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SESSION: GENERIC ENGINEERING: HOW FAR SHOULD WE GO?

Moderated by:

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Presentations by:

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and

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P R O C E E D I N G S

DR. SHULMAN: My name is Lee Shulman. I am going to be the moderator for today's session. As a brief bit of information, I am professor of Obstetrics and Gynecology and Molecular Genetics at the University of Illinois at Chicago. I am also on the board of trustees of ARHP. I want to thank you all for being here this morning, and at the meeting as well.

You may be wondering why this year's great debate involves a topic like genetic engineering, and in a sense, I owe you an explanation, but the explanation for me is very simple. You need only to look at the name of this organization, the Association for Reproductive Health Professionals.

Reproductive health has in the last 5 to 10 years incorporated many aspects of genetics and genomics into not only women's health care, but health care in general. So it was felt that we as an organization needed to evaluate and investigate this increasingly contentious topic, not just contentious with regard to the medical aspects, as you will hear this morning, but also the political and social aspects. I would dare say that this organization and the members of this organization are well familiar with political and social contentiousness in our professional and sometimes even in our personal lifestyles.

What is genetic engineering? In a real sense, it is going to be a definition that I give you that will illustrate why we are going to have such lively debate here this morning.

For me, genetic engineering truly involves an evaluation and manipulation of the genome with regard to diagnostic and therapeutic solutions to both congenital and acquired conditions. Now, what are conditions, what are diseases, what are congenital, and what are acquired truly are in the eye of the beholder, and you will hear a lot of that argument and discussion here this morning.

This session is not meant to be a primer on reproductive biology. If you are, in fact, looking for some more information, I believe this is available on all the tables. There is some very basic information that is being provided to you. I would also encourage all of you to look at the ARHP website. In fact, I have a copy of the face sheet here. There is actually a Genetic Engineering Resource Center.

Let me say that genetic engineering is not just cloning and stem cells. It really does involve many other aspects of, again, the evaluation and manipulation of the human genome.

So I am going to briefly introduce our two speakers. By mutual arrangement, Dr. Billings to my left will be speaking first, to be followed by Dr. Zavos.

Dr. Billings is a co-founder of GeneSage and editor-in-chief of Gene Letter. He is also the former deputy network director, chief medical officer of the Heart of Texas Veterans Healthcare System, and an expert in clinical genetics, immunogenetics, and the impact of genetic technology on society. He conducted his first experiment with stem cells in 1977 and is a co-founder of the largest private umbilical stem cell bank in the world and also a non-profit stem cell foundation.

He has considerable other and noteworthy aspects to his CV, but in the quest for time, I am going to move on to Dr. Zavos who is Professor Emeritus of Reproductive Physiology and Andrology at the University of Kentucky and a founder, director, and chief andrologist of the Andrology Institute of America. He is also a co-founder and co-director of the Kentucky Center for Reproductive Medicine and president and CEO of ZDL, Incorporated.

As you will soon hear, Dr. Billings is, if I can generalize, against cloning and Dr. Zavos is in favor of cloning. When Dr. Zavos heard that Dr. Billings had been involved with a stem cell bank, he told me that he was involved with a very large sperm bank, and when I asked why we had two bankers here, I thought that was rather appropriate that we, in fact, were in Washington.

So I will say thank you again for coming, and I will turn it over to Dr. Billings to begin.

DR. BILLINGS: In these hard economic times, I am not sure we need any more bankers, but thank you very much. I just wanted to add that I am a professor at the University of California, and if you would like to read my comments in more complete detail, look in the *Lanset* and in *Nature Medicine* over the last couple of years.

So human reproductive cloning involves the transfer or transposition of a nucleus and the genome within from a mature cell into an enucleated human egg or stem cell and then that product being implanted for gestation and birth.

Human experimental cloning, which is sometimes called human therapeutic cloning, is the same procedure without the gestation and birth. Now, during the transfer of the nucleus, one can manipulate the genome, and this can result in heritable germline genetic changes that could affect a family.

There is very good evidence and lots of experience in developmental biology that chromosomes change during human development, that genes rearrange, that segments of DNA get larger, get smaller, and are modified.

Now, for cloning to succeed, some undoing, sometimes called "reprogramming," of this process must take place. It is not at all clear that this can be done in any system safely. Effects that have been noted are major, including premature death and major developmental anomalies, but, in humans, it could be subtle, with just changes in mental development or neurological function or subtle birth defects.

Cloning has not, with a lot of effort, been accomplished in rabbits, rats, cats, dogs, or any primate. In those species where it has taken place, it has been very difficult and with lots of anomalies.

We are health care professionals, and we take oaths to do no harm. Yet, we also recognize that for our sickest patients, some experimentation in the practice of medicine with prior informed consent of the patient has to, and should, occur.

Infertile patients are generally not severely ill, and we do not have a legal or moral right to grant anyone a genetic child. Therefore, infertility medicine must be held to a high, high standard, with transparency of its practices, quality control, and accountability.

Assisted reproductive techniques and the use of genetic technology in those practices is a new method, and outcomes monitoring must get better and better and requires long-term follow-up.

Human reproductive cloning and human germline genetic manipulation, which results are unnecessary, unsafe, and risks doing harm to ethical science and medicine, rogue scientists and practitioners must be identified by the professional societies to reassure the public and to affirm their own standards.

In some cases, including those where individuals, despite the sanctions, would go ahead with human reproductive cloning or human germline genetic manipulation, these individuals should be treated as if we would do so in California, in many other States, and in many other nations. They should be treated as they are, criminals.

Thank you very much.

[Applause.]

DR. SHULMAN: And now Dr. Zavos.

DR. ZAVOS: Good morning, everyone. It gives me a great privilege to be among you and with you this morning, and I am going to argue in favor of reproductive cloning or reproductive regeneration, as otherwise known.

As we all know, there has been some hostility, and I think that my opponent already showed some of that already this morning. Therefore, we do take that seriously, and I think that the BMA, the British Medical Association, could not say it any better than just the way that he stated here. Public hostility to human reproductive cloning may be based on any logical transient fear of a new technology, and we accept that.

Now, infertility, as we all know, is a disability and also a disease that has reached epidemic levels in the developing world, and, therefore, I have been involved in treatment of infertility for the last 23 years and I have never been involved in the birth of an unhealthy child for as long as I remember. Therefore, we do take that very, very seriously.

As we all know, the development of the various assisted reproductive technologies that obviously do require some risk, just like any other medical procedure, involve IBF, ICSI, tesA, ROSI, spermicide donation or plasmic transfer, and most of those techniques have been developed, actually, without the performance of too much or any, for that reason, animal research. Therefore, we as humans do take risks in the development of new technologies, and we know exactly what we are doing.

Now, patients, which is the source of our market, this is the basis upon which the patients want to have a child, yesterday if at all possible, and they want to have a healthy child. And they don't want to borrow somebody else's genes or genomes or sperms or eggs for that reason to have a child. They want to have a biological child of their own.

Now, let's talk a little bit about Dolly because Dolly is the most well-known sheep in the world that was produced by a sheep herder in Glasco, Scotland, known as Ian Welmut. Ian obviously produced this as an experiment which is nothing but a hit-and-miss experiment, and anybody that knows anything about experimentation knows very well that when you take 277 anucleated eggs, you create 13 -- 29 embryos, and you transfer all 29 unscreened embryos into 13 recipient ewes, ewes being female sheep recipients, and you produce one Dolly which is healthy, and that no other mishaps have taken place. That is a hit-and-miss experiment.

Now, from that experiment, the percent success rate on a per-embryo transfer is 3 percent. All 29 unscreened embryos -- and I should mention that and emphasize that. Unscreened embryos were transferred into recipient sheep in order to have a pregnancy. That is an act of desperation.

Now, based upon that, Ian Welmut and Jaenisch, the MIT professor, have stated in science as late as 2001 that animal cloning is inefficient. It is about to stay that way for the foreseeable future. If anybody has any sense at all, they would really come to a conclusion that if you just allow evolution alone, this technology will evolve properly.

Furthermore, a number of studies -- and I mean a significant number of studies -- were cited at the National Academy of Sciences that we debated not too far from here in August -- has shown that the success rate is tremendous.

Case in point, this is a Chinese study that was published in 1998, not 2001, and the success rate is 32 percent on a per-embryo-transfer studies done in goats here. Thirty-two percent is 2 percentage points above IBF success in the United States, which is 30 percent.

Now, Dr. Cato published his work here in Science magazine "a success rate of 80 percent." Obviously, the numbers are not quite there, but this is 80 percent. When you talk about 3 percent in Dolly, that is just 3 percent in Dolly. Therefore, we need to call a spade "a spade" here.

Now, as late as 2 weeks or 3 weeks ago, when the first announcement of the first human cloned embryos by ACT was made -- and the world obviously turned upside-down -- they also revealed 24 cloned cows were healthy, and this study was obviously concluded that they reach adulthood. They can reproduce. They have offspring of their own, no obvious genetic problems, and, obviously, they are normal, normal, normal.

It was published. I read this article, "Cloned Cows Pass Their Health Exams." I read this on a flight from Larnaca, Cyprus, to Amsterdam. I just picked up the newspaper, and that was the news of the day. When I got to Detroit that evening, obviously the first cloned embryos were announced.

Now, the difficulties as we know them today, when we review the literature, poor cloning response among the animal cloners, poor implementation and poor health of the animals born. Now, those difficulties, when you review the literature, are due to poorly designed experiments, poorly executed approach understood, and some of those experiments were done for fame and fortune, ladies and gentlemen, just like the Dolly one.

Now, Jaenisch was the worst opponent in this business. He is beginning to concede and says the bad results are due to the cloners, not the cloning procedure, and, obviously, he made those statements on August 7th, interviewed by an Australian interviewer, after the National Academy of Sciences where various scientists showed that the success rate is 30, 40, 80 percent in animals, not 3 percent as they claim.

Also, Jaenisch is morally against human cloning, and I need to ask my opponent today to tell him whether he is morally against cloning because we need to separate the boys from the girls here. We need to call morality one thing, science another, and not just mix them together because they don't mix.

Also, Jaenisch, this great MIT professor, stated before the Congress of the United States, which we debated again not too far from here, that Dolly is obese, and if obesity has anything to do with cloning, I can tell you that 50 percent of the American people would be wrongly cloned.

Furthermore, Dolly has an IQ problem, and, of course, MIT does not have an IQ test for sheep yet. And I do not know exactly where he gets those kinds of statements and he comes before the Congress under oath to tell them those kinds of lies. They don't fly in science. They may fly in front of Congressmen of the United States, but they don't fly around here.

The problems with animal cloning lie in the areas of tissue culture, of improper selection, improper understanding of reprogramming of genes, complete lack of embryo screening, which is unheard of in human reproductive medicine, developmental asynchronous between the uterus and the embryo transfer, and persistent use of highly inbred animals, which humans are not highly inbred. Therefore, those are facts as they appear in the literature together, today.

Animals versus humans. Let's agree on one thing. I hope that you all agree that we are humans in this room, and there are no animals. Animals are animals, and so we do see animal cloning, and it is difficult to appear to be species-specific. They have already established that, just like Dr. Billings indicated that we have not been able to clone the rabbits and others, although we have cloned mice and pigs and sheep and goats. Therefore, this specificity does apply to the human as well. Animal cloning success rates vary among different scientific groups, even within the same species, which means that they are different mechanics. There are good mechanics and bad mechanics in this business. We cannot just generalize.

Animal cloning data cannot be extrapolated with a great degree of accuracy to the human species, and, therefore, in order for us to understand what happens at the human level, we must do it in the human.

Now, furthermore, the Duke University about the second week of August has shown that humans may be easier to clone than animals, so much for good news.

Now, the future of cloning, obviously, is wide open. The politicians make political decisions. The religious leaders make religious decision. We the scientists make scientific decisions, and the medical people make medical decisions. This is not a religious issue. This is not a political issue. This is an issue that we will have to deal at the scientific and medical level.

As I tell the world and as I travel the world, I tell them this genie is out of a bottle. It keeps getting better and bigger every day. Therefore, the question that we should be addressing today is who should develop this technology and what we should do to develop a safe technology with minimal risks to the mother and the child. Therefore, we are ready to do that, and we are prepared to do that.

Thank you very much.

[Applause.]

DR. SHULMAN: Thank you, Dr. Zavos.

We will now have a 2-minute response by both speakers. Dr. Billings?

DR. BILLINGS: Thank you.

First, let me say that the human clone experiment that ACT published over Thanksgiving holiday was, by all aspects, a profound failure and shouldn't be interpreted any further than any other failed human experiment might be interpreted.

Second, let me just say that my friend and colleague, Dr. Rudolph Jaenisch, is one of the most distinguished developmental biologists in the world and has published extensively on these topics for many years.

Third, let me say that I don't think that any of us really want to live in a world where science and medicine are independent of all other human society and of all human limits that are just uncontrolled and unfettered. I don't think that's in the interest of society. It is not in the interest of the patients. It is not in the interest of the scientists. And the fact is that human reproductive cloning is illegal in many countries, and it is illegal in many States.

It is also not safe, and it would involve, as Dr. Zavos has just told you, a whole kind of human experimentation with all sorts of unforeseen and unhappy results.

DR. SHULMAN: Dr. Zavos.

DR. ZAVOS: I would have to agree -- we are not going to agree a whole lot on too many things here today, but I would agree that what ACT has done, it was a disaster, and, obviously, it generated a press release about 3 weeks ago and it went throughout the world. I didn't agree with what they done, and I think that motives need to be questioned.

I think that if we were to produce cloned embryos in the fashion that ACT has, it would spell a disaster for us involved in the reproductive medicine area. Therefore, we don't intend to clone human embryos in that fashion, and we don't intend to transfer such embryos in order to achieve a healthy pregnancy and a healthy offspring. Therefore, that is the case.

Now, as far as this consortium and the team that I represent -- and this is a team effort. This is not, by any means, my effort. We are totally committed in developing this technology, and, therefore, we will develop this technology in a legal fashion, in a forum and in a country and in a laboratory where the necessary criteria and quality controls do exist.

It is not illegal to do human cloning in the U.S. Only five or six States do have any laws against it. This is a big country, and, therefore, we can -- you know, if you want to die from a crime, you can go and commit a crime or kill somebody in Texas, but intelligent people kill their relatives or otherwise in States where the death penalty does not apply. Therefore, the same applies here. We don't intend to kill anybody, but we intend to do it legally in a legal country under the conditions that really allow us to do that, and this is very important for people to understand.

As for Professor Jaenisch, the MIT professor, I have my sympathies for him because where simply he has been going around lying to people and lying to the Congress, such as Dolly is obese and Dolly has an IQ problem, and the success rate is 3 percent and it is about to remain that way, I have no respect for people like that.

Thank you.

DR. SHULMAN: Thank you, Dr. Zavos, and for those of you who are having problems with your relatives, we will give you a list of States that don't have capital punishment.

[Laughter.]

DR. SHULMAN: The response of the response, Dr. Billings.

DR. BILLINGS: Well, I don't think intelligent people kill anybody, and I just want to also say that there are incredibly few couples who have a genetic reason that could be potentially, if it were ever safe, treated with a cloning-like procedure.

Many couples see this as a way of reproducing a child, let's say, that was lost through an accident or some other process, and I don't think that we're really in the business of creating technology fixes for the grieving process. As we all, of course, know, a clone wouldn't be identical to the donor of that nucleus. So I just hope that you all can see through these kind of smoke and mirrors here to what the substantive issues really are.

Thank you.

DR. SHULMAN: Last response?

DR. ZAVOS: Well, nobody could say it any better than the man that developed the first test-tube baby, 23 years ago, Louise Brown. Robert Edwards is his name. I have tremendous respect for him. He is a personally friend, and he has stated recently that what happened in response to this Washington meeting that he participated, 23, 24 years ago, is exactly what happened to us when we were there this last August at the National Academy of Sciences in which obviously everybody came at us and attacked us in such a way.

What happened to Robert Edwards after Louise Brown is born is that IBF became synonymous to sliced bread, and we see, obviously, the development of reproductive cloning is inevitable, and it will be developed safely. All I am challenging our friends and relatives in the Government of the good old USA is come and join us. Give us the proper support. Let's do it on top of the table and develop the best criteria for the development of this technology because everybody understands, inevitably, this technology will be developed. The genie is out of the bottle.

DR. SHULMAN: Thank you.

We will now open the floor to questions. We have time for about five to six questions. Please feel free to step up to a microphone and ask away,

PARTICIPANT: [Inaudible] -- closed location. Can you elaborate on how that experiment is going and when you plan to actually make the transfer?

DR. SHULMAN: Can you just repeat the question again?

PARTICIPANT: You recently told the British media that you and your partner, Dr. Antinori, are close to creating the first human embryos and then implanting them in the uterus of a volunteer. Can you elaborate on those plans and where the transfer will take place?

DR. ZAVOS: Well, I can tell you exactly what we are doing. We are developing the technologies that we promised that we would do. We have done a great deal of animal experimentation, and we are not going to do it in the human until we are totally convinced that it is a safe way to go about doing it. So that is the commitment that we have made to the world.

We are very close in producing the first cloned embryos. The agenda that we have is that we would not transfer those embryos unless those embryos test to be reasonably healthy to produce a healthy pregnancy and a healthy offspring. Therefore, we cannot disclose anything more than that. We cannot tell you where we are doing this because of simply security reasons, but that is as far as we can go. We are totally committed in doing this, and we will continue as such.

DR. SHULMAN: Thank you, Dr. Zavos.

Dr. Billings?

DR. BILLINGS: No, I don't have anything to comment on that.

DR. SHULMAN: Yes.

PARTICIPANT: James Trussell, Princeton University.

It seems to me that the debate this morning is largely besides the point for two reasons. My belief is that a cloning -- the primary use of cloning, the primary demand for cloning eventually is going to be for the treatment of disease; that, in fact, people will want to produce clones so they can get stem cells, so that they can then produce treatments that won't be rejected by their own body when they are transplanted.

Reproductive cloning, my guess, is never going to be very popular. However, there is a powerful, powerful desire for parents to advantage their children, either by sending them to the best schools or by making sure that they have the best reproductive outcomes.

There are many repro-genetic techniques that can be used to do that, which do not involve cloning at all and would seem to be much more likely to be used than reproductive cloning.

DR. SHULMAN: I will let you respond to that.

DR. BILLINGS: Well, first of all, let me just say about regenerative medicine that, yes, in fact, it offers a great deal of hope to expand transpondation. The role of cloning in regenerative medicine is completely up for debate in the sense that it is not known whether you do need to create genetically identical stem cells in order to benefit individuals in transpondation.

We don't currently in our transpondation protocols use genetically identical organs or cells unless there is an identical twin available. So it is really completely unknown, and, yes, more experimentation needs to be done, both in developing stem cells as well as deciding whether you actually need to clone into them.

In the meantime, I would point out that there are sources of stem cells from adults or newborns which are readily available, which represent biological waste in some cases currently and which also need exploration in the use of regenerative medicine.

As far as heritable changes, genetic manipulation to improve children, yes, being a parent of a 3-month-old and a 3-year-old, I feel that I want to advantage my children as best as I possibly can, but I am certainly not of the belief that changing the child's germline is the most efficient and safest or best way to do that.

Providing for maternal nutrition, making sure that my wife didn't smoke, providing good nutrition and good medical care for my child and so forth is much more important and much safer and less likely to be tainted by the fashion of the day.

DR. SHULMAN: Dr. Zavos?

DR. ZAVOS: Obviously, we are in the business of helping infertility couples to have biological children of their own, be it reproductive cloning or reproductive regeneration.

We are against cloning or reproducing the Michael Jacksons and the Michael Jordans in this world, and also, we are totally against designer babies. Therefore, we are not interested in manipulating the genetic information, the genome, but rather just allowing those mothers and fathers to be, to become biological fathers and mothers of those children, and, hopefully, those children will be healthy children and we are totally committed to that.

DR. SHULMAN: Thank you.

PARTICIPANT: Well, you actually both raised some interesting regulatory issues. You are against designer babies, but you are for cloning. So where are you going to stop this pathway, and how would you foresee the Government regulating it, since obviously this is where we are going?

DR. ZAVOS: This is a very good question, obviously, and I think that for our Government, a responsible government, not to be able to debate this issue as vividly as we want them to -- I participated in a debate on "Face the Nation" with Congressman Weldon, who I found to be totally naive and ignorant. This is a man who has introduced the bill that George W. would sign to ban reproductive and genetic cloning in the good old USA, and this is not the way that we ban technologies. This is not the way we make decisions. We, rather, debate those issues, educate those Congressmen and the public, in order for the public and the Congressmen, their representatives, to make a reasonable decision.

This is an issue that needs to be addressed in a responsible fashion. We don't want to develop this technology in clandestine laboratories, but if this is a choice that is given, we will. However, I am known to be doing research in laboratories and such under IRB reviews, and I have participated in NIH-funded -- I have been funded by NIH before, and, therefore, I am prepared to do that, but I am only prepared if they don't call me a criminal, but rather a scientist that I am and totally dedicated in this area of reproductive medicine.

DR. BILLINGS: Let me be just perfectly clear. Human reproductive cloning and human germline genetic manipulation done by scientists and physicians should be criminalized and banned.

Experimental cloning, under those circumstances, should go forward in a regulated fashion, and there should be high standards of outcome measures and quality control in all assisted reproductive technologies.

PARTICIPANT: Well, having said that it should be criminalized, where would you draw the line on that? Because we are actually doing germline transfer in this country when we transfer mitochondrial DNA.

DR. BILLINGS: Right. First of all, I don't think the germline -- I consider the germline to be the manipulation of the nuclear genome; that is, the manipulation of the nuclear genome. What you are talking about in terms of transfer of viable mitochondrial genome genes is a different process, in my view.

Second of all, I think it is very clear that cloning for reproductive purposes can be distinguished, because there is a gestation and a birth, from cloning for experimental purposes that might lead to therapeutic advantage.

DR. ZAVOS: Well, we can argue here as to who came first, the chicken or the egg. When we talk about reproductive cloning, we promote and we allow that embryo that is produced to go to full fruition and yield a viable child, healthy child.

In the business of stem cell research using clone embryos, we are allowed there to dismember those embryos, and I mean dismember them. That's the word that I like to use because, truly, we are taking them apart. We take the stem cells, the blastomeres, and we create a tissue culture to treat some 80-year-old man's disease by killing a viable embryo that could give rise to a child. Therefore, I don't know who needs to be criminalized here, those that kill or those that promote fertility, those that promote a life of a young child. That is really the issue here.

I think that they look at themselves as the great saviors, and by my definition, they are not.

DR. SHULMAN: Are there any other questions from the audience?

[No response.]

DR. SHULMAN: I think it is clear that this particular topic is incredibly complicated by the molecular biology of the topic which doesn't, in a sense, lend it to very simplistic discussion of the technology here, and, again, as something that I think many of us are well aware of, both moral, ethical, legal issues that surround whether or not -- even whether or not this research should go forward.

I would like to ask a question, and it is sort of a follow-up to yours. Many of us have at times in our careers either sought Government protection and assistance and at other times protested Government assistance in our practice. Where would you see the role of a Federal, a State, a local government in either -- not so much in the support of such research because, in reality, a ban on research is not really a ban on that research.

When you hear about the Federal Government saying they are banning research, what you don't usually read in that article is that they are not allowing Federal monies to go forward to support such research. In fact, through the Clinton administration, there was such a ban on research for that, but monies were spent on other aspects that could get around, in a sense, that "ban."

What I would ask both of you -- and I am going to give you both 3 minutes because we are somewhat ahead of time -- is State, local, Federal Government, where do you see the Government involved in this, and where would you like to see the Government involved with this?

I will start with Dr. Billings.

DR. BILLINGS: Well, I am generally not in favor of Government's mixing in science and medicine, and it takes a lot to get me to advocate for anything but the kind of historical regulations that we have seen that have led to better drug industry and better therapeutic products in many of the ways in which the American practice of medicine is way superior to other countries' practice of medicine.

That said, I believe that there ought to be not a local and not a State ban on human reproductive cloning, even though I helped write the bill in California. I believe there ought to be an international ban on human reproductive cloning, and I and others have begun the process of starting an international convention process that would lead to an international ban on reproductive cloning.

It is already prohibited in the Council of Europe statement. It is already criminalized in Japan and in 25 or so other nations, and I believe that this is the beginning of a uniform process. I would like to see it be very clear, very simple, and, thus, would not likely impede proper research.

DR. SHULMAN: Thank you.

Dr. Zavos?

DR. ZAVOS: Well, obviously, coming to Washington and found to be a criminal, it is not an insult to me. I am a dedicated scientist, and by no means -- the only thing I got in my lifetime was a speeding ticket or two. Therefore, I do get a bit offended when somebody says let's criminalize this because it is just a simple way to do it.

I made a statement to the Congress of the United States about 6 months ago by saying those that ban this technology will not be the Neal Armstrongs that would fly us to the moon and walk us on it, and this applies, obviously, to every development, every scientific, medical and otherwise.

When we were transplanting hearts, we almost thought how can you take somebody's heart and put it in somebody else's. If we would just ban every technological achievement, if we were just to go back to the caves, we will be there today with Mr. bin Ladin, and we don't intend to be there. We are trying to get him out of the caves.

Therefore, the future of this humanity of ours is we are striving to develop new technologies, and this technology will be developed. I think that the Congress of the United States realizes that, and that is why they are really trying to take some action on it.

I am also against the Government getting involved with science and R&D's and that kind of thing, but at the same time, I am saying that if at least you do not fund this technology, don't ban this technology because we are simply -- when Dr. Billings says here that it is criminalized in Japan, who are the Japanese now to call us criminals? Obviously, they killed millions of people, 40, 50, 60 years ago, and today, they are going to say, well, you cannot clone somebody because it is a crime in Japan? I have already talked to the Japanese quite extensively, and I debated the issues with the Japanese quite extensively.

All I can say is that this technology is very popular among people that wish to have children of their own, biological children of their own, and, therefore, I did not solicit anyone out there, and I have 3,000 couples that wish to participate in this effort. That tells you, really, whether they wish to have this criminalized or they want this to be developed and made available for them in order to have children of their own.

The issue here is such that we are talking, as we all know, about infertility couples; that even if there is one here on this first table, he is not going to get up and say I am a infertility couple, I wish to have a child, and I want to make a statement. They don't do that. They are a very silent minority, and we will respect that, but we will be striving towards satisfying and meeting their needs, and that's what we are here for.

Thank you very much.

DR. SHULMAN: Yes.

PARTICIPANT: Do you have any suggestion of the Government is not going to have any kind of ethical guidelines or decisions about this, about whether the physicians should? I mean, do you have any kind of medical ethicists on your board that counsels these potential patients?

DR. SHULMAN: One minute each. Dr. Billings?

DR. BILLINGS: I assume you are directing that primarily at Dr. Zavos.

DR. SHULMAN: Oh, one minute.

DR. ZAVOS: Yes, we do have ethicists, and, of course, the best ethicist, as you may know, being in a medical system or a medical setting is the doctor and the nurses themselves. Obviously, they are driven by ethics, and when that door closes and whether that woman goes for a pelvic examination or any kind of examination, obviously those ethics guide that doctor and guide those scientists, guide the people, and we don't want some bioethicist out there that has been appointed by the genome corporation or any other company that put him on the payroll to tell them whether they are ethically correct or not.

I debated some of those ethicists. Trust me. You can buy two for a dollar.

DR. SHULMAN: We should have known that. It would have helped our honoraria.

[Laughter.]

PARTICIPANT: Not that much, really, Lee.

DR. ZAVOS: Let's make it 75 cents. I will up the price.

PARTICIPANT: I would like your comments on this. Is there anything like inherent, programmed genetic cellular death? If there is, what is the wisdom in taking, for example, genes from an 86-year-old man and cloning it?

Thank you.

DR. BILLINGS: Well, the study of cellular apoptosis or programmed cellular death is a relatively new field of cellular biology and molecular biology. It is about 15 or 20 years old.

Yes, there appear to be genes that are involved in programmed cellular deaths, and these are some of the genes which would need to be reprogrammed if cloning were to be successful.

In my initial comments, I said that we are really not sure that that can be successfully done. The fact that after many, many unsuccessful attempts and failed attempts that some animals have been cloned doesn't really say whether you can actually do that in a controlled way that would be clinically acceptable.

Let me just say that I don't care how many people currently, under current conditions, say in a poll or come to Dr. Zavos and say I would be interested in being cloned. If the facts of what the experimentation show and if people are presented with all the possible outcomes, with the fact that this is unprotected human research, that the outcome would be uncertain and potentially very severe, I would be surprised if all those people would still want to consent for this kind of experiment on manipulation.

DR. SHULMAN: One minute.

DR. ZAVOS: I wish that I had some of those people here with me today to tell you that we don't care. We do care, though. I personally do care about the safety of those people, and, therefore, that's what makes the difference between them and ourselves.

Infertility people are very susceptible to the decision-making process, and they are very emotional about the subject. Therefore, we do care. Dr. Billings, about how many people are interested because we are in the business of helping people, and, therefore, we listen to them. When people say we want this technology developed and made available to us, as long as it is safe, we would employ that.

Bear in mind that the success rate in IBF today is only 30 percent. That is 3 out of 10 chances. When you pay 10- or \$20,000, that is the success that you get, and I think we are reaching that level with animal models today and I think we can do much better with the reproductive cloning than IBF.

Thank you.

DR. SHULMAN: One brief response.

DR. BILLINGS: You know, Dr. Kevorkian raised an issue in our society which is an important one, which is the care of the terminally ill and are we offering them the most technologically advanced and appropriate care. On the other hand, Dr. Kevorkian was a rogue and a criminal.

DR. ZAVOS: I hope that you are not equating Dr. Kevorkian with me today. If you do, all I can say is shame on you.

DR. SHULMAN: And I think it's time for our summations.

[Laughter.]

DR. SHULMAN: I think it's clear that this is an incredibly complex topic that, again, is not at least currently amenable to simple catch phrases or descriptions.

Let it also be clear that genetics and genomics have been an integral part of health care. As you have heard from the beginning of life -- [audio break].

[Side B of audiotape begins.]

DR. SHULMAN: So we continue to have to do both, evaluate the role of genetics and improve the environment in which we all live, but for those of us who choose to ignore or don't want to face the reality of genetics and genomics in our health care, understand that from the chlamydia test you provided to your patient yesterday to the prenatal diagnosis that you referred your other patient for to the new CF screening guidelines that are required now for all obstetrical providers in the United States and to be RCA-1 and -2 screening for those families and women who are at risk for breast and ovarian cancer. Genetics has become a part and parcel of women's health care and health care in general, and those of us who truly do choose to ignore that role are going to become anachronisms in a very short period of time. I say this not as an OB/GYN and a geneticist. I say it as a physician and a health care provider.

What I hope happened here this morning -- I am glad there were not fisticuffs because then I would have needed my referee's role, although we are not done yet, but what I hope happened here is not so much that any opinions were cemented for you, but that this issue was, in fact, open for you. Read about it. Go to the Internet. Find out about it. Again, I think the ARHP documents that are available are an excellent introduction, and I also have to commend this organization not just because I am a member and involved with it, but that this is one of the few organizations that would truly stand up and put this out for its members and for its guests, really not -- I hate this term -- not just thinking outside of the box, but really introducing for us what is going to be the very near future for health care professionals in the United States.

The one thing we did do is we switched things around, and we are going to have Dr. Zavos provide us his closing remarks first.

DR. ZAVOS: It has been a privilege for me to be with you again and among you, and I will encourage any of you that wish to discuss anything with me, I will be available right after this gathering. If you wish to obtain more information about what I do, you can go to www.zavos.org, and you can extract more information, as you wish. You can even send me an e-mail, if you so desire.

In this business, the business that I am in, we are totally dedicated in helping people. This is a people's business. We do that 24 hours a day, 7 days a week.

As a director of the Andrology Institute of America that treats male infertility, as the co-director of the Kentucky Center for Reproductive Medicine and IBF, we take care of the female patients and we allow couples to have children and perpetuate the species and complete their life cycles. This is what we do for a living, and this is what we intend to continue to do because this is what drives us.

Now, I also would like to thank the ARHP for inviting me at this gathering. It has been a privilege. I can't resist in thanking the chairman of this session, Dr. Shulman, for doing such a wonderful job in sitting between us, Dr. Billings and myself, and buffering the situation as appropriately as possible.

Inevitably -- and I really would like to say that no doubt, humans will produce, be it reproductive regeneration. Whether it is criminalized in Japan or in France or elsewhere, there are laws or bans in some countries, but there were 170 countries that are wide open. Therefore, 170 countries, as we say in Kentucky, ain't hay. It is a lot of territory.

Therefore, we can't just say we in America and say that is the world. We can't anymore. We have got illusions about that. Today, we are chasing Mr. bin Laden on Tora Bora and we are throwing the best bombs that we can. We can't even find him, and we pay \$25 million for somebody to tell us where he is. Therefore, we as Americans have to realize that this world is wide open for all of us, for all nationalities, and 23 years ago, IBF was banned in the U.S. for 6 years until it became a \$1-billion industry and we invited IBF in. Therefore, it is wide open, that cloning technology will be developed, and similar to IBF, the technology of reproductive regeneration will advance, techniques will be improved, and knowledge will be gained.

Reproductive regenerations, difficult questions -- and that is cloning when I refer to that -- difficult questions can be answered only through a dedicated pursuit of knowledge and an exercise of our willful rationality, and in the end, the answer to the debate over human nature may be simply that the nature of man is the product of his own will.

Thank you very much.

DR. SHULMAN: Dr. Billings.

DR. BILLINGS: I, too, want to thank you very much for having this discussion. If you would like to know more about how GeneSage supports reproductive health practitioners, go to www.GeneSage.com.

I am also the editor-in-chief of the most widely read Internet publication which is free on generic medicine and society, and that is www.GeneLetter.com, and some of these issues has been discussed in GeneLetter over the years.

I hope you see this as an opportunity, as one kind of technology that this group needs to consider, and that it is not fundamentalism. It is not anti-women's rights or anti-abortion to consider limitations on technology and to ensure the highest standards of safety in when a technology is applied.

Now, about a year ago, I drafted a statement which was then transformed into a statement on human cloning by advocates of women's health and reproductive rights and circulated widely.

It has been signed by hundreds of health care professionals, including many who are familiar to -- and for those of you who would like to know who signed this, I would be happy to share those names with you, but let me just read you the part about human reproductive cloning that generated the statement.

Human reproductive cloning represents one use of methods that involve the transfer of human cellular nuclei from one cell to another. Nuclear transfer may have important experimental and clinical applications in the future to support tissue and organ regeneration and replacement, but experimentation or application in the assisted reproductive settings for the purpose of producing complete live-born individuals is not appropriate. As with human germline genetic manipulation, it is difficult how the safety of human reproductive cloning could be established using currently acceptable research practices. There is no overriding clinical rationale for the use of human reproductive cloning. The use of this technology for human reproduction would create a new category of biological identify, clones. The social implication of such a development are uncertain and fraught with great risk. Nonetheless, rogue scientists have publicly announced their intent to begin human reproductive cloning. While science flourishes by individual creativity and perspicacity, it must also enjoy the acceptance and trust of the public and its oversight. Human germline genetic manipulation and human reproductive cloning represent extensions of scientific methods that endanger people and, thus, the scientific enterprise itself. For the sake of the promise of human progress that science embodies, these methods should be prohibited.

Thank you.

DR. SHULMAN: Thank you.

I want to thank all of you for attending. Please enjoy the rest of the meeting. This debate, this discussion, will continue, assuredly.

Thank you very much.

[Applause.]

[End of audiotape recording.]

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