

# THE LEGACY OF CHORNOBYL: HEALTH AND SAFETY 20 YEARS LATER

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## HEARING BEFORE THE COMMISSION ON SECURITY AND COOPERATION IN EUROPE ONE HUNDRED NINTH CONGRESS SECOND SESSION

APRIL 25, 2006

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APRIL 25, 2006

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# **THE LEGACY OF CHORNOBYL: HEALTH AND SAFETY 20 YEARS LATER**

**APRIL 25, 2006**

COMMISSION ON SECURITY AND COOPERATION IN EUROPE

WASHINGTON, DC

The hearing was held at 2:07 p.m. in room 2226 Rayburn House Office Building, Washington, DC, Hon. Christopher H. Smith, Co-Chair, Commission on Security and Cooperation in Europe, presiding.

*Commissioners present:* Hon. Christopher H. Smith, Co-Chair, Commission on Security and Cooperation in Europe; and Hon. Benjamim L. Cardin, Ranking Member, Commission on Security and Cooperation in Europe.

*Witnesses present:* Stephen G. Rademaker, Acting Assistant Secretary of State, Bureau of International Security and Nonproliferation; H.E. Oleh Shamshur, Ukrainian Ambassador to the United States; David Marples, Ph.D., Professor of History, Director, Stasiuk Program on Contemporary Ukraine, Canadian Institute of Ukrainian Studies, University of Alberta; Pablo Rubinstein, M.D., Director, National Cord Blood Program, New York Blood Center; and Kathleen Ryan, Executive Director, USA, Chornobyl Children's Project International.

## **HON. CHRISTOPHER H. SMITH, CO-CHAIRMAN, COMMISSION ON SECURITY AND COOPERATION IN EUROPE**

Mr. SMITH. The Commission will come to order, and good afternoon to everybody.

Tomorrow, as we know, April 26, marks the 20th anniversary of the world's worst nuclear accident at the Chornobyl powerplant in Ukraine. Compounding the disaster was that it took place under the veil of secrecy, which was characteristic of the Soviet Union. In the days and weeks following the accident, people were denied accurate information on the dangers of what had happened.

This bitter legacy of Chornobyl continues to be felt 20 years later, and its consequences will remain for the people of the region and beyond for a long time to come.

The health, social, environmental, economic, and political consequences of the disaster continue to have a profound impact on

countries in the region, especially Ukraine and Belarus, which bore the brunt of the radioactive fallout.

Although experts differ, sometimes sharply, on the extent and magnitude of the human cost of Chernobyl, there is no doubt that the physical and psychological welfare of millions in Ukraine, Belarus, and western Russia, including nuclear cleanup workers, has been harmed. There is no question that continued assistance will be needed for the most vulnerable, including the children. We must never lose sight of the human toll of Chernobyl.

Last year, I successfully included language in the State Department Authorization Act to provide assistance to improve maternal and prenatal care, especially for the purpose of helping to prevent birth defects and pregnancy complications. The monies would be for individuals in Belarus and Ukraine involved in the cleanup of the region affected by the Chernobyl disaster. While numerous studies have furthered our knowledge of Chernobyl's consequences, there is still much we don't know, including its long-term impact on human health and on the environment.

There is a need for further study and action. For example, we need to ensure that sufficient U.S. funding is targeted toward Chernobyl health studies and efforts to prevent birth defects through the distribution of folic acid and better prenatal care. We know that folic acid is one of the key ways of preventing spina bifida, for example.

We need to be vigilant of the latent health effects that are still expected to emerge.

The need for the international community's involvement, both government and non-governmental organizations, is still great. And it is important to remember that Chernobyl is not just a Ukrainian, Belarusian, or Russian problem. We all have a stake in dealing with this truly global disaster. An immediate pressing priority, especially for Ukraine, is the completion of the Chernobyl Shelter Plan, as well as other efforts to mitigate the consequences of the disaster.

With the rapid deterioration of the sarcophagus covering the damaged reactor, we can ill afford another release of tons of radioactive dust into the environment. We need to do everything possible to protect people and the environment from the large quantity of radioactive remains of the Chernobyl nuclear power plant, even as we persist in our assistance to the victims.

Although the international community, including the United States, has provided invaluable assistance in helping to mitigate Chernobyl's devastating legacy, there is still much that remains to be done. We cannot afford to close our eyes or our hearts to these problems.

Among our many witnesses today is the Director of the National Cord Blood Program at the New York Blood Center, Dr. Pablo Rubinstein. Members of this Commission are particularly interested in knowing what real cures and life-transforming treatments are being identified to address the immediately recognizable and latent diseases caused by high exposure to radiation. Having pioneered the field of public cord blood banking nearly 15 years ago, Dr. Rubinstein is on the cutting edge of offering hope and life and cures for an array of diseases once deemed terminal, including leukemia.

As the prime sponsor of the Stem Cell Therapeutic Act of 2005, H.R. 2520, signed into law by President Bush last December, I'm proud that Federal funding is now helping to increase the number of high-quality cord blood units available to match and to treat patients. Our goal is to expand the inventory such that matched stem cells will be available to treat more than 90 percent of patients. All cord blood banks participating in the inventory program will have the capacity to search the cord blood and bone marrow matches through a single access point. Essentially, a nationwide stem cell transplantation system is being established.

Considering the implications for the use of cord blood to combat diseases caused by radiation exposure and the lessons we have learned from the Chernobyl disaster, perhaps there is more that we could do to better prepare if there should be a similar accident or even a terrorist attack.

As Dr. Rubinstein will testify, and I quote him, "Cord blood is especially, if not uniquely, suited to be used in the emergency treatment of subjects exposed to lethal doses of radiation."

Ladies and gentlemen, I am very pleased to have with us on this panel a number of distinguished witnesses, and we look forward to their testimony.

Beginning with our first panel, let me introduce an old friend and a very, very competent man who worked as General Counsel for the International Relations Committee for many, many years, the Acting Assistant Secretary of State for the Bureau of International Security and Nonproliferation, Steve Rademaker.

Secretary Rademaker currently heads the newly created Bureau of International Security and Nonproliferation of the State Department. Prior to joining the State Department, Mr. Rademaker was chief counsel to the Select Committee on Homeland Security of the U.S. House of Representatives.

For most of the previous decade, he held positions on the staff of the Committee on International Relations, on which I also serve. Prior to this, he held several positions on U.S. Government, including General Counsel of the Peace Corps and Deputy Legal Advisor to the National Security Council. Mr. Rademaker earned a BA and JD and MA from the University of Virginia.

Secretary Rademaker, please proceed. If you would, introduce those who are accompanying you.

**STEPHEN G. RADEMAKER, ACTING ASSISTANT SECRETARY  
OF STATE, BUREAU OF INTERNATIONAL SECURITY AND  
NONPROLIFERATION**

Sec. RADEMAKER. Yes. Thank you, Mr. Chairman. It's a great pleasure for me to appear again before the Helsinki Commission, and I do want to thank you for the invitation to address the Commission on the 20th anniversary of the disaster at Chernobyl.

I'm joined today at the witness table on my right by Warren Stern who helps direct our office that has been responsible over the years for our response to the Chernobyl disaster and on my left by Patricia Metz who works in that office and has done a great deal of work over the years on this very important issue.

If some of the questions lead into areas that require their technical expertise, with your indulgence, I may turn the microphone over to them.

First, though, I do have a prepared statement, which I will read into the record.

As all of us know, Chernobyl was the worst nuclear accident in history. It was triggered early on the morning of April 26, 1986, when the Chernobyl facility's No. 4 reactor exploded. Thirty people were killed in the blast or exposed to lethal doses of radiation as they sought to control the ensuing fire. The reactor burned for 10 days, releasing hundreds of times more radioactivity than Hiroshima and contaminating large areas in northern Ukraine, southern Belarus, and western Russia.

The United States recognizes the serious and continuing health, environmental, social, and economic legacy of Chernobyl some two decades later. We, at the State Department, have worked with Ukraine and the broader international community to help deal with the consequences of the accident, and today I would like to describe some of those efforts.

The United States has and continues to provide substantial assistance through bilateral and international programs directed at mitigating the consequences of the Chernobyl accident. My bureau has worked most closely with Ukraine on issues associated with nuclear safety, both at the Chernobyl site and in Ukraine, more broadly. My testimony will focus on those issues.

First, I would like to note the humanitarian assistance we are providing to the victims of the accident in both Belarus and Ukraine. With respect to Belarus, since 1992, the Department of State's humanitarian programs have delivered and distributed \$235 million in humanitarian commodities donated by private donors and the Department of Defense.

This assistance was provided to the most needy in Belarus and was made possible by \$13 million in Freedom Support Act funding with 39 airlifts and 1,030 ground shipments. These commodities included medicine, medical supplies, medical equipment, food, and clothing. A significant amount of medical and other assistance directly benefited those affected by Chernobyl.

With respect to Ukraine, since 1992, the Department of State's humanitarian programs have delivered \$582 million in humanitarian commodities donated by private donors and the Department of Defense.

This assistance was made possible by \$43.5 million in FSA funding for 74 air and 5,150 ground shipments. Approximately one-half was targeted to those affected by Chernobyl, particularly children.

The United States has also invested \$12 million in health programs targeting those affected by Chernobyl. These programs included physical and mental health screening and treatment for children, breast cancer awareness and access to modern cancer treatment.

In commemoration of the 20th anniversary of the Chernobyl accident, the Department of State, in partnership with two U.S.-based NGOs, sponsored and funded a humanitarian medical airlift to Kyiv, Ukraine on April 20, 2006.

In Ukraine, the United States has worked bilaterally and within broader international efforts to achieve substantial improvements in nuclear safety at Chernobyl and elsewhere. The cornerstone of these efforts is the Memorandum of Understanding [MOU] agreed between the Group of Seven countries and Ukraine in 1995.

The fundamental objective of the agreement was to develop a path forward for the ultimate closure of the then operating Chernobyl unit three reactor, while also providing for assistance that would help Ukraine deal with the consequences of the Chernobyl accident and related nuclear safety issues.

The MOU led to the permanent closure of the remaining operating Chernobyl reactor in December of 2000. As a result of this step, Ukraine significantly improved nuclear safety for its own people and those of its neighbors.

The MOU also set in motion a sustained program of intensive cooperation between Ukraine and western governments and financial institutions through loans and grants for nuclear safety improvements and power sector reforms.

In the context of the MOU, the United States has provided more than \$400 million to enhance the safety of nuclear power plants in Ukraine. Ukraine's nuclear plants are now better equipped with fire safety and diagnostic equipment and boasts improved quality assurance programs and procedures.

Ukraine's nuclear plants now have in place modern emergency operating instructions to address problems as they arise. The United States also works closely with Ukraine to share experiences in the area of nuclear regulation to ensure that nuclear power does not compromise health and environmental standards.

The MOU mobilized approximately \$1 billion in loans to increase energy sector stability and reliability and \$1.6 billion in grants for nuclear safety, including \$1.3 billion for the Chernobyl site itself.

The Chernobyl Shelter Implementation Plan, or SIP, represents a key element of the nuclear safety framework established under the 1995 MOU. By providing a path forward for transforming the deteriorating sarcophagus that currently covers the destroyed reactor, the SIP will provide an environmentally safe ending to another chapter of the Chernobyl tragedy.

Under the leadership of the G-7 and EC and managed by the European Bank for Reconstruction and Development, the Chernobyl Shelter Fund was established to fund the SIP. To date, more than \$1 billion has been pledged to the fund by 29 countries and the European Commission. Significantly, last year, Russia made its first contribution—\$10 million to the fund.

The United States played a prominent role in establishing and supporting the fund. The United States remains the largest single country donor with a total CSF pledge total of \$203 million.

Key elements of the SIP, including construction of auxiliary systems and preparatory works and stabilization of the sarcophagus, are complete or nearing completion. The SIP has entered its final and most important stage: construction of the shelter itself. Review of bids for executing this complex task is in the final stages. Construction of the new safe confinement or shelter is expected to be complete by 2009.

The aftermath of Chernobyl continues to plague the region. Hundreds of thousands of people were displaced following voluntary and forced evacuations. This large-scale displacement produced massive social disruption and economic hardship. Lingering fear and uncertainty associated with Chernobyl-related health effects continue to factor heavily into the daily lives of the affected population.

The Chernobyl Forum was created to bring together eight U.N. organizations and the governments of Belarus, the Russian Federation and Ukraine to develop an agreed-upon scientific basis for implementing the U.N.'s 10-year strategy for revamping and reenergizing efforts to mitigate the lingering consequences of the Chernobyl accident.

The World Health Organization and the International Atomic Energy Agency coordinated the two-pronged review of health effects and environmental consequences, respectively. This review included participation of the United Nations Scientific Committee on the Effects of Atomic Radiation, the authoritative U.N. body for review of the science on the environmental and human health effects of radiation.

In 2005, the forum completed its review of the scientific understanding on the effects of Chernobyl. The forum's conclusions reaffirmed scientific consensus on health and environmental effects and recommended that resources be targeted to those areas identified to be of greatest concern.

While debate continues over health effects and numbers, one important outcome of the process has been a clear consensus among the U.N. agencies and the three governments that a path forward for recovery is needed, and such a path should focus on mitigating the continuing social and economic consequences.

To this end, the United Nations has recently shifted responsibility for oversight of Chernobyl-related programs to the U.N. Development Program, with the aim of improving the targeting of Chernobyl-related assistance and emphasizing community-based recovery and development.

While this is clearly a day of mourning for what was lost, we must also look ahead. One positive outcome of the disaster has been to focus the world's attention on the issue of nuclear safety. For example, immediately following Chernobyl, the international community adopted two key instruments for ensuring cooperation in the event of a nuclear accident: The Convention on the Early Notification of a Nuclear Accident and the Convention on Assistance in the Case of a Nuclear Accident or Radiological Emergency.

In the past two decades, both national and international infrastructures for ensuring the safety of nuclear power plants have improved tremendously. On this solemn anniversary, we pay tribute to the lives lost and communities destroyed in the aftermath of the Chernobyl accident, but we also look ahead to a safer nuclear energy future for Ukraine and in the rest of the world.

Thank you, Mr. Chairman.

Mr. SMITH. Mr. Rademaker, thank you so very much.

Let me just begin. Russia, as we all know, will host the G-8 summit in July, and I'm wondering what place or what prominence the whole Chernobyl disaster will be given at that summit. Obvi-

ously, there's lots of competition with Iran and other issues, the price of oil, but it seems to me that this remains an issue, especially when you realize that there are at least 12 Chernobyl type reactors, one in Lithuania and 11 others in Russia itself.

And I'm wondering, as well, have safeguards been put into place to ensure that those remaining reactors do not follow the same course of events that we saw in Chernobyl? I remember when we had Three Mile Island, there were a whole series of post-TMI safeguards that were put into place, and I'm wondering if that kind of follow up was done among those other reactors as well.

Sec. RADEMAKER. Yes, Mr. Chairman. First, with regard to your question about the G-8 summit, which will take place in St. Petersburg, I will note that the issue of Chernobyl has factored importantly in previous G-8, and before that G-7, summits. It's difficult for me to predict or to speculate right now about the kind of treatment Chernobyl may receive at the upcoming summit, but with the 20th anniversary we know that this issue is on everyone's mind, and perhaps you read there was just a conference in Kyiv on this important issue.

So I would expect there would be some consideration of it. How importantly it will factor given all the other issues that are before the heads of states when they meet I cannot say, but we do have a history to look at, and the G-8, and before that the G-7, have played critically important roles in focusing international attention and international assistance on this problem.

With regard to your second question about the remaining Chernobyl style reactors that are still in operation, as you noted, there are 11 such reactors currently operating in the Russian Federation and one in Lithuania, although the one in Lithuania is scheduled for decommissioning. Your question was, have safety upgrades been made at these reactors, and the answer is, yes, they have. These are not exactly the type of reactors that exploded at Chernobyl 20 years ago.

But even with these safety upgrades it remains the view of the U.S. Government that these are not safe plants, and we would favor their decommissioning.

Mr. SMITH. Let me ask, and perhaps your associates who deal with, I assume, the health issue might want to touch on this as well. I read the Chernobyl Forum's report for 2003 and 2005, and on the issue of cancer mortality the statement was made, "It is impossible to assess reliably with any precision numbers of fatal cancers caused by radiation exposure due to the Chernobyl accident."

Others have suggested that the numbers contained in this report very much lowball the number of cancers attributable to the exposure. As a matter of fact, there is a call at the end for more studies, which I think is a very prudent step to take, but meanwhile there are people who may be manifesting or getting cancer who are going underreported or not getting the help they need.

And there was also some writing that suggested that latency period for many forms of cancer will not show themselves for another 5 or 10 years, even from now, the 20th year, and I'm wondering if our Department of Health and Human Services, people at NIH, or others are working in a collaborative way with Ukrainians to try to get a better handle on this.

I note that this report has been criticized by some, at the U.N. agencies and three governments. I'm just wondering where the reality is.

Sec. RADEMAKER. Mr. Chairman, if I may turn to my colleagues to respond to your questions to the extent we're in a position to do so. I do note that you have a panel later today with bona fide experts on this issue who may be able to speak with greater certainty to the questions you ask.

But, Warren?

Mr. STERN. No, I have nothing specific to add. I mean, the Chernobyl Forum was an effort to bring together that had been compiled and analyzed over many years in a forum in which governments and U.N. agencies could agree on a statement about their impact. The U.S. Government agencies do play an important role and it's including Department of Energy and other U.S. Government agencies. We generally support the work that's been done by the Chernobyl Forum, and we support and played a role in it.

Mr. SMITH. I note the differences you just cited, the Belarus assistance, both private as well as our assistance, and the Ukrainian, the \$235 million, \$582 million. Since most of the people who were mal-affected were from Belarus, has any of that to do with Lukashenka's lack of cooperation with U.S. or PVO efforts to help those who have been affected?

Sec. RADEMAKER. I think, Mr. Chairman, the principal explanation is that Ukraine is a much bigger country than Belarus, and so the total figure for Ukraine is larger. The numbers I gave you are not Chernobyl specific. They're overall assistance, humanitarian assistance that we have provided. And I think I was clear in my testimony that the U.S. Government did not pay for all of this assistance; we paid for delivery of assistance, and much of it was donated by charitable organizations.

Mr. SMITH. But with the focus of going to the people who've been affected by Chernobyl.

Sec. RADEMAKER. Correct. They were foremost among the beneficiaries of the assistance in both countries.

Mr. SMITH. Can I just ask you on the new safe confinement, the \$800 million new structure, what will happen between now and, I think you said, 2009 or 2010 when it will finally be completed? Are there ongoing persistent risks of having all of that hot material leaching into the atmosphere or whatever it might be doing?

Sec. RADEMAKER. Efforts have been made to mitigate those risks. Warren, do you want to comment on the specifics?

Mr. STERN. Sure. The greatest concern over the years has been, and will continue to be, that the structure could collapse. It was built very hastily, and many components weren't actually formally attached together. Over the past several years and the coming years, we have been, and will be, implementing structure upgrades at the existing shelter to help prevent any possibility or any significant possibility of collapse; that at the same time as we are building the new shelter.

Mr. SMITH. Could I ask you, and perhaps you might want to get back to us on any very specific information on this, but in the U.N. report, the Chernobyl Forum's report, they note an increased risk of leukemia associated with radiation exposure from Chernobyl was

therefore expected among the population exposed. And I'm wondering if you could maybe get back to us as to what the latency period on that is. Is that something that we expected to see right away or will we see it manifest over the course of several years, if not decades?

Sec. RADEMAKER. When we get back to the Department, we'll ask that question and get you the best answer that we're able to produce.

Mr. SMITH. Appreciate it.

I also would note, finally, that the report makes clear that large numbers of people are being relocated back to areas that had been contaminated, and I'm wondering if sufficient assurances are being provided to those people that it is indeed safe knowing the shelf life or the lethality of radiation over the course of many years. How is that being monitored?

Obviously, the most mal-affected area probably will remain hot for centuries to come, but it seems to me living in a state where we've had a problem, not so much with radiation, although we had a few instances right next to my district, in my district, where we had a plutonium problem with a missile that imploded and spilt its plutonium all over into the soil. There have been many problems with toxic waste and the like and what people thought were clean and restored areas turned out to be anything but, carrying with them threats to human life and health for a longer period of time.

And I hope there are assurances to those who relocate back that it is indeed clean and that the aquifers and the water and the soil are not still contaminated. I'm wondering, who oversees that? Is that the government?

Sec. RADEMAKER. To comment quickly on your question, I think it's probably not correct to say that people are being relocated back to the area. I think there are people who are relocating themselves, people who previously lived there and simply want to go home. And I think, by and large, they understand the risks that they're running, and the governments in the region have not stopped people who are determined to return on their own from doing so, though they've tried to make them aware of the risks that they're running.

Mr. SMITH. I do have one—oh, yes, please.

Mr. STERN. Just to add that we in the international community have worked very closely with Ukraine over the past decade to ensure for ourselves that their nuclear radiological standards meet international standards, and while, obviously, whether people relocated is a national decision of Ukraine, I would assume that they are following international standards for exposure and the like.

Mr. SMITH. And, finally, has the Department tried to glean lessons that could be learned in case a dirty bomb or a nuclear device is detonated? Are we looking at this as a case study so that lessons could be learned for everyone on what to do, particularly in the first days? My understanding was for approximately 10 days the veil of secrecy certainly hurt efforts to evacuate, and I don't think western bureaucracies would have that problem; people would be out as quickly as we could get them out. But has there been any looking at this from the standpoint of what can we learn on how to deal with this issue should Al Queda or someone else go that route?

Sec. RADEMAKER. The answer is, yes, experts have looked at it and tried to draw lessons, I think, particularly about how the dispersal occurs of radioactivity, because this is the closest thing we've seen to a dirty bomb type incident.

Mr. SMITH. All right. I want to thank you for your testimony, and look forward to the information that you'll provide to the Commission for the record, particularly as it relates to the HHS question. So if you would get back to us as soon as you can. And it's always great to see you.

Sec. RADEMAKER. Again, Mr. Chairman, thank you for having us, and we're glad to be able to participate in this very important event, because it is a very sad anniversary and much sadder, obviously, for the people of the affected region, but I think it's appropriate that we take time here to commemorate what happened and to review what we've done to try and address the problem.

Mr. SMITH. Thank you so much. Take care.

Let me invite our second panelist, if he would make his way to the witness table, and we're very, very delighted to have Ambassador Oleh Shamshur, who has been Ukraine's Ambassador to the United States since January 13 of this year.

A career diplomat of foreign affairs of Ukraine, he has served as Minister Consul at Ukraine's embassy to the Benelux countries, head of the ministry's European Union Department and most recently as Deputy Minister of Foreign Affairs. Ambassador Shamshur has also served as Deputy Chairman of the State Committee for Nationalities and Migration of the Ukraine and as the consul of Ukraine's Permanent Mission of Ukraine to the U.N.

He holds a Ph.D. in history from the University of Kyiv, and I'd like to thank him and congratulate him and Ukraine on the recent parliamentary elections, which were the first of any in the non-Baltic former Soviet states to be deemed free and fair by the OSCE, which had large numbers of election monitors, including staff members of our Commission who were there. The elections were a milestone in Ukraine's democratic development and underscore the democratic gains made since the Orange Revolution. So congratulations on that free and fair election. That's what it's all about.

Mr. Ambassador, the floor is yours.

#### **H.E. OLEH SHAMSHUR, AMBASSADOR OF UKRAINE TO THE UNITED STATES**

Amb. SHAMSHUR. Thank you, Mr. Chairman.

Mr. Chairman, ladies and gentlemen, I would like to start with expressing my deep appreciation to you, Mr. Chairman, and members of the Commission for convening these hearings and inviting me to testify at them. I feel extremely honored to address the U.S. Helsinki Commission, recognized internationally for being a distinct, respected and reliable voice in defense of human rights.

In relation to the 30 years of the U.S. Helsinki Commission and 20 years of the Chornobyl disaster, it nearly coincides in time, we think, to focus two inseparable dimensions of human existence: Freedom and the right to life. Chornobyl was not only an incredible accident and the greatest man-made technological disaster, there was much more about the Chornobyl catastrophe. This has become a frightening reminder of the awesome human cost measured in

lives and life-threatening health problems, of the lack of freedom, democratic procedures, civic control and transparency.

The plain and awful fact is that the biggest lethal catastrophe in human history was kept secret from ordinary citizens who were massively exposed to radiation exceeding the maximum acceptable level by 100 times. During the critical period after the explosion, while evacuating the local population from the direct neighborhood of the nuclear power station, the Soviet government let millions of people in Ukraine, Belarus, and Russia conduct their daily lives as usual, unaware, unwarned, unprotected.

The first four days after the disaster, people in Kyiv and dozens of other cities were urged to go outdoors to celebrate May Day, an official Soviet holiday. Those moments when the radiation cloud was reaching Sweden, when West Europeans were called to restraint from buying fruit and letting children play outside, in Ukraine parents carried their kids to the festivities. By early May, millions of people, including children, received unthinkable amounts of radiation as the volume of radioactive materials released into the atmosphere exceeded Hiroshima by 400 times.

As a representative of the Ukrainian Government, I am asking you to join the people in Ukraine in commemorating one of the saddest anniversaries in my country's history by, first and foremost, paying tribute to the victims of Chornobyl, both civilians and those heroes who unselfishly sacrificed their lives to tame the nuclear monster.

Scores of people were doomed and suffered a painful death in the following days, months, and years. Many more are still struggling with the health problems rooted in those tragic events, including such serious ones as thyroid and breast cancers and other tumors. Lives of millions are put at risk. Experts and humankind are yet to comprehend and assess the full scope of the hazardous consequences of the nuclear devastation, including continuous exposure to radiation of such magnitude.

About 5 million were directly affected by the explosion; 2.6 million of them Ukrainians, almost half of them children. Over half a million inhabitants of Ukraine who were affected by the Chornobyl accident died between 1987 to 2004. Thirty-five thousand of them are the so-called liquidators, those brave men and women who paid with their health and eventually lives to put out the fire in the unit four of the station, evacuate local personnel and their families, bury the radioactive waste and create what we call now Shelter One or sarcophagus over Chornobyl's "ground zero".

Six thousand, seven hundred and sixty-nine children died of horrible diseases caused by the calamity, including thyroid and other cancers. Ten thousand square kilometers of once fertile and flourishing land remains radiation polluted, as well as 2,218 Ukrainian townships and settlements.

By 2015, the financial expenditures of the Ukrainian Government in coping with the Chornobyl-related problems will amount to \$170 billion. The burden of the Chornobyl expenses is enormous. Situation, however, can further deteriorate as the new problems require the utmost urgency. This is the problem that may have European and global repercussions as the current confinement, or Shelter One, or the ill-fated reactor No. 4 cannot hold out for much

longer. It has to be replaced by more solid and safer construction without any further delays.

What they're facing is the stark reality of 200 tons of highly radioactive and melting substances separated from the rest of the world by the precarious construction which possesses the label, "deadly hazard".

Let me remind you that only 3 percent of the reactor fuel was released into atmosphere 20 years ago. The rest of it still represents the most horrible explosive device undermining the safety of the whole of Europe.

Ladies and gentlemen, today there was already mentioned the Chornobyl Forum and findings issued in 2005. So those findings in fact alleged that some estimates of the Chornobyl aftermath were exaggerated and evidence directly relating radiation to the growing number of children and adult cancers in the affected regions were sometimes lacking or unreliable.

Earlier, I had mentioned officials statistics issued by the Ukrainian Government. I firmly believe they're convincing enough to give the idea of real scope and gravity of the situation generated by Chornobyl disaster. I'd like also to stress a fact that is sometimes neglected, and we should be aware of the period of, so-called, health life of radioactive strontium, for example, released in the atmosphere in 1986 is 90 years.

Therefore, however scary it might sound, the full story has not been told yet. The greatest implications of the catastrophe might be still ahead for Ukraine and other nations. We should be well prepared to face this eventuality.

The price Ukraine has paid for the lies, hypocrisy and greed of the Soviet regime at the demise by Chornobyl and its aftermath has been enormous. What we need now is assistance in addressing two very concrete and urgent problems: Building new reliable Shelter. Taking this opportunity, I'm asking the distinguished members of the Commission to weigh in their political authority to call upon all G-8 members and other countries concerned to follow the example of the U.S. Government and to make other good financial contributions making possible of the erection of Shelter Two.

The construction costs are estimated at slightly over 1 billion U.S. dollars, representing a rather modest amount of money compared to the damages which 200 tons of highly radiated waste still glowing underneath the corroded Shelter One that one might incur. We also urge all the signatories of the Ottawa Memorandum to honor their obligations concerning compensation of the losses suffered by Ukraine due to the decommissioning of the Chornobyl nuclear power station.

Second, and this is our second priority, not in terms of placing but simply mentioning, is meeting the health needs of the innocent children suffering from hazardous effects of Chornobyl. We deeply appreciate the work done in this respect by the members of the U.S. Congress, such as Co-Chairman Chris Smith and Representative Lincoln Diaz-Balart. It was largely due to Mr. Balart's efforts that one of the biggest humanitarian airlifts organized by the Children of Chornobyl Fund arrived in Ukraine for the benefit of Chornobyl-affected children.

I know that more projects are in preparation, and I am deeply thankful for them to our American partners.

I strongly believe that our two countries, Ukraine and the United States, will stand united in facing the challenges and preventing any nuclear tragedies that might be caused by the consequences of a disaster that happened 20 years ago but remain so present in our lives. Thank you.

Mr. SMITH. Thank you so much, Mr. Ambassador.

We're joined by Commissioner Cardin.

Mr. Cardin, do you have any opening comments?

Mr. CARDIN. Thank you. I'll just put my statement in the record and allow us to continue with the exchange.

Mr. SMITH. Mr. Ambassador, if I could just ask a few questions to you. How would you assess the international assistance so far? Has it been adequate? Has there been enough support from the United States, Europe, Russia, for example? My understanding is that Presidents Yushchenko and Putin held discussions recently that included Chornobyl. Is there any insights that you might be able to provide us as to what came out of those discussions with Putin and Yushchenko?

Amb. SHAMSHUR. Thank you, Mr. Chairman. Actually, I think that from the very beginning it was clear for everyone that the sheer scope and seriousness of the disaster represents the challenge that cannot be addressed by Ukraine only. We are thankful and satisfied for the assistance we have gotten so far from the international community to mitigate the adverse consequences of Chornobyl disaster, especially in the field of health care.

However, a lot of problems have not been resolved. I mentioned already the most pressing of them, again related to health care and especially the Shelter. As for the latter, I should recognize that only recently when the urgency of the problem has come to the fore of everybody's attention, international donors have become more active and more forthcoming. So we hold that all donors will honor their obligations, making it possible to construct a new safe shelter.

We think that assistance should become more comprehensive. It should include a health protection shelter implementation plan, assistance in construction of nuclear waste depository and spent fuel storages.

I mentioned already our hope that all those who signed the Ottawa Memorandum will also honor their obligations.

Definitely one area we are looking also for international assistance and cooperation is in the scientific research related to Chornobyl and its aftermath. For example, our president has put forward the idea of creating an international nuclear research center to study all aspects of Chornobyl aftermath.

As far as the issue of Russian involvement is concerned, I would like to stress what you mentioned that indeed on April 19 there was a telephone conversation with President Putin and President Yushchenko. They discussed Chornobyl issues, also within the context of G-8. Unfortunately, I am unaware of any practical results, but we hope that specific arrangements and discussions will follow. Thank you.

Mr. SMITH. Let me ask you, as you know, ionizing radiation is known to cause infertility, birth defects, cancer, and pregnancy

losses. In studies in birth defect surveillance in Ukraine, initiated by medical geneticist, Dr. William Wertelecki, of the University of Southern Alabama, with the cooperation of USAID, has shown elevated frequencies of spina bifida and other neural tube defects.

Just parenthetically, I serve as the co-chair of the Spina Bifida Caucus here in the Congress, and one of the most surefire ways of preventing spina bifida while the child is still in utero is, as you know, folic acid, of having a sufficient amount of folic acid in the diet of the mother.

And I'm wondering if any efforts or any initiatives are planned by the Ukrainian Government, particularly in northwest Ukraine where this is a real problem, obviously, in and around the contaminated area, to get folic acid, whether it be through flour or some other way to those who are bearing children.

Amb. SHAMSHUR. At this stage, I can only say that we highly appreciate efforts by Dr. Wertelecki and his colleagues to start with such a program. We also hope that we will see a productive cooperation of him and his colleagues with the Ministry of Council of Ukraine. What we can definitely promise that this embassy will make everything possible to facilitate this kind of cooperation.

Mr. SMITH. Can I just ask you, having read the report, the Chernobyl Forum, and other reports that seem to have contradictory conclusions as to how many people may die, the Greenpeace report suggested a figure of 90,000. This U.N. report puts it at 4,000, although it admits that there's no way to know the exact number, and I think that's a proven course to take because there are so many unknown variables.

I'm just wondering where the Government of Ukraine comes down. Do you have a sense of what—I mean, as one of the partners in this report, do you agree with its findings or—

Amb. SHAMSHUR. Well, actually, I would say that our response to the figures is the figures which were issued officially by the Ukrainian Government. I already mentioned some of them. I would just confine myself to saying that according to our estimation, from 1987 to 2004, 504,117 people who were affected by the accident of the Chernobyl nuclear disaster and who were screened by the Ministry of Health of Ukraine died. Thirty-four thousand four hundred ninety-nine of them were liquidators, and almost 7,000 were children.

These are the figures which are available for Ukrainian Government and These are the figures which we issued officially.

Mr. SMITH. Let me just ask you with regards to the radioactive debris, where is that being buried? Is it in the exclusion zone? Is it being contained onsite or is it being sent somewhere else? And I was kind of surprised to find that some 4,000 rotation workers are in the exclusion zone at any given time. Has there been any mal effects shown on them being in such proximity to radiation?

Amb. SHAMSHUR. According to my knowledge, all the debris was actually processed and decontaminated in the exclusion zone, although I should stress that Ukraine has taken over the responsibility since 1991, so I can speak authoritatively for that period, after 1991.

As for the current number of people currently working at Chernobyl nuclear power station, definitely, we need a sizable

amount of people working for decommissioning. I'm not aware of the exact figure. I can tell you only that Slavutich City, which was created specially to provide and to house a workforce for Chernobyl decommissioning, has around 30,000 inhabitants. Most of them are almost exclusively working at the Chernobyl power station.

Of course, we expect more people to be involved after we start construction of Shelter Two, but at this stage it's a bit premature to release any estimates as to the actual numbers. Of course, the numbers will be limited to the absolute necessary levels.

Mr. SMITH. Let me just ask one final question with regards to resettling or people resettling in areas that may be hot. What kind of protections are provided to them, warnings if you will, not to move back to an area that may provide a risk to them?

And with regards to lingering problems with respect to radiation in water and the environment, is there an aquifer that's in proximity to the Chernobyl disaster? Is there concern about the water supply at all?

Amb. SHAMSHUR. I think, actually, as far as the first question is concerned, I would like to say that, yes, over 1,000 people, but, again, it's a very approximate estimate, have returned to Chernobyl exclusion area. Everything has been made in order to make it impossible, although they were infiltrating the area. All warning is being done. Definitely there is a risk to their health, but it was their decision to come back. It should be noted that most were aged people who wanted to come back to the place where they were located.

As for the food chain issues are concerned, I would like to say that this now is one of the utmost priorities of the government. We have installed a rigorous system of food and water control including filters. If, again, I'd be quite honest in assessing the possible effects, I would like to mention a couple of effects.

First of all, water supply. We are very concerned about this problem. Our estimation at this stage that the polluted waters that didn't reach the water-bearing horizons, the water-bearing layers. And so in this sense we are monitoring very closely how the situation would develop, although potentially it's very serious.

So, second, at the same time we face the situation that the level of radiation in rivers is augmenting because the flaps of high water they carry some contaminated particles from the higher layers of the soil.

Then I should also say that in 440 settlements the level of radiation in meat and milk products, in dairy products and meat products exceeds accepted levels. So that's something that is being also very closely monitored and definitely products with these levels of radiation are not used. And, definitely, we are also very concerned with the accumulation of radioactive particles in the forest, in trees, berries, mushrooms, and this situation is being monitored.

On the whole, I would like to say that dangers do exist, and we remain very vigilant to take all the appropriate measures.

Mr. SMITH. I'm just a little bit perplexed about the 1,000 that moved back. Can they not be forcibly kept out for their own—

Amb. SHAMSHUR. Well, actually, you should imagine that the area is extremely vast. It's 30 kilometers in diameter, I think. And everything has been made to actually make it impossible, but as

far as in the center we have the situation of infiltration. Plus, again, in my own perception, sometimes people are so unwilling to go back and it's so emotional that it's really difficult for the law enforcement to enforce their removal.

Mr. SMITH. Where do they get their food? Do they grow it?

Amb. SHAMSHUR. Well, they grow it.

Mr. SMITH. Do they then sell it?

Amb. SHAMSHUR. Mostly, they grow it, and they put their lives at risk; it's understood.

Mr. SMITH. Do they go to market and sell what they grow?

Amb. SHAMSHUR. Actually, no. That is being prevented, and that is being controlled, but for their own consumption they use the food normally which they grow. Sometimes they have visits from their relatives, but that's something that we try to limit to the utmost extent.

Mr. SMITH. I introduced you earlier, and I do hope we can do some real follow up with Dr. Pablo Rubinstein from the New York Blood Center and the Director of the National Cord Blood Program, because there is, and I hope you can stay for the next panel, some real hope and expectation, especially for blood-related diseases, especially cancer, like leukemia, where there have been miraculous cures effectuated by the transplantation of cord blood stem cells. So there may be an area of real collaboration there for at least some of the diseases that have devastated Ukrainians and Belarusians and Russians.

And I want to just say I hope we could follow up on that and work with you on that, how sorry we all are for the great loss of life, but we stand ready in a bipartisan way to do whatever we can to be of assistance.

So, Mr. Ambassador, thank you for being here, and I'd like to yield to Mr. Cardin.

Mr. CARDIN. Mr. Ambassador, let me thank you for your testimony and leadership on this issue.

This is a week in which the world memorializes Yom Hashoah, a day of remembrance for the Holocaust. And I mention that because it took decades after the Holocaust for the world to understand what happened and the victims and the victims' families and trying to return the properties that were taken. We're still debating those issues, we're still fighting with those issues in some countries.

So now we're 60 years plus later and we're still dealing with a tragedy that never should have happened but should have been dealt with a lot sooner, and we now have another genocide taking place in Darfur. So we don't learn our lessons, unfortunately, of history.

I mention that because in Chornobyl I think, obviously, the Soviets tried to hide what happened there and that's made the effort much more difficult to deal with. And I think one of the lessons from Chornobyl is that we have to have more openness in that way in which we deal with these risk issues.

We're not trying to confront the problems, and I do believe there's now more attention to what has happened. And in your testimony you point out that we have yet to see the entire release of

the nuclear dangers, that we're still in a risk situation, a further risk to our health, and we need to take action there.

My question deals with the assistance of the world community. You pointed out that those who have signed on to the Shelter Fund you want them to comply with their commitments. I guess my question is, I know that the Russians have agreed, I think, to \$10 million in the fund, I think that's what it is, and everybody's applauding that as an acknowledgement that they need to be part of the solution. I would think the money and effort should be a lot greater than \$10 million.

In our Commission, we try to get to the facts, which countries are helping, which countries are not. So I would hope that you could give us some guidance, either today or through our work with our Commission, as to what countries have really been in the forefront, not just financially, although finances are very important, but been in the forefront to try to deal with the problems of Chernobyl, to deal with the victims of Chernobyl and to deal with the lessons of Chernobyl and which countries have not been there that should be there or which countries are not doing what they should be doing so that we can use every opportunity we have to get more international support for your efforts.

In July, Mr. Smith and I will be attending the Parliamentary Assembly of the OSCE. The Second Committee that I chair will be dealing with environmental issues, and Chernobyl will be one of the subjects that we will be dealing with, and I expect we'll come out with a resolution that will speak to Chernobyl. And I think it would be helpful for us to properly use our influence as a U.S. commission to know which countries should be doing more than is currently being done so that we can try to get more focus on the issues that you've brought to our attention.

Amb. SHAMSHUR. Thank you, Congressman. I think that at this stage for me it would be not so proper to pass judgment, but I would gladly supply you and the Commission with the data relating to the contributions and activities supported by certain donor countries, those who are involved in the implementation of the Chernobyl programs, and I presume that in this case it will be self-explanatory, in a way. So I promise to do it without any delay after this.

Mr. CARDIN. Thank you. That's a very diplomatic answer. We don't have to be quite as diplomatic on our Commission, but I understand your restraints. We have to do better.

Amb. SHAMSHUR. Yes, I absolutely agree with you. And I would be ready to supply you with this information. And I would like to stress again that I extremely appreciate the possibility to be with you today and trying to answer your questions and enlarge the knowledge on the most pressing problems related to Chernobyl.

What I can repeat again is that we are very happy with the level of cooperation we have with the United States with implementation of Chernobyl programs. And what is also very important is that we have a very good synergy of efforts on the part of the Federal Government, local authorities and non-governmental organizations, counting also as partners the Ukrainian Government and the Ukrainian non-government organizations.

Mr. CARDIN. Well, we also hope that you're having help from your European friends. I guess that's our concern. I'm very happy that our government and our Congress is responding, as I would want them to do and would urge them to do and we'll be part of making that happen, but I'm interested as to how Europe is responding and how Russia is responding, because, it seems to me, they have more direct effect from what happened in Chornobyl but we all have that responsibility to make sure that the victims are cared for and are put at lower risk than they currently are and that we deal with the lessons of Chornobyl.

So I'm very interested as to how your European neighbors are working with you to help in this issue.

Amb. SHAMSHUR. Thank you. Actually, we have continuous cooperation with the European Union, although I would say that the involvement of different countries is definitely different, and, as promised, I will provide you with our assessment.

Mr. CARDIN. Thank you.

Mr. SMITH. Thank you.

Mr. Ambassador, thank you so much for your testimony. We look forward to working with you going forward, and thank you to your associates.

Amb. SHAMSHUR. Thank you very much.

Mr. SMITH. I'd like to now invite our third panel, beginning with Dr. David R. Marples, who is the Professor of History and Director of the Stasiuk Program on Contemporary Ukraine, at the Canadian Institute of Ukrainian Studies, University of Alberta. He is the author of 10 books, including three on Chornobyl, with others on Stalinism and Ukraine, contemporary Belarus and the collapse of the Soviet Union.

At the University of Alberta, Professor Marples was awarded the J. Gordin Kaplan Award for Excellence in Research in 2003 and a Killam annual professorship in 2005 and 2006.

We will then hear from Dr. Pablo Rubinstein, who is Director of the National Cord Blood Program for the New York Blood Center. Dr. Rubinstein was born, educated, and trained in Chile as a physician and surgeon. He specializes in the field of immunogenetics, the structure of the function of the genes regulating immunoresponses, their relationship to transplantation and association with disease.

He is the head of the laboratory immunogenetics of the Lindsley F. Kimball Research Institute of the New York Blood Center and is clinical professor of pathology at the College of Physicians and Surgeons, Columbia University.

Dr. Rubinstein is the author of over 200 papers in the field of immunogenetics.

We will then hear from Kathleen Ryan, the Executive Director of the Chornobyl Children's Project International. Kathy Ryan has over 15 years experience as a business executive and as a consultant to nonprofit organizations. She spent 11 years at America Online where she served in increasingly senior management positions.

After leaving America Online, Kathy decided to put her business skills to work for non-profits that she truly believed in. She consulted with the Frank Foundation, an humanitarian organization dedicated to the neediest children of the former USSR, Vital Voices

Global Partnership, which offers training and support to women in emerging democracies, and the AOL-Time Warner Foundation.

Dr. Marples, if you could begin.

**DR. DAVID MARPLES, Ph.D., PROFESSOR OF HISTORY, DIRECTOR, STASIUK PROGRAM ON CONTEMPORARY UKRAINE, CANADIAN INSTITUTE OF UKRAINIAN STUDIES, UNIVERSITY OF ALBERTA**

Dr. MARPLES. Thank you. First of all, thank you very much for inviting me to this hearing. It's a pleasure to be dealing again with the Helsinki Commission. Sometimes I feel like I ought to be an honorary American. Only a month ago I was testifying at the State Department on the elections in Belarus.

Rather than look at the history of this accident, which I'm quite happy to do in the questions that follow, I'd like to go over my prepared statement and focus this time more on Belarus than Ukraine, because I think most of the attention so far has been on Ukraine.

As the 20th anniversary of Chernobyl approaches in Belarus and the opposition forces plan a protest march on April 26 in the aftermath of the presidential elections, there is no sign that the country has come close to overcoming the profound health, social and environmental problems caused by the nuclear accident.

I think the issue is being clouded by two factors. First, there's the politicization of Chernobyl as a symbol of a confrontation between the president and the opposition, particularly the United Democratic Forces behind candidate Alexander Milinkevich. And, second, there's a rather unseemly international dispute as to the health effects of Chernobyl and particularly the long-term mortality rates from radiation-induced cancer.

President Lukashenko marked the previous two anniversaries with visits to the Chernobyl zone, which were marked with intensive TV publicity and the overall message that if the Chernobyl zone was really dangerous, the president of Belarus would not be visiting.

Though parts of the zone, especially the region of Homyel, have been depopulated, students and migrants are being used currently to cultivate land that remains contaminated with radionuclides, particularly cesium-137 and strontium-90.

The president has even detained several scientists whose findings contradict the official position that the accident in Belarus has been largely overcome and he's claimed that he uses the forces of his own government to deal with Chernobyl, and there's been no outside assistance.

I think when Kathy testifies you'll realize that that is not true.

The Government of Belarus did not agree with some of the findings of the Chernobyl Forum report issued in September 2005. About 90 percent of the republic was irradiated with short-lived radionuclides deposited by the radiation cloud formed after the two steam explosions at the fourth reactor of Chernobyl. The reaction of the republican authorities was then delayed by the lack of information about what had happened from both the Soviet authorities in Moscow and the Ukrainian party leadership in Kyiv and at Chernobyl itself.

The radioactive iodine, iodine-131, with a half-life of 8 days, has taken a serious toll and has resulted in some 4,000 cases of thyroid gland cancer to date; over 9,000 cases if one includes Ukraine and Russia, almost a quarter of them in young children and in most instances contracted after 1989.

Long-term effects were equally serious. Over the 17-year period, from 1986–2003, surgery has been carried out in almost 2,000 young adults and children. Nineteen so far have died as a result of tumor progression. About 23 percent of Belarus was contaminated with cesium and strontium and about 2 percent of the territory by plutonium radionuclides with a half-life of 24,000 years.

And many of the affected regions did not take any preventive action until 1989 when the Soviet authorities suddenly revealed that the fallout area from Chornobyl was much wider than originally thought. Belarus has also lost about a quarter of its valuable forest to contamination.

Today, about 1.5 million people in Belarus are provided with medical assistance as a result of the 1986 disaster. That's out of a population of approximately 9.7 million. Among those that took part in the cleanup operations from Belarus, the so-called liquidators, there have been registered more than 2,800 first-time cases, and in 73 percent of these incidents, it was among people working in the zone in the first two years.

Over 300,000 children continue to reside in the most affected regions of Homyel and Mahilyow. They suffer from a rising frequency of sicknesses of all types but especially respiratory diseases, digestive problems and childhood diabetes. Among the age group 10 to 14, for example, newly formed cancers in the Chornobyl zones exceed those in the clean region, northern part of Vitsebsk, by 1.5 times, and the incidence of endocrinopathology is double the average of the clean areas.

And it's in the aftermath of this picture that there's this international dispute over the true health effects of Chornobyl. There are two extant reports: The Chornobyl Forum report, which you've referred to previously, and the Greenpeace report, more recently released. And the Greenpeace report raises the number of long-term victims to over 90,000 and cites the Ukrainian figure of nearly 34,000 deaths among liquidators.

I think in fairness this controversy is somewhat contrived. There's a great difference between the contents of the Chornobyl Forum report and the press releases that were issued afterward. The press release was the one that gave the figure of the 4,000 long-term deaths. It's based on a single table in that report, and even that table does not add up to 4,000 deaths; it adds up to more than 9,000 deaths. And then, again, even if one takes that figure of 9,000 deaths, one is talking about only a small fraction of the lands contaminated by Chornobyl, namely the Republics of Russia, Ukraine, and Belarus.

It would be a great underestimate to only consider those countries as being the ones affected by Chornobyl. Virtually all of Europe was contaminated by Chornobyl. Most European countries and several other republics in the former Soviet Union have had to deal with the long-term effects, particularly southern Germany, parts of Scandinavia, Greece, and others.

In other words, neither report really disputes that Chornobyl-linked cancer from radiation will be ultimately in the tens of thousands. The Belarus government, which is listed as one of the authors of the foreign report, might have been content with a misleading press report, but it is not happy with the figures released subsequently from Greenpeace and other sources.

And for the 1.5 million people still requiring medical attention from the disaster in Belarus, these arguments are largely irrelevant. Most of them have lived on contaminated land for the past 20 years, the Chornobyl benefits have now been reduced to almost nothing, and their concerns have been simply dismissed as owing to psychological stress and dependency. So I believe that the impact of Chornobyl after two decades has hardly dissipated at all.

Thank you.

Mr. SMITH. Thank you so very much.

Dr. Rubinstein?

**DR. PABLO RUBINSTEIN, M.D., DIRECTOR, NATIONAL CORD  
BLOOD PROGRAM, NEW YORK BLOOD CENTER**

Dr. RUBINSTEIN. Good afternoon. Thank you very much for the opportunity to be here and listen to this eloquent testimony already pronounced and to words of our co-chairman, Mr. Smith.

The aspect of the problem that I will discuss, which is much more fully presented in my written comments at that part of the record, refers purely to the opportunity to help some of the victims in the deterministic or acute immediate phase of the treatment of patients—better call them victims—of high-dose radiation exposure.

Radiation in high doses is very well known as a bad thing to happen to humans. It produces acute effects in the changing of the structure of the nucleic acid in cells all over the body. Different tissues have different susceptibilities so that a given dose may be much more harmful to one tissue than others. And, in particular, the blood and immune systems are highly sensitive to radiation so that lethal doses can be present relatively quickly with doses of radiation very widely available to victims of the Chornobyl accident.

In general, from studying the relation between dose and biological effects of radiation, one can make three overall roughly defined zones. There's a low zone in which any consequences are reasonably quickly overcome and patients can return to normal life, essentially, in good condition.

A higher dose may reach the level at which the blood and immune system stem cells are hurt, and in many cases this hurt is irreversible. As a consequence, those patients will die, and if they are provided with a transplanted solution, a transplant of stem cell donated by someone else, the overdose, there is a region at which some of the stem cells remain and doses of radiation where most of the cells are killed but some remain.

There is hope that administering to those patients what we call cell factors, chemicals that stimulate the multiplication and reproduction and differentiation of stem cells, their future may be improved. These drugs have been used after Chornobyl in radiation accidents that occurred in Brazil and Japan, and they have proven

of some help, but still there is that range of radiation at which the only solution so far is a stem cell transplant.

And that is the nature of the activities that are being pursued by our institution and many others who have developed subsequently around the world. And this is the obtaining of stem cells from the blood that is left in the placenta and the cord after the birth of children. This blood contains very high numbers of blood and immune system stem cells. We call them hematopoietic from the Greek word that means, "formation of blood."

These cells from the placenta are similar to the cells that are in the bone marrow and normally are responsible for the production of our blood cells and our immune system cells.

And they can be used very effectively in transplantation for three very specific reasons that make them superior for this effort than the alternative sources of stem cells, which are coming from the bone marrow, either directly by surgical extraction from the bone marrow or indirectly by promoting these bone marrow cells to go into the circulation, into the blood of the donor and where they can be withdrawn with the proper technology today.

But to come back to the stem cells of the cord blood, there are three major reasons why these cells are preferable, and they are particularly preferable in the situation of an emergency of the type of Chernobyl but hopefully we will never have to deal with a situation of that type again.

The nature of things being what they are, this possibility cannot be discounted, and it is important to be aware of the existence of this resource which in our country has been solidified under the leadership of our chairman. Mr. Smith was the sponsor of legislation in the U.S. Government, which has gone into the law of the country, which establishes a mechanism for the formation of a national inventory of cord blood stem cells that will be stored frozen ready for use in either civilian or in the possibility of accident or event of this type.

The three major advantages of this type of stem cells, first of all, is a logistic advantage. These cells are ready to use. All of their characteristics are stored in computers. It is easy and fast to make these cells available to patients within days. With the other sources, you have first to find the donors, and once you find the donors you have to be able to bring them to a place where the cells can be extracted. None of this is necessary with cord blood.

The second reason, a major reason, is that the new cells in the cord blood are immunologically less developed, less powerful, less potent for the rejection of tissue from other human beings. And it is understandable that they be so because they are in a biological situation where they are exposed to another human being, a different one, the mother, all the time. So they have to have some mechanism for adaptation to this conviviality, if you will, between the baby and the mother.

And the third reason is that because of these lower immune reactivity, these cells can be administered to patients that are not completely matched. So it is not necessary to achieve the very high degree of matching that is necessary with bone marrow or peripheral [inaudible] collected stem cells to prevent the development of a

complication of transplantation, which is difficult in itself, and that can be lethal.

So because of these advantages, cord blood provides a wonderfully effective potential release of life sentence to patients.

I find that I need to mention some additional factors. Having the tools for achieving good results in the transplant is not enough. You have to actually be able to perform this transplant, and the number of victims that can accrue after an accident, even one of smaller scale than Chornobyl, can easily overwhelm our current ability in transplant centers around this country, which has more than any other country compared to the population. It's still not enough.

Even if all of the transplant centers were to be commandeered into the effort to treat patients from one such event, it would not be enough, and I think there is a big challenge for the medical establishment in this country and other developed countries to come to grips with what should be done nationally and internationally to take care of the aftermath of the situation of this type.

Thank you very much.

Mr. SMITH. Thank you, Dr. Rubinstein. Thank you so much.

Ms. Ryan?

**KATHLEEN RYAN, EXECUTIVE DIRECTOR, USA, CHERNOBYL CHILDREN'S PROJECT INTERNATIONAL**

Ms. RYAN. Thank you, Mr. Chairman.

Chernobyl Children's Project International, a partnership between citizens of the United States and Ireland, has worked with Chornobyl survivors in Belarus for 15 years. We are a largely volunteer organization. Professionals who give up vacations and raise their own funds to travel and donate their time are the backbone of our work.

We've delivered over \$70 million in humanitarian and medical aid, all of it privately funded. Working with NGOs, medical facilities and citizens in Belarus, we provide life-saving children's cardiac surgeries, community care programs for disabled children and their families, nursing and therapeutic programs and training, officer homes and hospice services for the most seriously ill children.

The Government of Belarus reports that it spends 10 to 20 percent of its annual budget responding to the Chornobyl aftermath and estimates that the total cost of dealing with the disaster will be \$235 billion. But economic statistics don't begin to scratch the surface of how Chornobyl continues to affect the daily lives of families in Belarus.

I returned only days ago from the international Chornobyl conference at the Palace of the Republic in Minsk. On day one, 25 speakers in a row stepped forward with their statements. I'm proud to say that as the politicians and policymakers talked about Chornobyl, Chernobyl Children's Project International volunteers were on the ground delivering \$3.5 million of privately funded medical and humanitarian aid to the most remote regions of Belarus, performing heart surgeries on children in Minsk and working with severely mentally and physically disabled children in southwest Belarus.

Leaving the conference to visit poor families in the concrete jungles of the cities and the villages far from Minsk, I was once again struck by the contrast and how it is for words ringing in a grand hall to truly convey how Chernobyl continues to affect the lives of so many.

Today, in Belarus, 20 percent of the territory is contaminated by radiation and cannot be occupied and farmed. One and a half million people, 15 percent of the population, continue to live in contaminated zones. Over 420,000 of them are children. These are people who grow and gather what they eat, who in rural areas heat their homes with contaminated heat and wood and have done so for two decades. Perhaps we can better appreciate these numbers by imagining that 45 million U.S. citizens had been exposed to radiation every single day for 20 years. How would we respond?

I submit my testimony without the authority of a doctor, historian, or scientist. I can only speak of the representative, one of a number of NGOs who worked hands on in Belarus and who have first-hand knowledge of the communities we serve.

The link between the dramatic increases in thyroid cancer and Chernobyl has finally been widely acknowledged, but thyroid cancer is only one of many health problems we see in Chernobyl communities. Our colleagues in Belarus and Ukraine observed increases in non-thyroid cancers and birth defects, cardiac and immune disorders, childhood diabetes and chronic respiratory and digestive illnesses since 1986.

I could go on, and Professor Marples has covered this point, but many experts fear that given the latency period, the worst is yet to come.

Countless stories of terrible suffering and fear are behind these statistics which I quote not as a scientist but because they are consistent with our observations on the ground. Are these health problems the result of radiation or of something else? Reputable scientists and researchers disagree and so sharply that this in itself should make us stop and think and recognize that it will take time before we fully understand the effects of radiation on health.

We must remain vigilant, keep our minds open to what we hear from the affected regions, continue research and not lose the important opportunity to develop screening and early intervention programs that are so important.

My organization isn't in a position to debate or defend statistics; we have to stay focused on responding to what we see in the field. As we examine the continuing impact of Chernobyl, we have to think beyond how radiation affects human health.

We've heard about the Chernobyl Forum report of the U.N. at this hearing, and we're skeptical of the reassuring health findings announced in the media only because they're in such sharp contrast to what we hear and see on the ground. At the same time, we welcome the report's important analysis of the many social, medical, economic and environmental factors that contribute to suffering in Chernobyl regions.

Chernobyl released not only radiation but a series of events, such as massive relocations, that were closely followed by the immense social, economic and cultural changes of the collapse of the Soviet Union. When we work with Chernobyl survivors, we must address

all factors that affect the quality of life in the communities where we work, whether health, poverty, lack of opportunity or fear.

I don't agree with those who say that the worst public health issues emerging from Chernobyl are psychological, but we can't ignore this issue, and I can personally attest to the psychological impact of Chernobyl in the communities I've visited, particularly among the thousands of dislocated families and those who live in contaminated territories.

In hospitals and villages throughout Belarus, I've met women who are afraid to bear children or to breast feed and countless families who struggle not only with poverty but with alcohol addiction, chronic health problems, confusion about how to protect their health and despair for their children's futures.

In many villages and city apartments, it is the rule and not the exception to see extended families held together by an elderly grandmother or a single parent. Lack of the most basic community support services leads many families to abandon their children to orphanages. The rate has doubled since 1990.

We believe that the most important programs we can support will be the ones that we develop in partnership with the communities we serve and that provide the hope and the means to keep families together to provide alternatives to institutionalization.

The international community plays an important role in improving the health and living conditions of Chernobyl survivors. We applaud the World Bank's recent approval of a \$50 million loan to Belarus to provide an energy infrastructure to homes, schools, hospitals and orphanages that now use ancient systems and burn contaminated heat and wood. I've personally visited dozens of village families raising children inside sooty, moldy, suffocating homes, and I've slept in cold, damp orphanages.

This program and others like it are important because they will provide long-term improvements to quality of life and health. We need to support these programs but also recognize that Chernobyl survivors have immediate needs, and lives can be saved today through intervention, especially intervention with children and expectant mothers, early detection and programs such as UNICEF's call for salt iodization in central and eastern Europe.

At the same time, we need to invest in research to better understand the effects of radiation on human health.

After the 20th anniversary of Chernobyl has passed, Chernobyl Children's Project International will continue our mission to provide long-term hope and to alleviate today's suffering caused by Chernobyl. We are not alone in our response. The International Red Cross has screened over 600,000 children for early signs of thyroid cancer in Belarus and Ukraine. Last week, Chernobyl Children's Project International donated a mobile thyroid monitoring clinic to support their important work. Our cardiac program partners, the International Children's Heart Foundation, saves almost 100 young lives a year in Belarus and thousands more all over the world while providing training for local physicians.

Children of Chernobyl Relief and Development Fund is internationally recognized for their work with hospitals in Ukraine, and this week their airlift in partnership with the U.S. State Department delivered over \$2 million worth of vital medications and

health care equipment. This coming Friday, City Hope International, also working with the State Department, will land a medical airlift in Belarus containing \$4.5 million in pharmaceutical and medical supplies.

As we approach the 20th anniversary of Chornobyl, we cannot forget the people who survived this disaster, followed by a profound political, social and economic upheaval that was not of their making. At the same time, we can't forget the lessons of Chornobyl and how it reminds us of the delicate balance between technology, nature and human life and the knowledge that our choices, whatever they may be, have a price.

I know I speak for most Americans when I express the hope that our future energy decisions will place the highest priority on safety and security.

Thank you.

Mr. SMITH. Thank you so very much, and thank you for the extraordinary work you're doing on behalf of the children of the Chornobyl disaster.

Let me ask, if I could, a couple of questions.

First, to Dr. Rubinstein. To the best of your knowledge, has the Ukrainian or the Belarusian Government or anyone involved in the provision of health care to those who are suffering the aftermath of Chornobyl been provided cord blood stem cell transplantations?

Dr. RUBINSTEIN. No, sir. I am unaware of any instances in which that has happened for the victims of the Chornobyl accident. However, one must recognize that the acute phase was very short and that now we are in a phase after the accident in which it is very difficult to attribute precisely a case of leukemia to either the aftermath or a case that would have developed spontaneously, which is one of the problems, I suppose, in the evaluation of the magnitude of the effect.

Mr. SMITH. But if someone is suffering from leukemia, regardless of its genesis, it seems to me that if the provision of cord blood stem cell transplantation remains available, it might have a healing and curing effect upon them.

I would note that there was a study commissioned by the U.S. Office of Naval Research that found that Ukrainian children in two of the surveys had twice the rate of acute lymphoblastic leukemia as children in areas that were spared Chornobyl's fallout. Then there's a Harvard Medical School study that found that children in Greece who were in utero at the time in Chornobyl actually then had twice the risk of developing leukemia.

So it would seem that there is a spike of leukemia, at least you could infer that from this information. And I remember meeting, I think it was one of your patients, Stephen Sprague, who was late into his leukemia disease, who was cured with a transplant.

Dr. RUBINSTEIN. Absolutely. In fact, I didn't mean to introduce any doubt in the relationship between radiation exposure and the risk to develop leukemia. That has been established, I think, conclusively and definitively. There's no question about it.

The infrastructure that is necessary to do bone marrow transplantation or cord transplantation is important, and the facilities in these regions exist but they are mostly circumscribe to large cities. As we have heard, many of the victims are outside.

And I regret that we have been still unable to develop procedures that are easy and fast and easily available. But the authorities in Ukraine have been active in investigating the possibility of establishing cord blood banks. This has happened. I'm not sure to what extent these have succeeded yet.

Mr. SMITH. That's something that we'll look into as well, and I hope, Mr. Ambassador, you could work with us in trying to follow up on that.

Mr. Marples, your number of 1.5 million residents of Belarus getting medical assistance as a result of Chernobyl, could you elaborate on that a bit? I mean, that is an astonishingly high number, and that is current day, today.

Dr. MARPLES. Yes. Yes. That's the current picture. It means a number of things. It doesn't necessarily mean all these people are ill, but it does mean that they're potentially at risk from various things. Most often these days the biggest danger from radiation is in the ground leaking contaminated products. And many of these regions are fairly remote. There are a number of large cities around, but most of them are fairly remote regions, and there's often very little alternative to doing that. These people are not really wealthy enough to choose where they get their food.

Mr. SMITH. Going back to Dr. Rubinstein, if I could just ask you, would the transfusion of one, two or more cord blood units into a radiation victim improve his or her chances of survival?

Dr. RUBINSTEIN. That's a remarkably astute question, Mr. Smith. It is one of the issues with cord blood and other sources of stem cells, but there is a dose relationship between the number of cells administered and the success of the treatment.

With cord blood, because of the immunological features that we discussed earlier, it is possible to administer several units of cord blood at the same time so that we can in fact provide adults with a sufficient dose of cells. And this has been proven to improve the overall outcome of these transplants. There is data in our country in the treatment of leukemia that shows that providing several units at the same time enhanced the ability of the treatment to work for patients with leukemia, in particular acute leukemia. This is the type that most frequently follows from radiation exposure.

Mr. SMITH. Let me just ask you, one of the arguments that we made in pushing our legislation was that in addition to the benefits derived from a cord blood transplantation for blood-related diseases and upwards of 67 other diseases as well that the potential to absorb potency exists for cord blood stem cells, that they can be coaxed into becoming just about anything in the body. Do you see this as holding any hope for some of these other victims?

One of the things that I heard from our witnesses was that the latency period the worst may yet be coming, notwithstanding the soothing words or what this U.N. report seems to tamper down concerns, at least if you read it. That's the sense I got, that there's been more exaggeration than not and that the numbers are lower than we expected. But if there is a latency period that's much longer, there could be many other radiologically induced diseases, cancers, that might be helped with a cord blood transplantation.

Dr. RUBINSTEIN. Yes, Mr. Chairman. It is in fact true that cells have been developed in the laboratory from old blood stem cells but

are not blood cells, and these include cells of the nerve tissue as well as bone, endocrine tissue, liver, skin and others. And so, considerably, it will be possible to transfer these developments from the laboratory to the clinic in the very near future. Many institutions in this country and abroad and in Europe, including the former Soviet Union countries, are investigating activity in this area, and it is being recognized at the moment as one of future utility.

And we have heard in the testimony today that there is a significant increase in the frequency of endocrine abnormalities in children, particularly in these areas. And so this is one of the areas in which cord blood development may well help ourselves involved as a blood center in an effort in this area. We hope that perhaps this will come to fruition before the major onslaught of late complications of the Chernobyl accident occur.

Mr. SMITH. Let me ask the 90,000 figure cited by Greenpeace, how accurate do you believe that figure to be? Is it based on good science or how did they come to that conclusion?

Dr. MARPLES. The Greenpeace report is largely based on scientific findings from Ukraine. I mean, it's a bit of a simplification because scientists from other republics were consulted, but I think most of those scientists were from Ukraine. And, therefore, it has a certain relevance, I think, to Ukraine rather than the other republics.

I thought the Greenpeace report was reasonably good. It wasn't as comprehensive as the other reports, and my fear about it is that it may have been released simply to counter the other report, which sometimes means that the report is together rather quickly. And to be perfectly frank, that was my overall impression of the Greenpeace, that it was kind of thrown together a little bit with different reports from other people rather than a comprehensive picture. If you read it today, I presume you did, it is rather hard to follow.

Whereas the Chernobyl Forum report was much better put together, but, as I mentioned, I felt that the conclusions that were released officially did not reflect the basis of the report. I think that's fair to say, and I will be very surprised if the 100 scientists who worked on that report were very satisfied with what was said on their behalf. So, overall—

Mr. SMITH. Was it a U.N. type consensus document, do you think, where to get consensus more prominent statistics are underplayed?

Dr. MARPLES. Well, I understand that some of the scientists working on the Chernobyl Forum report were certainly not in favor of atomic energy. Many of them were dissatisfied with the current state of research on Chernobyl health to date and that there was an effort, at least, to try and bring in other scientists and not come necessarily to a conclusion that everything is being exaggerated or everything is being underplayed but to come somewhere in the middle.

It didn't do that in terms of what we were told about the report, and that is why I think it's so misleading to simply take those conclusions, like 4,000 dead or 4,000 long-term casualties, and, if I might, even the figure, incidentally, which is repeated ad nauseam,

31 initial deaths from Chernobyl is, in my opinion, nonsense. There is simply no way there were only 31 deaths from Chernobyl. What it means is 31 deaths reported from Chernobyl by the Soviet authorities, and that figure even during the summer of 1986 when countless people were dying at the site never went up, not by a single one. So it's just an example of really where some problems lie.

Mr. SMITH. Are you convinced that the containment effort is being carried in a prudent fashion? I mean, what are they doing with that debris?

Dr. MARPLES. There are about 100 burial sites within the Chernobyl zone. I mean, the biggest real burial site is the reactor itself. This is often now low-level radioactive waste, and this is not a permanent solution for it, but no one is going to live in this zone, presumably, so, therefore, what else are they going to do with it? I really don't know.

Mr. SMITH. Well, I would just note parenthetically, we don't know what we're going to do with our own nuclear waste.

Dr. MARPLES. Exactly.

Mr. SMITH. And we have a fourth of all reactors. We have two in my own State of New Jersey and they store it onsite with no realistic expectation that you'll come out and be ready any time soon to receive it. So I was just wondering what they did with it.

Were you or any of you touched or how do you react to the seemingly excessive weight—maybe that would be the wrong way of putting it—given in the report about the psychological consequences of Chernobyl vis-a-vis the medical and physical?

Dr. MARPLES. Well, I'll give my answer, and then I'm sure that Kathy will want to add something on this. But my only feeling about the psychological impact is that it's misdirected. In other words, of course there's psychological impact on Chernobyl. The reason is really why are people so stressed out about this accident.

And I would argue that the biggest problem with Chernobyl was the initial secrecy. That has caused nearly all the major medical problems that have arisen, it's caused nearly all the major casualties that arose aside from the initial fire when people tried to put out the graphite fire. And, therefore, I think that there's going to have to be some more accurate account coming immediately with a major accident. You just simply cannot respond to an accident in this particular fashion.

Mr. SMITH. Kathy?

Ms. RYAN. I would agree with that, and I was also struck by some of what I thought was glib language in the media coverage of the report in discussions of how Chernobyl survivors needs to empower themselves and take back control of their lives. I think there are reasons why people are having these psychological issues, and they're very real. I've seen it time and time again.

In a lot of the Chernobyl-affected villages, people are very confused about what their level of risk is. They simply don't know. They heard different things from humanitarians that come in, researchers that come in, filmmakers, media, whatever the case might be, and they're quite confused. And they've heard guidelines about what they need to do to keep themselves safe, but they either don't believe them or they're confused; they hear conflicting things.

So I think it's very understandable that there would be a psychological impact, and I don't think that it's so much an idea that we should urge them to get a better attitude about their situation but we need to come up with some solutions for them to help them feel better informed.

Mr. SMITH. Are there any initiatives you might recommend for both Belarus and Ukraine to assist a mother who may be carrying a child, in the interest of affirming both, of protecting both mother and baby? Folic acid was one we talked about earlier to mitigate spina bifida. But just so that this information is not out there, which could lead to an abortion, which would take, obviously, the life of a baby, is there anything you might recommend to affirm them both and to help the mothers get through this?

Ms. RYAN. I don't know if there's specific data on this—David might know—but I hear anecdotally all the time that abortion rates have gone up exponentially, and obviously that reflects the fear of bringing life into the world, and leads us to say there needs to be good maternal and childcare programs. The folic acid issues that you discussed, the UNICEF has made statements about the importance of iodizing salt, better information for expectant mothers. All of those things would be very important.

Mr. SMITH. With regards to the orphanages you mentioned growing in their usage, could you give us some details on that? Is it that the families are so sick they can't take care of their kids or they're stressed out and they're just leaving their children or are they actually orphans where mother and dad are dead?

Ms. RYAN. The issue in the growth of the number of children being put into orphanages has been highlighted by UNICEF in their plan to address the consequences of Chernobyl going forward in the three countries. And what I've observed is that a lot of—they're not orphans in the sense that both of their parents died. A lot of times in eastern Europe they were put into the orphanages for social reasons. They were either abandoned or the children were taken away from their homes because of a problem in the family.

Mr. SMITH. Can you just tell us how well or poorly the cooperation is with Belarus and perhaps with Ukraine as well, I mean, maybe compare the two?

Ms. RYAN. OK. My organization doesn't do any work in Ukraine, so I can't speak for Ukraine. In the case of Belarus, we've been working in the country for 15 years, and so a very high priority for us has been to ensure that we have really good diplomatic relations, both inside the country at the central level. We also spend a lot of time in the local communities working with the local governments. That takes a little bit more effort.

And we also rely on our relationship with the Embassy of Belarus here in Washington, DC. When we have issues that come up, we call on them for help and they make telephone calls and help us out quite a bit.

Dr. MARPLES. Well, I was just going to stress that you cannot really emphasize enough the differences between the governments that are dealing with Chernobyl. You said right at the beginning that it was a credit to Ukraine that they just had a democratic election. Belarus just had an election too, and it was anything but democratic.

And we have a government here that claims to be having one of the highest growth rates in the world and one of the brightest economies. If that's the case, how come 20 percent of the country lives in dire poverty and can't even get clean supplies or food? There's a clear anomaly there. This is not a matter of not getting enough foreign aid, it's a matter of not getting the proper aid from its own government, the people's own government.

So I think there is a real difference there, and the Ukrainian situation in that sense is much better than the one in Belarus.

Mr. SMITH. I want to thank all three of you for your excellent testimonies today and more importantly for the great work you're doing on behalf of the people who are at risk. And your testimonies will help our Commission, I think, do a better job. We're certainly much more informed, as I leave here, so I want to thank you, and your extraordinary work is deeply appreciated.

The hearing is adjourned.

[Whereupon, at 3:55 p.m., the hearing was adjourned.]

## APPENDICES

### PREPARED STATEMENT OF HON. SAM BROWNBACK, CHAIRMAN, COMMISSION ON SECURITY AND COOPERATION IN EUROPE

Twenty years ago this week, the world witnessed one the worst health and environmental disasters in history when reactor 4 at the Lenin nuclear power station near the town of Chornobyl in the Soviet Union exploded, spewing radioactive fallout into the atmosphere. The level of radiation released on that day was exponentially greater than that released at Hiroshima or Nagasaki and the damage from Chornobyl extended far beyond the borders of the USSR to countries throughout Europe.

Two decades later the international community continues to grapple with the myriad consequences stemming from the Chornobyl meltdown. These include health and environmental concerns as well as political and economic questions. While the immediate death toll was relatively low for a disaster of this magnitude, the ongoing cost in terms of human suffering is staggering. Thousands of people were forced to abandon their homes, their possessions, and their livelihoods. Vast swaths of prime farmland were contaminated, rendering the land useless to agriculture or even habitation.

Although we still have a lot to learn from the experience of Chornobyl, one thing is clear: we need a mechanism for the timely sharing of information in the aftermath of such disasters. Many other questions also need to be explored. What could have been done differently to minimize the exposure of the population? How safe are the reactors, similar to those at Chornobyl that are still in operation, across the post-Soviet space today?

Indeed, this disaster has led many throughout the world to reject nuclear power as an option despite its many benefits. These concerns are underscored by the current energy situation we face and the overwhelming consensus that energy diversification and security is a question we can no longer afford to ignore. Additionally, I am particularly interested in learning, from our distinguished panel of witnesses, more about the controversy surrounding the Chornobyl Forum report. I understand there are concerns with some of the findings in this report, especially those that deal with the projected number of casualties that may be directly related to radiation exposure from Chornobyl. I hope that our conversation today will shed some light on these complicated issues.

Accidents can happen anywhere, but it was the pervasive culture of secrecy in the Soviet Union that magnified the tragedy of Chornobyl. Children in the now-abandoned town of Pripjat were allowed to play outside in the critical hours following the meltdown, the annual May day parade in Kiev took place while reactor 4 still smoldered, needlessly exposing thousands to harmful levels of radiation, and the world learned of the greatest nuclear disaster in history, not from the Soviet leadership, but from the workers of a Swedish nuclear power plant who had detected radioactive particles on their clothing that were not from their plant. Twenty years later, the Soviet Union is no more, Ukraine is a free and sovereign nation, but the devastating legacy of Chornobyl lingers on.

On this sad anniversary, it is appropriate to honor those first responders who—without thought of their personal safety—rushed to the inferno engulfing reactor 4 to contain the blaze, the coalminers who frantically dug holes in the ground surrounding the reactor to pump coolant on the overheated core, the construction workers who labored round the clock to seal-off the site of the blast, the decontamination crews, and all those involved in the massive evacuation and treatment of the injured and affected people of this monumental catastrophe. Many of these heroes are no longer with us today and many of those who remain are still suffering the physical and mental effects of that tragic day in 1986. May their memory and legacy of selfless service to their fellow man give hope to those still suffering and inspire those who continue to work to mitigate the ongoing effects of Chernobyl.

I would like to welcome our distinguished panel here today and I look forward to hearing your expert commentary on the lessons learned twenty years on and the challenges facing Ukraine, Belarus, Russia, and the international community in the years ahead.

**PREPARED STATEMENT OF HON. CHRISTOPHER H. SMITH,  
CO-CHAIRMAN, COMMISSION ON SECURITY AND  
COOPERATION IN EUROPE**

Ladies and Gentlemen, tomorrow, April 26th, marks the 20th anniversary of the world's worst nuclear accident at the Chornobyl power plant in Ukraine. Compounding the disaster was that it took place under the veil of secrecy which was characteristic of the Soviet Union. In the days and weeks following the accident, people were denied accurate information on the dangers of what had happened.

This bitter legacy of Chornobyl continues to be felt twenty years later, and its consequences will remain for the people of the region and beyond for a long time to come. The health, social, environmental, economic and political consequences of the disaster continue to have a profound impact on countries in the region, especially Ukraine and Belarus, which bore the brunt of the radioactive fallout. Although experts differ—sometimes sharply—on the extent and magnitude of the human costs of Chornobyl, there is no doubt that the physical and psychological welfare of millions in Ukraine, Belarus and western Russia, including nuclear clean-up workers, have been harmed. There is no question that continued assistance will be needed for the most vulnerable, including the children. We must never lose sight of the human toll of Chornobyl.

Last year, I successfully included language in the State Department Authorization Act to provide assistance to improve maternal and prenatal care, especially for the purpose of helping prevent birth defects and pregnancy complications. The monies would be for individuals in Belarus and Ukraine involved in the cleanup of the region affected by the Chornobyl disaster. While numerous studies have furthered our knowledge of Chornobyl's consequences, there is still much we don't know, including its long-term impact on human health and on the environment. There is a need for further study and action. For example, we need to make ensure that sufficient U.S. funding is targeted toward Chornobyl health studies and efforts to prevent birth defects through the distribution of folic acid and better prenatal care. We need to be vigilant of the latent health effects that still are expected to emerge.

The need for the international community's involvement—both governments and non-governmental organizations—is still great, and it is important to remember that Chornobyl is not just a Ukrainian, Belarusian, or Russian problem. We all have a stake in dealing with this truly global disaster. An immediate, pressing priority—especially for Ukraine—is the completion of the Chornobyl Shelter Plan as well as other efforts to mitigate the consequences of the disaster. With the rapid deterioration of the sarcophagus covering the damaged reactor, we can ill afford another release of tons of radioactive dust into the environment. We need to do everything possible to protect people and the environment from the large quantity of radioactive remains of the Chornobyl nuclear power plant even as we persist in our assistance to the victims.

Although the international community, including the United States, has provided invaluable assistance in helping to mitigate Chornobyl's devastating legacy, there is still much that remains to

be done. We cannot afford to close our eyes, or our hearts, to the problems.

Among our witnesses today is the Director for the National Cord Blood Program of the New York Blood Center, Dr. Pablo Rubinstein. Members of this Commission are particularly interested in knowing what real cures and life-transforming treatments are being identified to address the immediately recognizable and latent diseases caused by high exposure to radiation. Having pioneered the field of public cord blood banking nearly 15 years ago, Dr. Rubinstein is on the cutting edge of offering hope and life and cures for an array of diseases once deemed terminal.

As the prime sponsor of the Stem Cell Therapeutic and Research Act, H.R. 2520, signed into law by the President last December, I am proud that federal funding is now helping increase the number of high-quality cord blood units available to match and treat patients. Our goal is to expand the inventory such that matched stem cells will be available to treat more than 90 percent of patients. All cord blood banks participating in the inventory program will have the capacity to search for cord blood and bone marrow matches through a single access point. Essentially a nationwide stem cell transplantation system is currently being established. Considering the implications for the use of cord blood to combat the diseases caused by radiation exposure and the lessons we have learned from the Chernobyl disaster, perhaps there is more we can do to be better prepared internationally should, God forbid, we are again faced with a similar accident or even a terrorist attack. As Dr. Rubinstein will testify, "Cord blood is especially, if not uniquely, suited to be used in the emergency treatment of subjects exposed to lethal doses of radiation."

Ladies and gentlemen, I am pleased to have with us this panel of distinguished witnesses. We look forward to hearing your testimony.

**PREPARED STATEMENT OF HON. BENJAMIN L. CARDIN,  
RANKING MEMBER, COMMISSION ON SECURITY AND  
COOPERATION IN EUROPE**

Twenty years ago, the word Chornobyl entered our lexicon, and, more importantly, the world's consciousness. That catastrophe, the largest nuclear accident in history, released hundreds of times the radiation of the Hiroshima and Nagasaki blasts. The consequences of Chornobyl on human health, the environment and on the social and economic fabric of the countries most affected have been profound and have implications for generations to come.

In marking the 20th anniversary of that tragedy, we remember all of its victims, including all of the emergency and recovery operation workers—the “liquidators”—many of whom were also victimized by a system steeped in secrecy. We remember that the accident has had an adverse impact on the lives and health of millions of men, women and children in the contaminated areas of Belarus and Ukraine as well as parts of Russia. While we remember the victims who have succumb, we must also commit ourselves to continue to provide help those people whose lives are—and will continue to be—impacted by Chornobyl.

An important lesson from Chornobyl—one that remains relevant today—is the importance of transparency in governance. The nature of the Soviet system did not lead to a humane or rational response to the tragedy. Silence and obfuscation in the immediate aftermath of the accident perhaps manifested itself most starkly in the failure of the authorities to provide the population of surrounding areas with timely warnings regarding the dangers posed by the massive fallout of radiation. The consequences of this secrecy remain with us to this day. They are a vivid reminder of the value of open democratic and accountable governments which respect the human rights and dignity of the individual. Regrettably, some in the region prefer to cling to the past, failing to heed the lessons of Chornobyl.

As Chairman of the OSCE Parliamentary Assembly's Committee on Economic Affairs, Science, Technology and Environment, I am interested in exploring how the OSCE might play a positive role in alleviating the consequences of Chornobyl on the participating States that bore the brunt of the impact: Ukraine, Belarus and western Russia. I plan to raise this issue at our Committee session during our Annual Meeting in Brussels, and I am hopeful that the Committee will address this issue in its resolution that will be incorporated into the Brussels Declaration.

The international community has helped in this effort, by increasing the financial commitments to the Chornobyl Shelter Fund to \$1 billion. I am encouraged by President Yushchenko's recent statement that the construction of a new structure over the damaged reactor will be completed in 2010, and heartened that the United States has made—and will continue to make—substantial contributions to this and other Chornobyl-related projects.

I look forward to hearing from the witnesses today.

**PREPARED STATEMENT OF HON. HILLARY RODHAM CLINTON,  
COMMISSIONER, COMMISSION ON SECURITY AND COOPERATION  
IN EUROPE**

Thank you, Mr. Chairman, for calling today's hearing on the consequences and responses to the Chernobyl nuclear disaster.

Twenty years ago today, explosions at one of the reactors in Chernobyl resulted in the release of radioactive materials to areas in what is now the Ukraine, Belarus, and Russia. In both the immediate aftermath of the accident and in the years following, hundreds of thousands of people were exposed to extremely high doses of radiation, with over 100 deaths occurring in 1986 as a result of acute radiation sickness. The World Health Organization (WHO) reports that almost 300,000 individuals still live in areas contaminated by the disaster.

However, it is only in the past few years that the true impact of the Chernobyl disaster has emerged. Radiation health experts tell us that most cancers that result from radiation exposure do not develop for decades. Already, we are seeing an increase in thyroid cancer among Chernobyl survivors—an increase attributable to the consumption of contaminated milk by children in the aftermath of the accident, many of whom had iodine deficiencies which made them more susceptible to the high levels of radioactive iodine resulting from the explosion. The WHO estimates that about 9,000 of the individuals exposed will die from Chernobyl-related cancers.

In addition to the threat of cancer and other radiation-related conditions, many of the individuals in Chernobyl and the surrounding cities faced significant mental health challenges, some of which have not yet been resolved, resulting from their evacuations following the accident, the uncertainty surrounding their physical health, and the stigma they faced when they were relocated to new communities.

While I was First Lady, I had the opportunity to visit the Ukraine, and was impressed by the dedication of doctors and nurses in Belarus and Ukraine who were trying to keep affected children alive. I am proud to note that our government helped provide support for airlifts and other shipments of essential items to assist the hospitals treating families in the aftermath of this disaster. Through our partnerships with nongovernmental organizations, we helped to set new standards for the post-Soviet medical system, with delivery of new technology, physician training programs and critically important hospital supplies.

During the Clinton Administration, we also made significant gains in working with the government of the Ukraine, as well as the G-7, to help mitigate the environmental and social impacts of this disaster. Our government provided over \$200 million to help ensure safe containment and closure of the Chernobyl site, and increase safety at other nuclear facilities. We also worked to address the needs of displaced workers, helping them find other jobs and receive additional training. I believe that we must continue to help those impacted by this disaster, especially as long-term health impacts appear.

I appreciate the opportunity that today's hearing presents to raise the issues of areas where Chernobyl continues to have an effect on all of us, and I look forward to working with my colleagues

on this Committee and the Administration to ensure that our government continue to be responsive to the needs of those who lived through this tragedy. Thank you.

**PREPARED STATEMENT OF DR. PABLO RUBINSTEIN, M.D., DIRECTOR, NATIONAL CORD BLOOD PROGRAM, NEW YORK BLOOD CENTER**

These comments are presented in the hope that they describe the possible roles of cord blood transplantation in the aftermath of Chernobyl-type accidents and other situations involving the release of large amounts of radiation. The consequent exposure of large numbers of people to radiation damage is a dreaded catastrophe, 20 years after Chernobyl.

I will focus specifically on the currently known functions of cord blood stem cells and their potential application to the treatment of victims of such catastrophes.

**INTRODUCTION**

It has long been known that ionizing radiation produces deleterious effects on organisms and cells. These effects have been well characterized and there has been considerable study of the clinical effects of chronic and acute exposure. Clearly, the type and dose of radiation and the rate at which it is absorbed by cells and tissues, are major variables. In acute exposures of the Chernobyl type, that also produce radioactive materials that continue to produce ionizing radiation in a more chronic way, the consequences have been characterized as either rapidly developing, called deterministic or stochastic, which develop slowly over many years. Additional damage was produced by the context: the explosion of the reactor and the fire that ensued produced thermal burns on many of the victims who died in the first weeks after the explosion, which, together with burns due to high dose beta radiation complicated greatly the treatment of victims enduring acute radiation syndrome. A large body of experimental data in animal models demonstrates that it is possible to rescue individuals exposed to lethal doses of radiation by restoring their bone marrow function with hematopoietic (blood-forming) stem cells.

Until recently, the only source of stem cells for bone marrow restoration was bone marrow from related or unrelated, HLA-matched donors. Grafts could be obtained directly from the bone cavities where bone marrow grows or from peripheral blood by first "mobilizing" the stem cells with growth factors. More recently, cord blood has proven to be a very good stem cell source for the restoration of bone marrow in the treatment of leukemia and other diseases and legislation has been signed into law for the support of a National Cord Blood Program with a substantial inventory.

**THE ROLE OF HEMATOPOIETIC STEM CELL TRANSPLANTATION IN NUCLEAR EMERGENCIES**

Bone marrow aplasia, as a lethal consequence of exposure to large doses of radiation, originally prompted interest in bone marrow transplants more than fifty years ago. However, the role of hematopoietic stem cell transplantation in the care of victims has been questioned, although it is, still, the only hope for individuals whose own stem cells have been destroyed in nuclear attacks or accidents. The reason for questioning the efficacy of these transplants is the low yield of transplanted survivors in previous accidents, in-

cluding Chernobyl, a result largely determined by logistic difficulties: finding bone marrow donors opportunely, measuring accurately the quality and quantity of the radiation received to determine the amount and type of radiation damage, and overcoming the burns and other direct damage, in the field. A group of 13 patients exposed to  $^3$  4 Gy, received bone marrow transplants to combat the radiation-induced bone marrow suppression but only two survived. Among engrafted survivors, apparent transplant rejection was encountered in several patients, suggesting that immune cells may have survived the high dose of radiation, despite their much reduced numbers in the blood.

If the radiation dose received is sub-lethal (destroying only some fraction of the hematopoietic stem cells) patients should be recoverable without transplantation, by using growth factors, as in the Brazilian accident (Butturini A, et al., *Lancet* 2(8609):471–475, 1988). If, however, the amount of radiation received exceeded the maximum tolerated by tissues other than the marrow, such as the skin, gut, lung or nervous system, obviously, hematopoietic stem cell rescue would obviously not overcome other lethal lesions. The realm of hematopoietic rescue, therefore, lies in a range of radiation doses between these two circumstances.

The total-body irradiation absorbed by individual victims of nuclear explosions and accidents is not likely to be homogeneous and risk levels based on dose calculations are, therefore, treacherous. An example of the difficulties in estimating the radiation received was described for Patient A after the 1999 accident at Tokai-mura (T. Ishii, et al, *J Radiat Res (Tokyo)* 42 Suppl:S167–182).

In addition, damage to different tissues and organs may be additive to some extent and radiation in these cases is often accompanied by thermal burns and traumatism that increase overall morbidity and mortality. There is consensus, however, in that the blood and immune system are the tissues most easily damaged beyond possible spontaneous repair because of the high radio-sensitivity of the hematopoietic stem cells. Hence, stem cell rescue will be necessary and will succeed in some patients. In others, stem cell transplants may be performed although conceivably, they might have recovered with just hematopoietic growth factors. Thus, for example, in the 1988 Brazilian accident, eight patients developed marrow aplasia after a cesium-137 exposure and were treated with recombinant GM-CSF. Four of seven evaluable cases survived. It is an open question whether the other three would have had a chance if cord blood had been available and all had been transplanted.

The use of both, allogeneic cells and growth factors, in the same patient is an obvious possibility of bypassing uncertainty as to the marrow lethality of the dose. This approach was tried on one of the three victims of the Tokai-maru accident in October, 2000, who lacked matched bone marrow donors either related or unrelated and was transplanted with DRB1-mismatched cord blood (Nagayama H, et al., *Bone Marrow Transplant* 29:197–204, 2002). Donor neutrophils and platelets appeared rapidly in the blood (engraftment) and the patient did not experience GvHD, but autologous recovery followed promptly the termination of GvHD prophylaxis with steroids plus cyclosporine. The patient lived for

210 days and succumbed to infection, attributed to severe immunologic impairment despite, or perhaps because of, autologous recovery with the progeny of heavily irradiated lymphocytes. The other two patients that suffered acute radiation syndrome, died shortly thereafter, one despite a bone marrow transplant.

#### ADVANTAGES OF CORD BLOOD AS A STEM CELL SOURCE

These advantages include:

##### LOGISTICS:

a) Cord blood grafts reduce very substantially the waiting time between the start of a search and the availability of a graft, an important issue for acute leukemia and some inherited diseases and an even more important one in the response to a terrorist action or accident. Cord blood can be routinely released for transplantation within 1–2 weeks, within 24 hours in an emergency.

b) Banked cord blood is free of attrition, in contrast to volunteer donors who sometimes cannot be located or may be unwilling or unable to donate when needed.

##### INFECTIOUS DISEASE RISK:

Cord blood grafts reduce exposure of recipients to latent common viral infections in the donor that can have severe consequences for immuno-suppressed patients, as is the case of transplant recipients. These infections are, principally, CMV and EBV. CMV has a prevalence among neonatal donors well below 0.5%, compared with 50–60% in US adults, while EBV is almost always negative in newborns and its prevalence in US adults is also above 50%.

##### IMMUNOLOGICAL:

For reasons still not completely understood, immune cells in cord blood are much less likely to produce the severe forms of acute Graft vs. Host Disease, a potentially lethal complication of stem cell transplantation. As a consequence, the recipients of cord blood grafts may receive partially mismatched grafts without a remarkable increase in the incidence of this complication of adult-donor transplants. Freedom from severe Graft vs. Host Disease allows us to provide partly mismatched grafts to a much larger fraction of potential recipients. This advantage is particularly important for members of ethnic minorities, whose spectrum of HLA types is different from that of Caucasoid donors, and whose frequency among potential donors is, per force, lower (minority).

#### CORD BLOOD STEM CELL USE IN TRANSPLANTATION

Because of the lower post-transplant morbidity and mortality from GvHD, clinicians can perform transplants with HLA-mismatched cord blood units that would be undoable with similarly mismatched grafts of bone marrow or mobilized peripheral blood stem cells. Cord blood, therefore, is becoming more widely accepted as a source of hematopoietic stem cells for transplantation. Worldwide some 7,000 to 8,000 cord blood transplants have been accomplished. For the past 2–3 years, about half of transplants in U.S.

children have used cord blood. Acceptance for adult patients is also becoming more widespread, especially with the success of double unit transplant protocols. Last year 45% of CBUs provided by the New York Blood Center's National Cord Blood Program went to teenagers and adults. Ethnic minority patients have especially benefited from cord blood: while 12% of the US population, for example, is African-American, 19% of US patients given New York Blood Center NCBP cord blood units have been African-American, comparing to only 6% of patients who succeeded in finding an unrelated donor through the National Marrow Donor Program (NMDP) (Source: GAO Report, October, 2002).

#### THE QUANTITY OF STEM CELLS IN CORD BLOOD COLLECTIONS

One of the characteristics of cord blood collections is the lower total cell content than in typical bone marrow collections, which is balanced in part by a more rapid proliferation of hematopoietic precursors (colony-forming cells). We have defined the cell doses (numbers of total nucleated cells (TNC) per kilogram of patient's weight required to support reasonably fast engraftment as  $2.5 \times 10^7/\text{Kg}$  or more. Since the cellular content of individual cord blood units is fixed at the time of collection, the cell dose is part of the criteria for cord blood matching, as well as the HLA match. Consequently, fewer cord blood units are dose-matched to adult patients than to children, explaining the relatively small number of adults given cord blood transplants to date. Double unit transplants, and possibly protocols to expand the number of cells, seem to be overcoming this limitation for adults.

#### CORD BLOOD USE IN ADULTS

Because of the reduced cell doses for heavier patients, fewer transplants have been performed in adults and these data are less abundant than for children. Cord blood grafts from the New York Blood Center's NCBP have been given to more than 800 teenagers and adults, however. In Japan, cord blood is being used in more than half of all hematopoietic stem cell transplants in adults. While survival post-transplant is generally lower for adults than for children, it is similar to that of unrelated bone marrow transplants to adults with comparable risk factors. A recent series of papers in the *New England Journal of Medicine* (November 25, 2004) reported achieving comparable survivals for recipients of cord blood or bone marrow from unrelated donors. Moreover, the use of several grafts simultaneously provides aggregate cell doses in the effective range for adults.

Obviously, transplantation data on patients previously treated with various drugs for leukemia and other diseases cannot be freely extrapolated to the situation of victims, who, although probably healthy at the time of the exposure, might have sustained additional injury in the form of trauma and thermal burns and would be transplanted in very abnormal conditions. Some patients may also have received very high radiation doses, lethal for other tissues and organs and will die for that reason despite the transplant. On the other hand, cord blood grafts may rescue some of the victims and provide temporary support for some patients to survive

the period of acute marrow aplasia without incurring much risk from graft-vs-host disease. This could give the patient's own remaining stem cells time to recover and replace the graft with the additional help of growth factors, as in patients whose conditioning regimens may have been insufficient.

#### VICTIMS AND GRAFTS

To conclude, the actual number of victims of depends on the type and magnitude of the radioactive release and the population density at the site of the explosion and its environs. It is estimated that a "small" nuclear bomb ( $\approx 1$  kiloton) exploding in a city like New York, Boston or Washington would produce some 30,000 victims. The number of irradiated persons, the level of their exposure and additional damage by the mechanical and thermal effects of the explosion would determine the number of grafts that would need to be available in order to provide appropriately matched cord blood stem cells for the victims that may benefit. In the case of accidents or attacks on power plants, the numbers are probably much smaller but potentially could challenge the nation's ability to treat victims appropriately. As opposed to surgically extracted bone marrow, cord blood units are donated without incurring risk and can be transplanted in a few days despite the presence of mismatches.

Because many victims are likely to be adults, current NCBP criteria require higher minimal cell doses for retention, to increase the range of recipient weights who can effectively use these transplants. Furthermore, new strategies for transplant management, including the use of multiple grafts in one transplant, raise confidence that cord blood could soon be at least as effective as bone marrow grafts for patients of all ages and sizes. Thus, a potentially large number of victims could be given access to a life-saving cord blood transplant and have a significant chance of survival.

In the event of an attack or accident, no other form of bone marrow rescue could possibly be mobilized opportunely enough to save many of the victims of radiation induced bone marrow failure: cord blood is especially, if not uniquely, suited to be used in the emergency treatment of subjects exposed to lethal doses of radiation (or to chemical agents that can similarly destroy the marrow's cells).

A fundamentally important aspect of any stem-cell including radiation preparedness plan is that, since cord blood transplants are being used increasingly to treat people with malignant and hereditary diseases, expansion of the existing inventory not only enhances preparedness, but the expansion would serve current and future medical needs as well. Thus the public investment needed for strengthening the National repositories will benefit the public whether or not the emergency materializes.



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