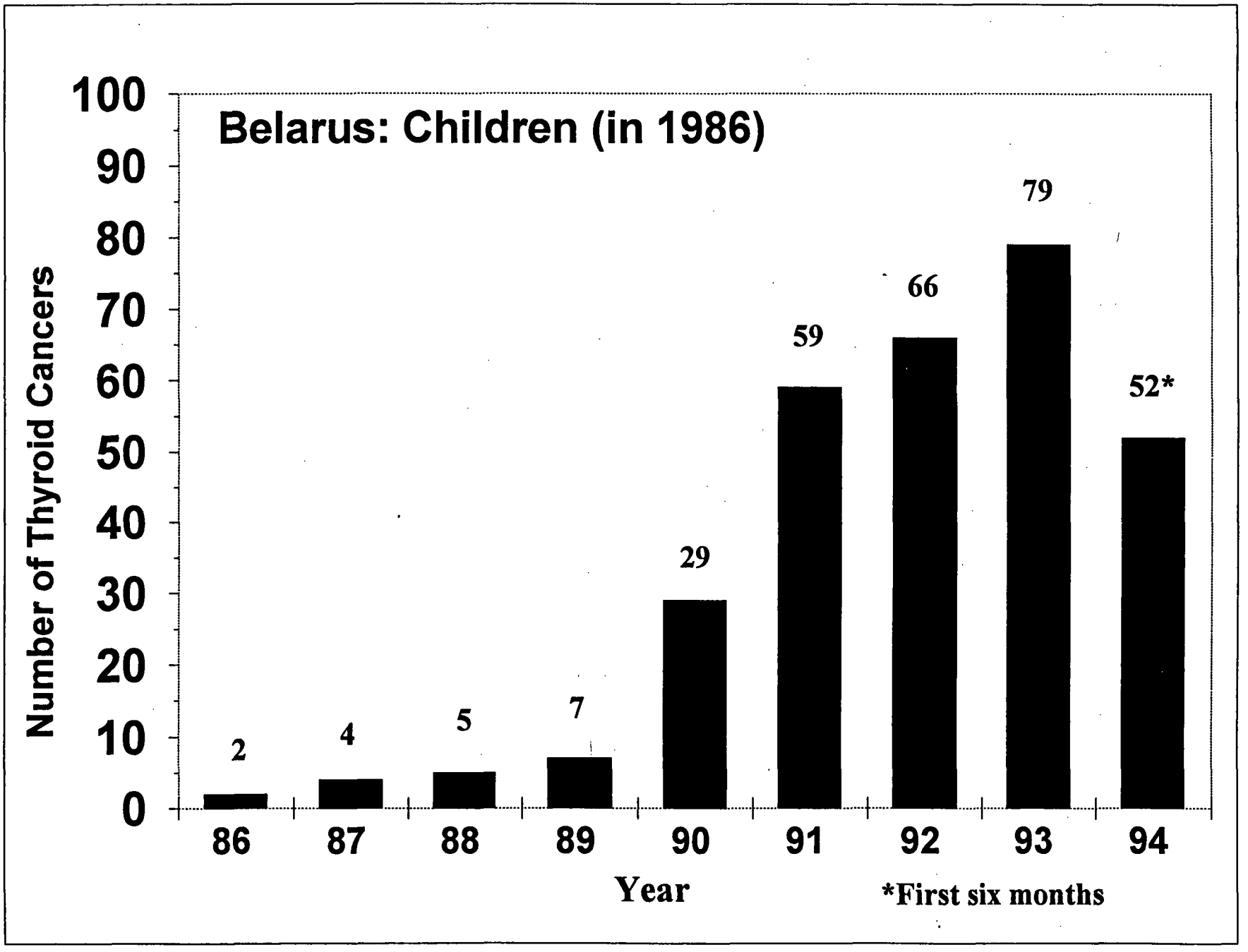
Ian Magrath, M.B.

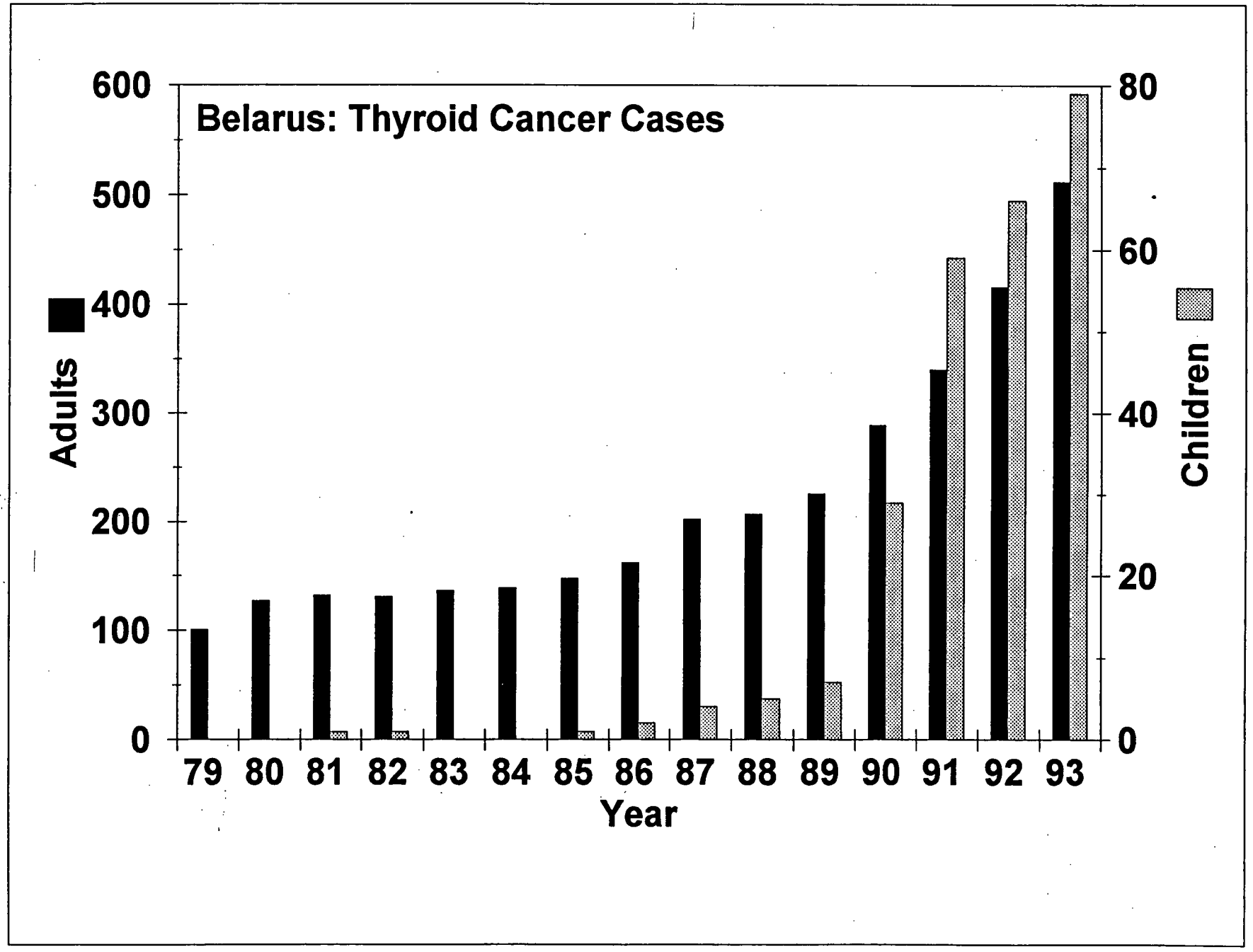
Leslie Robison, Ph.D.

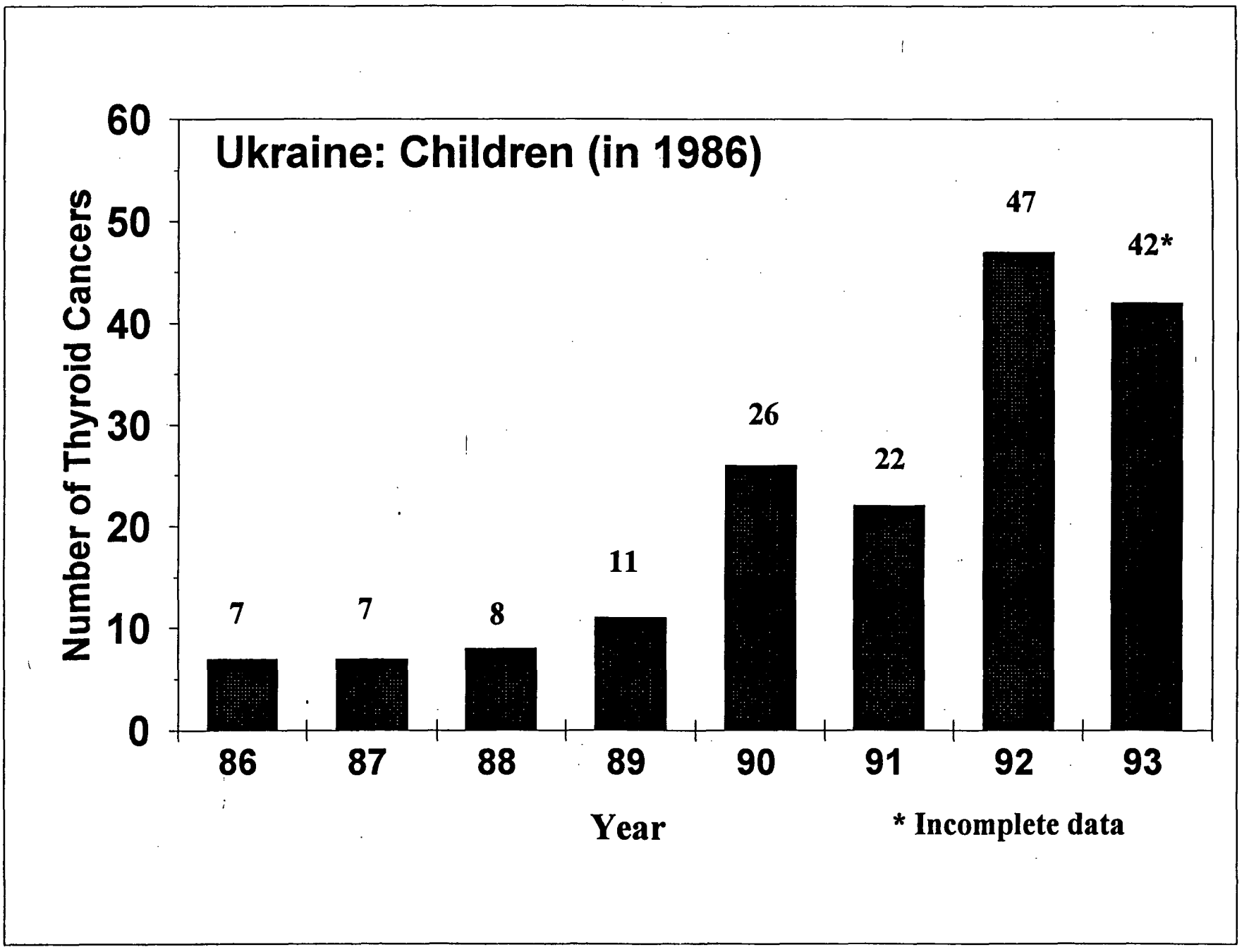
Bruce W. Wachholz, Ph.D.

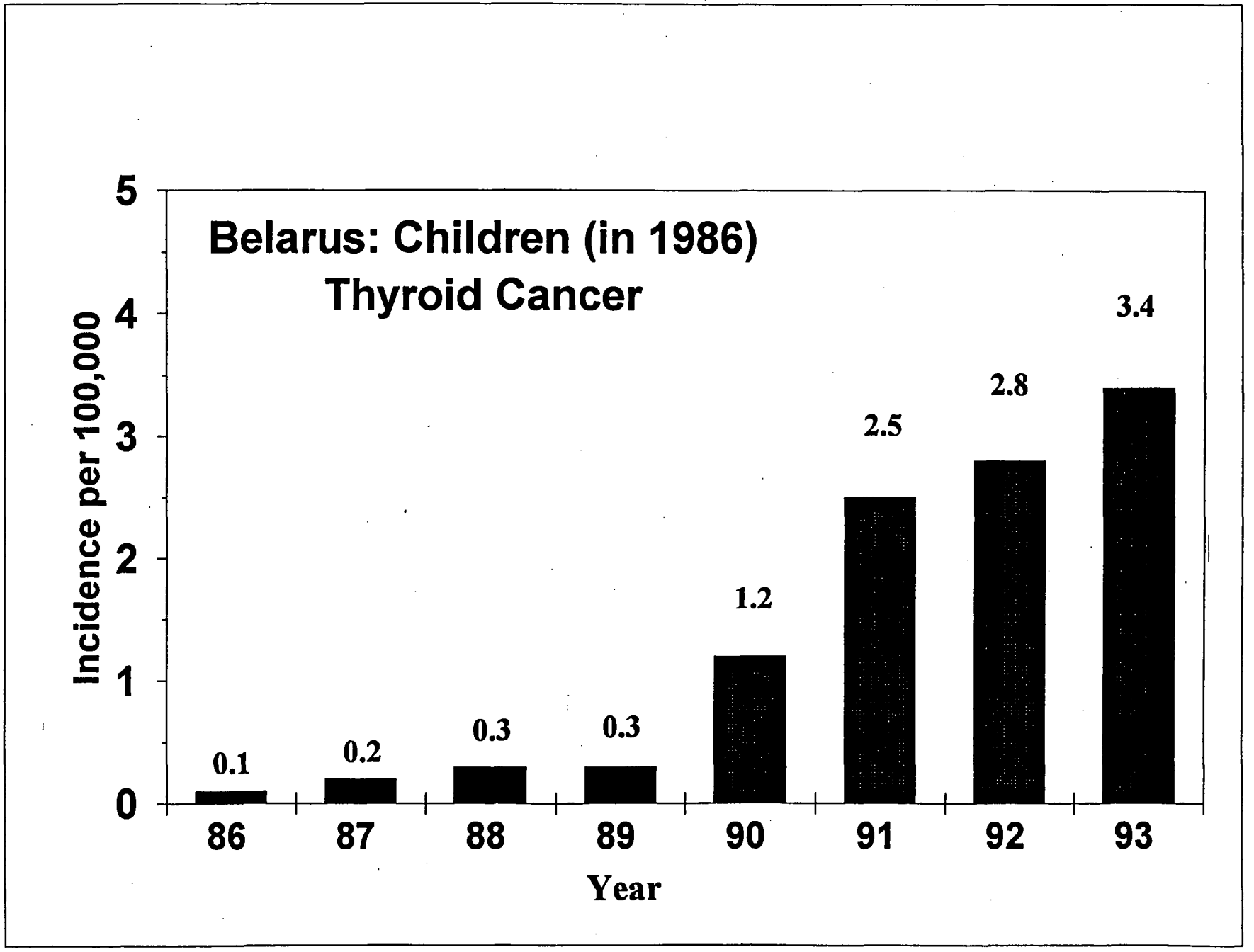
U.S. INTEREST - THYROID

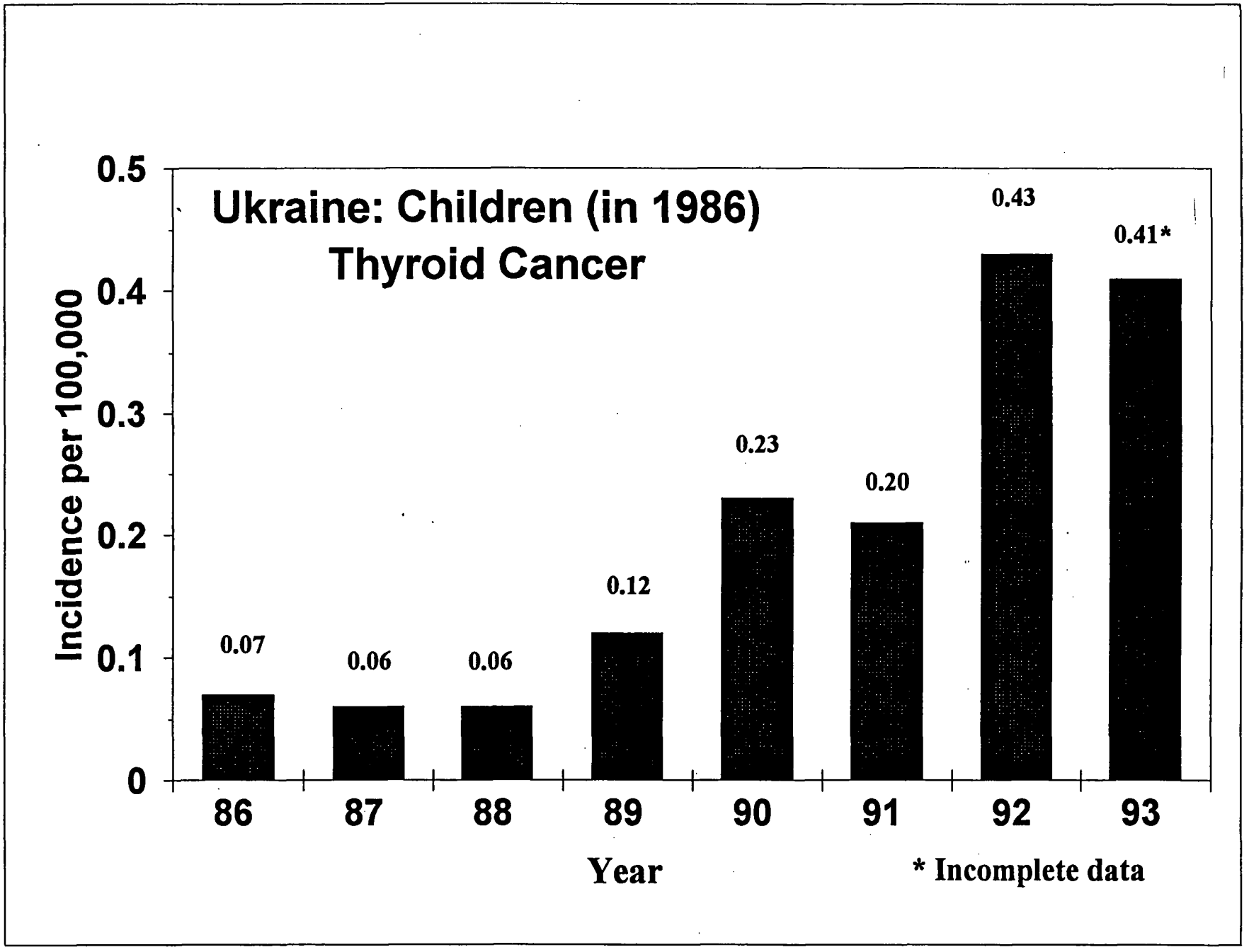
- Risk of Thyroid Cancer from I-131 Unknown
- I-131 Most Likely Source of Accidental Public Exposure
- Accidental Reactor Releases of I-131
  - Windscale, ENGLAND (1957) - ~20,000 Ci
  - Three Mile Island, U.S. (1979) - ~15 Ci
  - Chernobyl, UKRAINE (1986) - ~30 X 10^6 Ci
- Chernobyl - >1 X 10^6 Children Exposed
  >1 X 10^5 Children's Thyroids Measured


Belarus: Children (in 1986)
Number of Thyroid Cancers
100
90
80
70
60
50
40
30
20
10
0
2
4
5
7
29
59
66
79
52*
86
87
88
89
90
91
92
93
94
Year
*First six months


Belarus: Thyroid Cancer Cases
Adults
Children
600
500
400
300
200
100
0
80
60
40
20
0
79 80 81 82 83 84 85 86 87 88 89 90 91 92 93
Year


Ukraine: Children (in 1986)
Number of Thyroid Cancers
60
50
40
30
20
10
0
7
7
8
11
26
22
47
42*
86
87
88
89
90
91
92
93
Year
* Incomplete data


Belarus: Children (in 1986)
Thyroid Cancer
Incidence per 100,000
0
1
2
3
4
5
0.1
0.2
0.3
0.3
1.2
2.5
2.8
3.4
86
87
88
89
90
91
92
93
Year


Ukraine: Children (in 1986)
Thyroid Cancer
Incidence per 100,000
0.5
0.4
0.3
0.2
0.1
0
0.07
0.06
0.06
0.12
0.23
0.20
0.43
0.41*
86
87
88
89
90
91
92
93
Year
* Incomplete data

THYROID STUDIES

- Case-Control Studies
  - Belarus (1992) - 119 Cases of Children with Thyroid Cancer
  - Ukraine (1993) - Number of Cases to Be Determined
- Cohort Studies
  - Belarus - 15,000 Children
  - Ukraine - ~70,000 Children
  - Risk Estimates for Cancer, Nodules and Hypothyroidism
    - Dose
    - Age (at time of exposure)
    - Sex

THYROID COHORT STUDIES

OBJECTIVES

- Dose- and time-related morphologic and functional changes in the thyroid glands of children exposed to radiation from radioactive materials released from Chernobyl
- Risk estimates for nodules and cancer as a function of dose in relation both to sex and to age in 1986
- Comparison of the relative effectiveness of I-131 with that of X ray and gamma irradiation in inducing thyroid nodules and cancer
- Risk estimates for induction of hypothyroidism as a function of dose in relation both to sex and to age in 1986

THYROID COHORT STUDIES

BELARUS AND UKRAINE

- Sampling

  1986 Thyroid Measurements
  Children or in utero, 1986
  Fixed Cohort

- Annual/Biennial Follow-up Examinations

  Palpation
  Ultrasound
  Laboratory Tests
  Fine Needle Biopsy (as indicated)

- Dose Reconstruction

  1986 Measurements on Thyroid
  I-131 Fallout Maps
  Exposure History (Residence, Diet, etc.)

THYROID DOSE DISTRIBUTION FROM THE CHERNOBYL ACCIDENT AMONG CHILDREN WITH THYROID MEASUREMENTS

Estimated Dose (Gy)	Belarus	Ukraine
0-0.3	13,556	45,938
0.3-1	8,631	19,293
1-2	2,806	5,684
2-5	1,743	3,698
5-10	370	1,012
>10	111	530
TOTAL	27,217	76,155

THYROID DOSE RECONSTRUCTION

- Cohort Studies: Based on Thyroid Measurements
- Case-Control Studies: Based on ^{137}Cs Ground Deposition
- Factors Contributing to Exposure of the Thyroid:

  Primary: ^{131}I-contaminated Milk

  Other: ^{131}I-contaminated Foodstuffs

  Inhalation: ^{131}I, ^{132}I, ^{133}I

  External Irradiation: ^{134}Cs, ^{137}Cs

STATUS OF THYROID STUDIES

Belarus

Case-Control (1992)

All cases and control subjects selected

Pathology reviewed for most cases

Individual information received from most subjects

Individual dose reconstruction yet to be completed

Analyses in process

Publication in initial stages of preparation

STATUS OF THYROID STUDIES

Ukraine

Case-Control (1993)

Partial Identification of Cases

Current Efforts

- Identify Additional Cases
- Identify Control Subjects
- Dose Reconstruction
- Confirmation of Pathology

STATUS OF THYROID STUDIES

Belarus

- Cohort (1994)
  - Research Protocol Completed
    - NCI/NIH Scientific Peer Review Completed
    - Institutional Review Boards
      - Belarus - Established and Approved
        NCI - Approved
        NIH Approval Received
  - Belarus and U.S. Signed Agreement to Implement Protocol
  - Operations Manual in Preparation
  - Priority Equipment Needs Identified
  - Arrangements in Progress for Semi-resident Representative
  - Exchange of Experts
  - Training
  - Belarussian Management Team
  - Advisory Committee

STATUS OF THYROID STUDIES

Ukraine

Cohort (1994)

Research Protocol Completed

NCI/NIH Scientific Peer Review Completed
Resolution of Comments Imminent

Institutional Review Boards
Ukraine: Yet to be established
NCI: To be submitted following resolution of peer review comments

Exchange of Experts

Training

Ukrainian Management Team

Advisory Committee

ESTIMATED COSTS

FOR THE FIRST THREE YEARS (U.S. $*)

	Year 1		Year 2		Year 3	
	Belarus	Ukraine	Belarus	Ukraine	Belarus	Ukraine
Equipment	890	1,000	380	130	240	220
Supplies	290	560	450	460	700	770
Training, Workshops, Travel, Non-government salaries/fees	500		500		500	
TOTAL	3,240		1,920		2,430	

*(in thousands)

U.S. INTEREST - LEUKEMIA

- Risk of Leukemia ("Low" Doses/"Low" Dose Rates) Unknown
- Previous Exposure Populations
    - Japanese - Acute
    - Occupational - Low
- Chernobyl - ~600,000 Clean-Up Workers

LEUKEMIA STUDIES

OBJECTIVES

- Provide risk coefficients following exposure to low-to-moderate doses of radiation, and compare with Japanese data
- Assess time-response function and the influence of dose rate
- Investigate pathogenesis of radiogenic leukemia and provide for future studies of molecular biology
- Estimate future leukemia and solid tumor excess among clean-up workers

LEUKEMIA STUDIES

PHASE I - 18 Months

- Sampling - Sources of Information: Clean-Up Workers
  Registries

- Dosimetry

  - Physical: Badges
    Radiation Fields
    Questionnaires/Interviews

  - Biological:
    Fluorescent in Situ Hybridization for Translocation Analysis (FISHTA)
    Glycophorin-A (GPA) Somatic Cell Mutational Assay
    Electron Paramagnetic Resonance (EPR)
    Storage of Blood and Bone Marrow

- Leukemia: Ascertainment (1986-1992)
  Diagnostic Review/Terminology
- Other

PHASE II - Long-Term Epidemiological Study

STATUS OF LEUKEMIA STUDIES

IN UKRAINE

Scientific Research Protocol

Draft Protocol Prepared - March, 1994

Revised Protocol Subject of Meetings - September, 1994

Final Protocol Anticipated Before January, 1995

Projected Budget: $3M over 10 years

BELARUS

- Minister of Health

  Current - Inissa M. Drodyshevskaya

  Former - Vasily S. Kazakov

- Director, Institute of Radiation Medicine

  Alexander N. Stozharov

- Deputy Director, Institute of Radiation Medicine

  Larisa N. Astakhova

UKRAINE

- Minister of Health

  Current - Vladimir A. Bobrov

  Former - Yurij Spizhenko,
  Member of Parliament

- Director, Ukraine Scientific Center for Radiation Medicine

  Anatoly Ye. Romanenko

- Director, Institute of Endocrinology and Metabolism

  Nikolai Tronko

- Chief, Department of Dosimetry and Radiation Hygiene

  Ilya Likhtarev