

IIIII THE GENE MEDIA FORUM IIIII

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Promoting public dialogue of genome research and its impact on science and society

TRANSCRIPT

Cloning: The Debate

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Co-host:

New York Academy of Sciences

Alan McGowan:

Good afternoon, ladies and gentlemen, and thank you very much for coming. My name is Alan McGowan, I'm known as two things. One is the President of the Gene Media Forum, the second is the person who gets the credit for the work that everybody else does. And in this case, that work was done by Erica Cerilli, our program director and Laura Weber, who have talked probably to 30 to 35 people, including the senators involved in this issue, and otherwise, in putting together this panel.

It's a great please and honor for me to be with you, and to introduce the moderator. Before I do that, I just want to point out to you that after the session ends, right at 3:30, Mr. Reeve will go back into this private room, and will then leave some time thereafter. When he does, we will clear the room and the space, and please just let him exit without trying to stop and talk with him, and so forth, if you could respect that, that would be very good.

It is also, I'm the person who introduces people who probably need no introduction, and Craig Venter is one of those people. And we are really very pleased that Craig, after giving a talk at 8:15 this morning in Atlanta, was able to get on a private plane and come here in order to moderate this session, because he feels so strongly about the importance of this issue, as we do. As you may know, he is the President of three newly formed organizations, the TIGR Center for the Advance of Genomics, the Institute for Biological Energy Alternatives, and the J. Craig Venter Science Foundation. These organizations are all dedicated to exploring social and ethical issues in genomics as well as seeking alternative solutions to energy through microbial sources.

He's published more than 224 research articles and is among the most frequently cited scientists in biology and medicine. And as many of you know, he decoded the genome of the bacterium hemophilus influenzae, making it the first free living organism to have its full DNA deciphered and to date has also sequenced over 25 genomes. He's a recipient of numerous honorary degrees and scientific awards, including the Paul Ehrlich and Ludwig Darmstaedter Prize, the Tekeda Award, 2001, Techno-Entrepreneurial Achievement, that's what it says here, for Individual/Humanity Well-Being. The 2000 King Faisal Award in Science, and those of you who read the newspapers or *Science* magazine know what he was recently voted into as a member of the National Academy of Sciences. It's a great pleasure to welcome Craig Venter to this podium.

Craig Venter:

Well, good afternoon, I'd certainly like to start by thanking Alan and Erica and the Gene Media Forum for convening this public forum to discuss what I think is one of the most important issues in research and society today, and I think we're increasingly faced with social and ethical issues based on science, and I certainly believe that an open public dialogue is an imperative tool for improving public understanding. The public must have confidence in the integrity of scientists on the leading edge of these areas of research, and in turn scientists must take an active role in education of the public and elected leaders, and we have some of the key scientists involved in doing that today.

Currently there are two bills before Congress, the Baum ... Brownback-Landrieu, and the Kennedy-Feinstein bills, and it look like they will go before the Senate for a vote some time in June. As many of you know, the Brownback-Landrieu bill seeks to limit all forms of cloning, both reproductive and therapeutic, and would go further in that bill because it would criminalize both the scientists doing

the research and I think for the first time ever considered in history, criminalize the patients and the families who would treat ... seek treatment in the U.S. or abroad. The Kennedy-Feinstein bill would criminalize reproductive cloning for the purposes of creating a human being, but allows therapeutic cloning or somatic cell nuclear transfer for research purposes and life saving therapies.

Each of the panel members will speak for five minutes and then we'll happily take your questions. Not in the order they're sitting there, but in alphabetical order, let me start with Dr. Rudolf Jaenisch, he's an MD. He's a member of the Whitehead Institute and a professor of Biology at MIT. Dr. Jaenisch is a founding member of the Whitehead Institute, and is one of the founding members of the field of transgenic science. His lab has produced mouse models leading a new understanding of cancer and various neurological diseases. He's also made important contributions to cloning technology, studies of cloned mice, (Inaudible) help decipher how this genome from adult cell is reprogrammed to create a new organism.

According to Senate testimony from Dr. Jaenisch last year, and I quote, "cloning is an extremely complex area of biology, in which the process itself is now only beginning to be understood. It's premature to ban a technique that is still in the process of evolving, and at no point in our nation's history has Congress banned an area of scientific exploration or technology by federal legislation."

Next is James Kelly, he is an activist for spinal cord treatment, due to suffering a cervical spinal cord injury in 1997 in an automobile accident, Mr. Kelly is paralyzed below the shoulders. Since his accident he has transferred his professional trouble shooting skills to learning all he can from leading scientists and peer reviewed journals. His hope is to mobilize these scientists who work together towards fashioning an effective cure. During his recent Senate testimony, Mr. Kelly stated, "I think it is highly immoral for researchers to encourage the sick, crippled and dying to cut their own throats by supporting cloning, a research avenue whose extremely speculate potential lies somewhere in the distant, hazy future, to the detriment of proven avenues that offer more than futile help."

Dr. Stewart Newman, who is a Professor of Cell Biology and Anatomy at New York Medical College. Dr. Newman directs a federally funded laboratory in developmental biology. He's a founding member of the Council for Responsible Genetics in Cambridge, Mass, which is a public interest organization concerned with guarding against the misuse of biological science and technology. Dr. Newman predicted in recent Senate testimony, you can see a common thread here, everybody speaks before the Senate now, (Scattered Laughter), "If embryo cloning is permitted, within a few years frustration over lack of progress in producing safe and effective therapeutics from (?) embryo stem cells will lead to calls to permit harvesting of embryo germ cells from two to three month clonal embryos, and we may find ourselves here again."

Last but certainly not least is somebody most of us consider a national hero for his efforts, Christopher Reeve, since he was paralyzed in an equestrian competition in 1995, Christopher Reeve has become an activist and powerful spokesman for people with disabilities for the benefits of medical research. He's not only put a human face on spinal cord injury, but he has motivated neuroscientists around the world to attack the most complex diseases of the brain and central nervous system. Mr. Reeve is chairman of the Christopher Reeve Paralysis Foundation, formerly the American Paralysis Foundation. To quote Mr. Reeve, "If nucleus transplantation, aka therapeutic cloning, is banned, it will be a tremendous setback for science, and it will be indefinitely ... it will indefinitely prolong the suffering of hundreds of millions around the world, who are afflicted with wide variety of diseases and disabilities."

So you can see we have a spectacular panel of highly motivated, educated individuals. Each will start off with a five minute statement, starting with Dr. Jaenisch, followed by James Kelly, Stewart Newman and Christopher Reeve, and after that we'll take your questions. Dr. Jaenisch.

Rudolf Jaenisch:

Thank you. I am a Professor of Biology at MIT and I have a long-term interest in the mechanisms of mammalian development. In recent years we have focused on trying to understand the problems in

cloning of mammals, particularly of mice. So two issues, the focus of this discussion today, reproductive cloning and therapeutic cloning, I will be very brief on reproductive cloning. I have argued before, in Congress and other occasions, and this is unsafe and will remain so for the foreseeable future. I believe there actually principal biological barriers to make it ever really safe. So I will really better support therapeutic cloning and I want to concentrate on that.

So I want to discuss four aspects of nuclear transfer technology. The first one is the medical reasons why do you want to do this? Secondly, scientific aspects, is it feasible? Third, are there alternatives? And finally, what are the ethical, moral issues of using human eggs, from a biological point of view? So the medical reasons. The technique of therapeutic cloning combines nuclear cloning and embryonic stem cell research with the goal of creating a customized stem cell line for a needy patient. For instance, if anyone of you is severely diabetic, one would take, for example, a skin cell, remove its nucleus and transfer the nucleus into a human egg from which its own nucleus has been removed. The nucleus would be injected then ... would be ... and then the nucleus of this cell is exposed to signals of the egg, it reverts to its embryonic state, and your skin cell begins to re-express those things that it expressed when it was an embryo.

Whether the cell that results from this is a new embryo or a skin cell rejuvenated is as much a question of philosophy as of science. The cloned cells can be grown in the petri dish and can be induced to differentiate to insulin producing cells and implanted into you back. They will not be rejected because they are from your own body. So this is one possible scenario, medical scenario, there are many others, including treatment for Parkinson, blood diseases, liver diseases and so on.

Secondly, the scientific aspects, is this scenario feasible from scientific reasons? This is rather hot and often distorted debate recently. My laboratory just recently published a proof of (Inaudible) experiment, curing a genetically caused immune deficiency in mice. Our procedure combined the creation of a tailored embryonic stem cell by nuclear transfer into (Inaudible), the correction of the genetic defect by gene therapy, the differentiation of those cells to bone marrow cells and then finally the transplantation of these cells into the patient (Inaudible) mouse, with a restoration of the immune functions. The experiment shows that there's no principal problem applying nuclear transfer technology to therapeutic cloning for cell therapy.

Clearly, what is left is to learn to manipulate embryonic stem cells to generate other than bone marrow cells, and to learn how to do this with human embryonic stem cells. But I want to emphasize there is no principal biological problem which would prevent the application of this approach to the therapy of human patients. It is therefore somewhat surprising and actually disturbing that some, as for example, Senator Brownback, says that our experiment really proves that therapeutic cloning does not work. It's the opposite of the result and really distorts clear scientific evidence. An important issue of course is can transplanted ... cell transplantation work in principle for human patients for any disease? And I think the clinical evidence is very clear.

It has been established (Inaudible) for example, for Parkinson disease, you can use fetal brain cells from an abortus(?), or for treating diabetes, you can use eyelet cells from corpses. That works, this cure to the patients. The problem is, you need for one patient, for one Parkinson patient, the ... six abortuses, fetal brains, and there are not enough corpses to supply the needy patients with eyelet cells. The conclusion from all this is that only embryonic stem cells could provide the cells needed for an effective medical application.

Are there alternatives to nuclear transfer, such as adult stem cells? Let me come to adult stem cells. Adult stem cells have attained much attention. And the question is, can they provide another source for transplantation? Adult stem cells are isolated from a variety of tissues, and it has been suggested they can differentiate into functional cells such as nerve cells, muscle cells and so on. The hope is that such cells can be isolated from the adult, and conserved as a source for transplantation, this would propose no ethical problem, because no human eggs would be used. Now, what is the potential of these cells? There has been a lot of hype over the last few years and actually in recent months evidence has appeared that questions, seriously, some of the conclusion of the published work, and I'll summarize those concerns.

There exists no evidence whatsoever which would provide a proof of principle that these cells could have a therapeutical potential, therapeutic potential. The exception of course is bone marrow stem cells, which we know for 30 years to be very useful. So this (Inaudible) have learned how to use bone marrow stem cells. The most interesting claim of adult stem cells from the bone marrow or from brain or from other sources is that they could form cells of other lineages than their own. Now these claims have become somewhat doubtful by recent experiments which suggest alternative interpretation of some of the published data, and often some of these published results can not be repeated by others. It's a very evolving field.

It's clear that adult stems are rare, they're difficult to isolate, and nobody has been able to grow these cells for any prolonged time. I should say this is a very exciting field that needs to be explored with many (Inaudible). My laboratory is actively involved in research to find these cells, but we are not there to assess their therapeutic potential. So there's some ... then we come finally to the ethical and some moral issues of using human cells, human eggs. An important issue of course in this debate is ... concerns the use of embryos that have the potential to develop into human being as a source of generating a cell line. I want, based upon biological facts, emphasize a critical difference between therapeutic cloning and the derivation of embryonic stem cells from an in vitro fertilized embryo. All existing embryonic stem cells are derived from in vitro fertilized embryos.

In vitro fertilization, the embryos has a unique combination of genes that has not existed before, and it has a high potential to develop into a normal baby, healthy baby when implanted. In therapeutic cloning, the embryo has identical combination of genes as a donor, has no conception. Therefore the cloned embryo does not represent the creation of new life, but rather reprogramming and rejuvenation of an existing cell from your body. One could argue it's a special form of transplantation. The cloned embryo has a very low, exceedingly low potential to ever develop into a normal baby, because of the overwhelming problems which is associated with reproductive cloning.

So the generation of embryonic stem cells from cloned (Inaudible) for the purpose of therapeutic cloning would appear to pose fewer ethical problems than the generation of embryonic stem cells from in vitro fertilized embryos, and the majority in this country certainly supports that. So let's summarize then.

The field of stem cells is very exciting and very young. Embryonic stem cells is a field which has matured, we know it works, in adult stem cells we do not know this. So the question really is, do we want to close the door to the most advanced and promising research and deny the many now suffering patients a potential cure? So to criminalize therapeutic cloning in this country poses serious ethical problems, I believe. Given that adult stem cells research is still in its infancy, can we afford to wait and put away with embryonic stem cells? Do you want to tell patients who suffer now of debilitating diseases that they will have to wait for an unspecified number of years until the technical problem ... with adult stem cells have been resolved? In contrast a patient in Britain of course may in a few years be able to get this type of therapy. So I think the conclusion would be very unfortunate and would stop research on embryonic stem cells because of the unfulfilled potential of adult stem cells. Thank you.

Craig Venter:

Thank you very much. And the panelists, try to stick their initial time for the opening statements, that'll leave plenty of time to make their points later. Mr. Kelly?

James Kelly:

Yes, sir. Hello. Complex ... sorry about that. Complex technical obstacles stand in the way of human cloning through somatic nuclear transfer ever being medically used in humans. These obstacles include short and long term genetic mutations, tumor formation and unexpectedly tissue rejection. In addition, the cloning process is very inefficient in itself, often requiring a hundred women's eggs to create an embryo able to yield stem cells. Because of these road blocks, scientists expect it will take decades before cloning will have clinical uses, if ever, regardless of whether stem cells from cloning ... cloned embryos can show results in the lab. And leading

scientists in the embryonic stem cell field, including James Thompson, have admitted that the cost of cloning based therapy would be astronomical. Others have simply said that no one can afford it.

If human cloning research is allowed to move forward, these obstacles will need to be overcome for each of cloning's potential medical uses. This will unavoidably necessitate diverting crucial resources from other avenues that have already proven their ability to safely address the conditions that cloning has only hoped to address in the distant future. In humans, adult stem cells have successfully been used to treat multiple sclerosis, diabetes, certain forms of cancer, stroke, Parkinson's disease, and immune deficiency syndrome. They're in clinical trial for spinal cord injury, heart disease, and ALS. More work certainly needs to be done to refine and expand their uses and to improve their performance, but refining, expanding and improving are far cries from embarking on a new, highly problematic research, with little hope of leading to medically available treatments. In fact, such a trade off would be madness.

Yet we're being told that cloning is our brightest hope to cure disability and disease. Many sick, disabled and dying people have embraced this message in the name of desperation and trusting hope. In supporting cloning, Christopher Reeve unwittingly misled the Senate with at least seven false or misleading statements in his March fifth testimony. The press has misled the public through reporting such false and misleading statements, or distorting the results of scientific studies. Yet without a doubt, Christopher Reeve wants to regain his life as badly as I want to regain mine. You and the press surely wants cures to be available for you and your loved ones in your own moments of need. Therefore I can only assume that you and Christopher Reeve, both really believe what you are being told about the miracle of cloning. And you're being manipulated into cutting your own throats and the rest of America's too. Please consider this:

According to Dr. Wise Young of Rutgers, a growing consensus in their regenerative research field acknowledges that stem cells on the verge of maturing into their final adult cell type are the most desirable cell type for transplantation. These are not the early embryonic stem cells that scientists would like to harvest from cloned embryos. Nor does science have any way of bringing stem cells from cloned embryos to this most desirable stage. Yet the press has reported to the public that stem cells ... I'm sorry ... yet has the press reported to the public that stem cells from cloning aren't considered the most desirable cells for medical purposes, even if their technical hurdles could be overcome?

Why not? I'm willing to bet that none of you knew of this growing consensus. Furthermore, the study that led to Dr. Young's comments was reported in such a way to the uninformed, it appeared to be a major breakthrough for cloning, when in fact somatic nuclear transfer in the female eggs had nothing to do with it at all. Possibly the reporter didn't understand what he or she was being told, therefore, who was being led by whom. And finally, are you aware that recent research has shown that genetically matched cells, or stem cells, may be made directly from adult skin? This development strongly suggests the previously mentioned most desirable cells for transplantation could be made that would genetically match each patient through a rational, safe, and reasonably affordable process.

The process used in this study was tested twice, and was successful twice. It's expected to produce genetically matched cells of any stage, including embryonic if needed, but without making embryos. In the current political climate, this breakthrough was simply colossal. Yet, it was barely reported in the popular press. Was this an overlooked omission, or did no one explain its significance to you? And through you, to your readers. If not, why? If cures are needlessly slowed through the diversion of crucial funds, resources and research careers to cloning, then millions of people will needlessly suffer and die. Is it the proper role of the press to lead its readers to self destruction? If not, who's misleading the press? Thank you.

Craig Venter:

Next we'll hear from Dr. Newman.

Stuart Newman:

Thank you. I'm a developmental biologist. I work on early limb and organ development in chicken embryos. I'm here to argue that not only is full term cloning a bad idea, as Dr. Jaenisch forcefully pointed out, but that so-called therapeutic cloning, that is, nuclear transfer to make stem cells, is also in the long run going to be a bad idea. And I want to emphasize that my views on this don't arise from any notion of the sanctity of the embryo or any religious ideas or anything like that. But I do feel that there's probably nobody in this room that won't have some point in which they say, this is unacceptable. So for example, if a clonal fetus is allowed to develop to seven months, in order to harvest cells, this might be unacceptable to more people than growing clonal embryos for only seven days or 14 days.

Probably everybody in this room would say, we certainly don't want to make full term babies for the purpose of transplanting tissue. Probably everybody would object to that. What I would like to convey to you is that the logic of the science and medicine is leading us in that direction. Not because anybody is motivated to do that per se; specifically, I don't think any of the scientists involved are motivated to do that, but there are all sorts of pressures, patient pressures, commercial pressures--and the patient pressures I believe are very genuine, authentic and must be satisfied in some way, so I'm not arguing that there shouldn't be patient pressures--but there will be pressures to bring us to the point. As was quoted from my Senate testimony, there are, in fact, stem cells that can be harvested from two month old embryos. These are called "embryo germ cells."

So if clonal embryos were produced, and it became possible, as some scientists are attempting, to grow the embryo for two months rather than just for seven days or 14 days, it would be possible to harvest these embryo germ cells. Now, why would you want to do that? John Gearhart at Johns Hopkins has worked on those cells, and has shown that they are apparently as versatile as embryo stem cells from the early petri dish cultures, but they don't have the same propensity to cause cancer when transplanted into adult animals. Now that's a very important motivation for harvesting these later stem cells.

Last year, 2001, was the twentieth anniversary of the first report of embryo stem cells in mice, and on the occasion of that anniversary, I wrote an Op-Ed piece, which I sent to about 15 newspapers, including the newspapers of some reporters in this room. It wasn't published, but I pointed out as a scientist, that 20 years of experience of embryo stem cells in mice has led to just maybe a handful, less than six papers that showed any therapy or palliation in mouse models of human disease.

Dr. Jaenisch mentioned the scenario of treating diabetics with embryo stem cells. But one of the problems in Type 1 diabetics is that they reject their own insulin producing cells. So even if you could clone that person into a clonal embryo, grow up islet cells and transplant them back into the diabetic, the person's immune system would still reject those cells. So you would have to find some way to immune-suppress the diabetic patients anyway, so as to treat them with embryo stem cells. I think that the American people are very optimistic and only want to hear about the promises, and don't want to hear about the downside. I just point out that in a very recent paper of Dr. Jaenisch 's that he spoke about, where he showed the proof of principle of using stem cells and transplanting differentiated bone marrow cells back into the mouse with the immune deficiency, there was another experiment as well where they corrected the genetic defect in the embryo stem cells. The embryo stem cells were used to produce a full term clone of the original genetically defective mouse, but with the genetic condition corrected. They now had a genetic twin of the original mouse with the corrected gene, and were then able to use bone marrow from that corrected mouse to treat the original mice.

Now here's a scenario for which many people would say, "great!" People are already having new children to provide bone marrow for children with genetic conditions. If the public was aware that now you could clone your sick child and use the bone marrow from the new child--whom you'll love like your old child, of course--and transfer that bone marrow back into your sick child, huge sectors of the public would find that acceptable. And this is what I mean when I say that we're on a track where we're coming closer and closer to full term cloning, by way of all sorts of intermediate stages. And it's not that there aren't people already advocating this.

Dr. Jaenisch has argued very strongly against full term cloning, and as developmental biologists he and I know the reasons that this should never be attempted. But there are many people out there, bioethicists who are saying, well, we take risks every day in our lives. If it's risky to have a cloned child, well, so be it. We go out and drive our cars, right? We breathe the air. So let's take these risks. And this is crazy. But apparently otherwise responsible bioethicists are advocating this. And to my mind, this is going to happen; it's virtually inevitable unless legal restrictions are put in place. I disagree with some of the very punitive criminalization of scientific activities and therapies from abroad in the proposed Brownback legislation. I think something has to be done about that. But on the point of prohibiting embryo cloning, I think that it must be done, or we'll all wind up in a place where we don't want to be.

Craig Venter:

Thank you, and now, Mr. Reeve.

Christopher Reeve:

My greatest fear is that what we fear today will become commonplace tomorrow. And it's been shown time and again in our history, for example, when vaccines, immunizations against certain diseases became available, early in the twentieth century, there was a real fear and in fact strong opposition from the private sector and the government because the idea say for a vaccine against ... immunization against measles meant the introduction of a small amount of measles into the patient, and people couldn't comprehend that that would be actually the solution to contracting measles.

Now of course today, vaccinations, immunization are commonplace, and in fact required in many areas. You know, before you even travel overseas and right now the government is stepping up its program for immunization against smallpox. In the 1970s, government, the NIH, was working with a number of scientists on in vitro fertilization, however the buzzword of test tube babies came up and suddenly the progress was halted until an advisory commission could be formed, and funding was stopped in the meantime. In England, they went ahead, pursuing the technology, and the first cloned ... correction, the first, quote, test tube babies, or in vitro fertilization baby was born in 1978.

And then a few years later restrictions were lifted and in the United States the first test tube baby was created in 1981. Today, there are four hundred in vitro fertilization clinics across the country and approximately 179 thousand humans walking around today just in America who were created in a test tube. And it's absolutely routine, in fact in Senator Brownback's own state of Kansas, there are five clinics, and what is difficult as me as a patient to accept is that in those clinics, just ... I did research on the year 1999, as an example in that year, six thousand fertilized embryos were created for implantation. And out of that number, four thousand of them were thrown away. Perfectly viable fertilized embryos that were discarded, with the consent of the couples who were undergoing the in vitro fertilization process.

Four thousand that had been created by the union of male and female. And yet, in Senate testimony, Senator Brownback was asked whether or not he's in favor of in vitro fertility clinics, and he said, they're fine by me, many of my friends had fine children that way. However, on the subject of therapeutic cloning, which does not require the union of male and female, in which an egg is not fertilized, he believes that that little clump of cells, that's three to five days old, that could have its nucleus removed and have the patients' DNA put in for protection, he has literally described, he said this on the Charlie Rose show a couple of months ago, he thinks that that little clump of unfertilized egg cells is an individual, and has the same ... should have the same standing as an individual.

I am deeply disturbed by the contradiction of what I see as a disconnect there, and deeply disturbed that he has been able to influence so many of his colleagues in the Senate. Where I think his position comes from no actual moral center, but is basically political and the reason that I have so fervently support **therapeutic cloning, first of all, it is probably going to be, according to many scientists, the best possible treatment for patients suffering from a very wide range of diseases. Parkinson's, Alzheimer's, diabetes, stroke, brain injury, MS, ALS, spinal cord**

injuries, heart disease, the list goes on and on. And I'm just going to take the case of spinal cord injury for one moment.

I work with Dr. John McDonald at Washington University, in Saint Louis, and he is a very knowledgeable researcher on (Inaudible) stem cells, and a few years ago he said to me that in order to cure my particular condition, which is demyelination of nerves in a very small area of the spinal cord, right at the second cervical vertebrae, that if you imagine the rubber coating around a wire that allows conductivity of electricity, the same thing as with nerves, myelin is like that rubber coating. It's a fatty substance that if it comes off of the nerves, then signals do not go from the brain down to the spinal cord as required. However, it is possible, and he's demonstrated this as graphic(?) as possible, to re-myelinate.

Now, a few years ago, he said, he would be willing to inject human embryonic stem cells into you and hope for the best. But hoping for the best is a very dangerous proposition for people with spinal cord injuries because our spinal cord injury affects every organ in the body, and the most serious side effect is that it severely compromises the immune system, so spinal cords patients, particularly with high level injuries like mine, are prone first to pneumonia, which I've had at least five times since my injury, many patients often die from that. Also, it compromises the cardiovascular system, compromises the digestive tract, the ... your whole bowel-bladder-sexual function, skin integrity and also bone density, so that osteoporosis becomes a very ... a very critical factor.

So literally he said to me that the immunosuppression that would be required just to inject 30 million human embryonic stem cells from an anonymous donor might kill me. And now, he would be unwilling as a doctor, because of the ethics involved that a doctor is ethically bound to give his patients the best possible treatment, he would not inject me with embryonic stem cells unless we go the other route, which is therapeutic cloning- taking an egg, removing the nucleus, taking DNA from my skin and deriving stem cells from that, which would be injected in a manner that would probably not be rejected by my immune system.

So my future, and others would agree, many scientists would agree, my future, in terms of being able to recover will depend on some way of delivering stem cells without compromising my immune system and therapeutic cloning, which would use my DNA is the best hope. Then I will finish by saying that I am appalled that Mr. Jim Kelly would simply say that I made seven inaccurate statements, without informing you what they were. That is a low blow, and I think it should be retracted or explained. And I also would like to know, he claims that there are trials going on using adult stem cells for spinal cord research. I highly doubt that. I would love to know where he thinks that's happening. Thank you.

Craig Venter:

Thank you for ... all the panelists for your opening statement. We'd like to open it now for questions from the audience. I will direct things towards the panelists unless the question is pointedly towards one of them, and I will ask them not to go into a filibuster or monologue if they can avoid it on these issues, or I will consider that I have authority from the chair's position to cut them off. Somebody want to start? Yes, sir. And if you would also state your affiliation at the beginning.

Jeff Kluger:

Hi, I'm Jeff Kluger, with *Time* magazine, and this is for Jim Kelly. Granting your opposition to fetal stem cell research, on a scientific basis, why would you oppose proceeding along two avenues with adult stem cells and fetal stem cells, and seeing which yields the greatest results. I can understand wanting to ban the technology if you're opposed to it ethically, but if you're merely opposed to it scientifically, what would the objection be to allowing it to proceed along both avenues?

James Kelly:

Yes, sir. My objection is that resources, you can not have your cake and eat it too. Resources that are being devoted right now to expanding the uses of not just adult stem cells but other avenues that can lead to clinically available cures in the near future, if they're diverted to cloning, which the

leading supporters of cloning admit that it may take decades to iron out these problems, that can only slow the availability of cures.

Craig Venter:
Christopher?

Christopher Reeve:
May I be allowed to disagree?

Craig Venter:
Yes. I was about to, but I'll let you ... (Laughter)

Christopher Reeve:
The budget of the National Institute of Health in 1998 was 12 billion dollars. However, due to Congress and also got pressure applied by a number of disease groups, the budget for fiscal 2003 will be 27.2 billion dollars. And human ... HHS Secretary Thompson has said there is plenty of money available for the kind of research. Doubling the budget of the NIH and more within five years has been an extraordinary accomplishment. So to say that there isn't ... I mean, more money would be nice, but to say there's not enough money to do research into therapeutic cloning is a false statement.

Craig Venter:
As a biologist, I've always viewed that biologists, I guess because that's the way biology works, views life as a zero sum game, whereas the physicists managed to get together and get more money for the common good. But there's two grant funded researchers on the panel, somehow I don't think either one of them would probably argue that it was a zero sum game in getting more funding, but I'll ... Dr. Jaenisch.

Rudolf Jaenisch:
Actually I may want to take some issue with some of the issues you raised. Which I disagree with. You say that, yes, cells cause tumors. This is really not a problem. You can get rid of all stem cells before you transplant. That is no problem. You said that the EG-cells, the embryonic germ cells of John Gearhart are superior to ES cells, they are not. The ES cells are really much more superior. There's no problem with ES cells.

Secondly, you said diabetes can not be treated by transplantation because it's an immune reaction. In the diabetes treatment which is done now, the eyelet cells are encapsulated into membrane and they're protected against the T-cells. So I think this will be one scenario which would probably not be a problem then with immune response.

And finally you said, you quoted old paper that is a control experiment we made from these repaired embryonic stem cells where the genetic defect was repaired. We made mice. Indeed we did. But this involved the implantation of particularly modified embryo into the uterus. Want to just be sure that the British solution to this is black and white, it's very clear, there's just no way to misinterpret this. The British said, if you implant a cloned embryo into the uterus, it's a criminal act. If you put it into a petri dish for the intent to make an embryonic stem cell, it is allowed. It's just no black ... there is no gray zone. It's black or white. You implant or you don't. So I don't see that ... and since you can do all things we want to do in this petri dish ... growing ES cells. I don't really see why you have to invoke that the John Gearhart approach, that these embryos need to be implanted to generate then later cells.

Craig Venter:
Well, before we go to questions, I guess we have to give Dr. Newman a chance to respond.

Stuart Newman:

First of all, ultimately it won't be necessary to implant these embryos to bring them to two months, because people are working on surrogate uteruses and new culture media that will take the embryo further and further along.

The other thing is that comparing our situation to the English situation just doesn't work. The English laws relating to reproductive technologies are totally different from our laws. Our in vitro fertilization clinics are completely unregulated. In England, every embryo in every one of those clinics has a number and is followed. American society is not receptive to that sort of regulation. University scientists may figure out how to do this cloning and say all along we don't want it used to produce full term persons, and then the people in the in vitro clinics will just read the papers and do it privately.

As far as the other technicalities are concerned, I never said John Gearhart's cells were better than the ES cells, the ES cells may indeed be more versatile, but that's really just a scientific issue which is not that medically relevant. If you could obtain later fetal stem cells or even adult stem cells, and found that their lineages, that is, the types of tissues they could make, were more restricted than the embryo stem cells—for example, the embryo stem cells could make everything, but cells from the interior of the brain could only make nervous tissue cells and glial cells and things like that, it really wouldn't matter. If you can harvest adult stem cells from different organs, the pancreas for example, and so on, and use them to repair the tissue or organ that needs repairing, it wouldn't matter medically whether those cells were as versatile as the ES cells in the sense of developmental potency.

Craig Venter:

Why don't we leave it like that and a question here?

James Kelly:

Sir? Excuse me. Can I answer Mr. Reeves ...

Craig Venter:

Why don't we come back to that. Let's give the audience a chance to ask some questions.

Antonio Regalado:

I'm Antonio Regalado, from the *Wall Street Journal*, I just had an informational question for Mr. Reeve. You said that your doctor, Dr. McDonald, would not implant embryonic ... human embryonic stem cells into you unless that you went through the therapeutic cloning ... that that was your best chance of being able to recover potentially. Have you actually pursued that line of research directly with your own cells? Any attempts to transform them?

Christopher Reeve:

No, you have to understand that therapeutic cloning is a very nascent technology that's not ready for use in humans. But knowing that it will not . . . provided our scientists are allowed to go ahead with the research, it really shouldn't take that long before they're ready for humans. However, knowing that there is a better technology out there than just using embryonic stem cells, he as a doctor feels, given the immune rejection problem for people with spinal cord injuries, he's not going to go ahead, as he had planned to. There was a plan to actually use embryonic stem cells as soon as it would be allowed by the FDA. He is not going to do that until therapeutic cloning gets to the point where it could be applied to humans.

And I just want to make one other very quick comment and that is in England, just a month ago, Dr. Ann Bishop, who works with the tissue engineering corporation over there, was able to take mouse embryonic stem cells that derived . . . had been made obviously therapeutic cloning, and they turned those cells into tissue that is applied to the lungs, to deficient cell types or cell tissues in the lungs, and said, have already reported, I guess it's public knowledge, that they feel they are now ready to do it in humans, so the idea that it would be decades before you could get to human application, I think that is one example I'm giving you right now of the fact that that's not true. I can give you another example. Doctor Oswald Stewart, of the Reeve Research Center, UC Irvine has

said that you could probably get to the use of therapeutic cloning in humans within about three to five years. So I absolutely dispute the time line that's been put up before.

Craig Venter:

Other questions? Yes, ma'am. Please state who you are and where you're from?

Apporva Mandavilli:

I'm Apporva Mandavilli, from Biomednet news. There is this difference between the U.S. and U.K. as far as regulation, so what's to stop the average patient from just getting on a plane and going to the U.K. and getting the treatment they need? And is there a concern among the scientific community that this is going to set U.S. research back?

Craig Venter:

Dr. Jaenisch?

Rudolf Jaenisch:

If you will do this, according to the Weldon bill which was passed last year by the House, you will be arrested on the return at the airport, and put in jail and fined because you're carrying cells derived from a cloned embryo in you. That's the bill.

James Kelly:

Can I say ... can I respond to that also?

Craig Venter:

Yes.

James Kelly:

This is a topic that I discussed with Dr. Young of Rutgers. Dr. Young is in favor of therapeutic cloning, and he pointed out to me on the Internet, his Internet forum, speaking on the moral issues, he said that why ban cloning in the United States when somebody might be able to get on a plane, fly to England, whatever, if it was available, if it was a treatment, and be cloned? The only way we could find out whether or not they actually had such a therapy upon their return would be to do a DNA check of all returning people to the United States, which is ... of course is not going to happen.

My response to Dr. Young and here again, my reasons for even looking into this in the first place and for opposing cloning on the scientific reasons I've mentioned in my opening five minutes, my response to Dr. Young is, people can get on a plane, and they can fly to other countries. NBC mentioned the Eastern European countries as one where they might be able to engage in child prostitution. Does that mean that we should make child prostitution legal in the United States? Because if cloning is going to be banned, it's going to be banned because of these scientific reasons. It's going to be banned for moral reasons. That's why the ... that's why Senator Brownback proposed the legislation. And if it's banned for moral reasons, we shouldn't change our moral perspective in the United States simply because somebody else somewhere else in the world says something is moral that we in the United States have decided is immoral.

Christopher Reeve:

On the other hand, you have to understand that our allies are not rogue nations. The U.K., Australia, Canada, Singapore, Israel, India, these are just some of the countries that have already passed therapeutic cloning. In fact, England passed it twice. The House of Lords considered it, passed it, the pro-life groups objected to it, they took time to listen to those groups and then they passed it a second time. And therapeutic cloning is allowed with strict government oversight. And to say that those countries are less moral than we are, I think is hubris on our part that's out of control.

James Kelly:

Mr. Reeve, in your testimony to the Senate on March the fifth, this was a point that you raised when you mentioned the work with Melissa Holley in Israel, a clinical trial for Parkinson's disease in

Sweden and the fact that cloning was authorized in England. And you pointed out that these are not rogue nations, and as a justification for cloning in the United States. But Mr. Reeve, I don't know if you understand or not, but Melissa Holley . . . her research involved activating her macrophages, so it had absolutely nothing to do with embryonic stem cells or cloning at all. And the clinical trial that was taking place in Sweden was on fetal tissue, not embryonic tissue.

Christopher Reeve:

If you were to read the testimony, you'd realize I said that it was an acute injury, she went there within the first two weeks, and her own macrophages were used to alleviate her situation, in the chronic phase. I didn't say anything about therapeutic cloning or embryonic stem cells. I simply said that Israel was willing to do this, on a human being, after it had only been done on rats, because they felt it was safe, and they progressed much more rapidly than we did.

Craig Venter:

Let's go to the audience for another question. Yes, ma'am?

Makiko Tatebayashi:

Makiko Tatebayashi, Japanese newspaper, *Yomiuri Shimbun*. I have a question to Professor Jaenisch. I read article written by Dr. Jaenisch, it's in journal *Cell*, it's about experiment about mice cloning, but is there really no immune rejection if we use cell gained by so-called therapeutic cloning to human?

Rudolf Jaenisch:

Yes. Let me just briefly explain this experiment. Indeed, there's no immune rejection if you use your own cells, that's clear. However, in the model we used, this immune deficient mouse, which we cured, one of the unsuspected consequences of this particular disease, which also exists in humans, by the way, was that a cell which called the natural killer cells are increased in their activity, and those cells kill embryonic stem cell derived bone marrow cells. It was therefore necessary to treat these animals to get rid of these natural killer cells. So I would argue for the human situation, it was a very interesting finding for us. For the human situation, this will be only . . . only, would be only valid for a transplantation involving hematocritic cells, and in this case in humans you would just give a transient antibody treatment which eliminates natural killer cells, because after the graft has taken, there is no need for it any more. So I think this was a very interesting biological effect which says, under some circumstances, ES cell derived embryonic stem cell derived cells might be rejected, but we know why. And this was then converted or distorted by Brownback and some of his associates to say, our experience proved it doesn't work. That's a real distortion . . . that's the opposite what the experiment says. One just has to look at the facts. So I would believe for anything which is not involving the hematocritic system there is no problem, natural killer cells have no role in rejection of non-hematocritic(?) cells, and for hematocritic cells, for bone marrow derived cells, you would have to figure out whether the condition of the patient has an altered natural killer activity. And for this one disease we treated, that was the case.

James Kelly:

Professor Jaenisch, can you explain to me, maybe I'm confused about your experiment, okay? My understanding is that when you took the embryonic stem cells out of the cloned embryo and you made the repair to the genetic deficiency, my understanding you twice . . . when you twice put them into the mouse that had the genetic deficiency, that they were rejected. I understood that you created a new embryo with genetically repaired stem cells, you implanted that embryo in a female mouse, allowed it to come to term, and be born. You then took the stem cells from that mouse and treated the original mouse with them, and that led to the complete curing of that condition.

Rudolf Jaenisch:

No, I think this is a misunderstanding. In mouse of course we can generate embryos from embryonic stem cells, in humans you can not. We created mice from embryonic stem cells just to be sure that our repair worked. This was not therapeutic cloning. Therapeutic cloning is taking the repaired embryonic stem cells, differentiate them in the petri dish to bone marrow stem cells and take those bone marrow stem cells into the patient, into the mouse patient. (Overlap)

Man:

Right, right.

Rudolf Jaenisch:

So the generation of embryos was only control experiment for us to assure ourselves that the repair of the genetic defect worked, and could give rise to healthy mice. It was not part of the therapeutic cloning approach.

Craig Venter:

Dr. Newman?

Stuart Newman:

This is a question for Dr. Jaenisch. You say that the technique that you used to regenerate a full term mouse from the embryo stem cells alone can't be done in humans. Do you mean that technically it's impossible to do that procedure, or that it's not allowed?

Rudolf Jaenisch:

So it's a very interesting possibility. So it's called ... it's not a normal embryo. Embryonic stem cells are irreversibly ... have irreversibly lost the potential to make a baby. Irreversibly. Because they can not make placenta. Under no circumstances. So what you can do in mouse, you can take the host embryo and treat it in a way that this host embryo can not form embryonic tissue, but can form placenta. You now inject into such an embryo the blastocysts, the embryonic stem cells, there can form the embryo, the host can form the placenta, they complement each other, and that's called tetraploid complementation. So I want to emphasize embryonic stem cells have lost irreversibly the potential to make a baby, a mouse baby. You could of course in humans, I agree, as a mouse, you might be able to make this tetraploid blastocysts, which is quite a manipulation, and then do such a thing. These embryos are not normal. The mice coming out of this experiment are S(?) - abnormal, as cloned embryos.

Stuart Newman:

Point I'd like to ...

Craig Venter:

Well, let's not spend too much more time on this ... (Overlap)

Stuart Newman:

It's kind of interesting how the ways of thinking about this evolves. I agree that these cloned animals are not normal. Dr. Jaenisch's work has given ample proof of this. Moreover, the tetraploid embryos are also abnormal, and Dr. Jaenisch said before that in making clonal embryos to generate these stem cells you don't make a new individual, because it's an individual that is genetically predated, that is, it's genetically derived from a prototype. But back in 1997, when Dolly was first cloned, although there were people that said we should clone humans and people that said we shouldn't clone humans, it seemed like everybody agreed that if you do clone a human, it'll be a human. But now, people are saying, bioethicists, and I just heard Dr. Jaenisch say it, that when you make these clones by nuclear transfer, you're making something that's like ... more like a manufactured item. It's not really a new individual. Therefore, you could potentially do anything you want with it. If you wanted to grow it up to an abnormal full term whatever, it wouldn't be a person. As Dr. Jaenisch said, you're not creating a new individual by doing this, so you have something that you are now at liberty to do whatever you want with ... (Overlap)

Craig Venter:

So why don't you define human for us, what's your definition of ... (Overlap)

Stuart Newman:

I don't have a definition, but I'm saying that whatever results from this process is at least quasi-human, and I'm uneasy about people patenting it. The University of Missouri just took out a patent

on cloning mammals, in which they didn't specifically exclude humans from this cloning process. People are going to own these quasi-human entities, and I think it's something we should be concerned about. (Overlap)

Craig Venter:

Is a HeLa cell a quasi-human entity?

Stuart Newman:

No, no, we're talking about developing embryos.

Craig Venter:

But a HeLa cell has the genetic information from the donor. Why is that ... (Overlap)

Stuart Newman:

I don't think ... (Overlap)

Craig Venter:

... not a quasi-human entity under your definition?

Stuart Newman:

Well, I think that people can make that distinction.

Christopher Reeve:

And that's why regulation is so important, so this (Inaudible) stop, and only regulation can stop it. The government regulation, absolutely prohibiting reproductive cloning. Because if we don't ... if we don't stop it now with government regulation, then it will just breed out of control in back rooms, wherever.

Craig Venter:

Yes, sir. We need a microphone up here. (Overlap)

James Kelly:

.. one thing, Mr. Reeve. The Justice Department just testified to the House, and in their testimony, they specifically said that they can't tell the difference from the cloning process and the reproductive process as far as the embryos being implanted. And they specifically said that they would not be able to regulate reproductive cloning. Separate from therapeutic cloning.

Masakazu Kobayashi:

Masakazu Kobayashi, *Yomiuri* Could you ... could somebody give us a comment from the project of Advanced Cell Technology, I read that they published kind of pre-matured result of human cloning and kind of confused the general public and I'm not ... I don't understand it so completely, so could you give some comment, an implication on that?

Craig Venter:

Dr. Jaenisch?

Rudolf Jaenisch:

Is this on adult stem cells you wanted ...

Masakazu Kobayashi:

(Inaudible) they are the first company to work on the human cloning ... (Overlap)

Rudolf Jaenisch:

ACT, you mean ...

Masakazu Kobayashi:

Act, right, ACT. Yes.

Rudolf Jaenisch:

Well, ACT is a company from Boston, I am quite familiar with them. So this company did two ... did several things. They cloned cows, they misrepresented their results, they had very superficially interpret their results, saying the cows are normal. They are not. And I think there's no ample data available. (Overlap)

Panelist:

Yeah.

Rudolf Jaenisch:

So I disagree with them very much. And then they did this experiment where they in November, where they cloned human embryo. And this experiment was (Inaudible) to my opinion, outrageous. What they did was, they did a cell transfer from a somatic cell into a nucleated human embryos, and about 90 percent of these cells died right away, they just killed them. And three of those divided once or twice, and one made it to a miserably looking six cell embryo. And then they published this, and it was worldwide news.

To my opinion, that was very bad science, it shouldn't have published. Should stay there and they had to ... we didn't learn anything from this, so from my point of view, this was ... they did a disservice to this discussion. The aim was clearly to establish and maybe to initiate the discussion of therapeutic cloning. They don't want to make cloned humans. But I think they made a mistake in taking this failed experiment to worldwide news and with a very concerted media action which was, to my opinion, deplorable.

Craig Venter:

Yes, sir?

Peter Brown:

Hi, I'm Peter Brown, freelance, and I think it may be appropriate to ask our Chair to comment, if he would, on the political reality here. Is this ... is the Brownback bill, the one to look at or is this a skirmish in a long term fight? Is this bill going to pass or be defeated? What then?

Craig Venter:

I wish I knew how to truly predict the future. I've done it a few times scientifically correctly. My ... I'll go on the record, my hope is that it won't pass, and I think with the recent pronouncement of Senator Hatch, I think it goes a long way towards helping that it won't be. I think the principles in that bill are long term issues, and I think just the issue of whether that passes or not does not limit it as an issue in our society. So, they do not have enough votes, my understanding is, to pass it, but there's a lot of swing votes that could go either way, and I don't think we'll know until the vote takes place. But regardless whether it passes or not, this is not the last we'll ever hear of this issue, and I think because the issues are so important, everything from the criminalization of science to criminalization of treatments to what other people consider their moral imperative, we're going to deal with this for a long time.

Peter Brown:

May I follow up just to ask you, to what degree do you think this is ... the passage or non-passage is going to turn on scientific issues? Because my impression is that it is being played by people who are non-scientists playing on fears and hype and the usual political ... (Overlap) unreality.

Craig Venter:

I can only speculate on that issue, as anybody can here, and I'm not sure my speculation is any more valid than anybody's, but my disappointment with the discussion is it's largely, not this discussion, but in general in our society, has not been based on science or fact, or even trying to determine the facts, but on other issues. You know, one of the questions in fact I had for the panelists is, we have some religions, one for example that considers it immoral to have blood

transfusions. So if that religion became the majority, should they have a right to impose that view on the rest of us? Mr. Kelly in particular, but also Dr. Newman, you've argued the slippery slope argument. Why should your views prevail on the rest of society? Why shouldn't Christopher Reeve have his chance to pursue this, based on his moral and ethical view of the world?

Christopher Reeve:

I just have one thing for your question, sir, is that the latest poll that was taken, I believe it's less than three weeks ago, which I was at ... 68 percent of the American public supports the therapeutic cloning and only 26 percent are opposed, so that inside the Beltway there may not be a correspondence with what the public believes.

Craig Venter:

But Dr. Newman, as a scientist, you work in the peer review system, why this unusual outlet of legislation?

Stuart Newman:

I would say that the unusual thing that's happening is that we're taking a major step in reproductive technology. I mean, ten years ago, if you asked most people whether we should make new embryos for the purpose of therapy, people would say, no, maybe you could use spare embryos for this purpose. Those who weren't religiously committed to not using embryos at all, would have said, and I agree with this, the excess embryos in in vitro fertilization clinics could be subject to research and used for therapy. Indeed, some of the same Senators who are now supporting the alternative to the Brownback and are saying that yes, we should make these embryos for research, were saying just a few years ago that we shouldn't make new embryos for research and therapy purposes. So people's thinking about this evolves. Does it evolve because of new accurate information? Have new therapies in experimental animals with ES cells, for example, been so dramatic so as to justify this major step? Before coming here, I checked Medline on adult stem cells in mice and I saw many more papers where adult stem cells were used in mice to treat human-like diseases than such papers on ES cells ... (Overlap)

Craig Venter:

But if we knew those answers, it wouldn't be called research, right?

Stuart Newman:

Okay, no, no, no. What I'm saying is that these are two new areas, and you're saying why should my views prevail? What I'm pointing out is where we will be if we follow this logic. I'm not saying that we should stop it 14 days, at 21 days, at 48 days, whatever. What I'm saying is that ... (Overlap)

Craig Venter:

But if it's a law, it does have to be defined.

Stuart Newman:

Well, the law will not be enforced in this country. I don't think anybody believes that the law can be enforced, given the state of in vitro fertilization industry in this country.

Christopher Reeve:

I do. So do a lot of people ... we can regulate all kinds of things ...

Stuart Newman:

And if somebody ... if 14 days is the limit, and somebody comes along with stem cells from 15 day embryos that are much better, who could resist using the 15 days? I mean, why? Why should that particular point be the point that prevails?

Craig Venter:

So that's the slippery slope argument, right?

Stuart Newman:

Exactly.

Craig Venter:

And so ... (Overlap)

Stuart Newman:

And it's not always wrong.

Craig Venter:

... the ultimate end of the slippery slope argument gets back to reproductive cloning instead of therapeutic cloning, right? That's the slippery slope that's held in front of all of us as the big evil.

Stuart Newman:

It's reproductive cloning, but it's also all these stages along the way. The two month, the six month, the nine month fetus. Wherever you decide the line should be drawn it will be eventually be crossed.

Craig Venter:

But ... I'll give Mr. Kelly a chance to respond to my question, but extending the slippery slope argument, in the fundamental dispute, not ... I think you and Dr. Jaenisch have given highly educated views of why we should not have reproductive cloning in terms of the potential dangers of that and the outcome, in terms of the biology of the individuals, but I think the public view has gotten its view not from the Gene Media Forum, but from Hollywood media forum, (Scattered Laughter), from movies like "Cloning" and "Multiplicity", where ... Mr. Kelly, do you think if you were cloned, your clone would be a Xerox copy of you, with your memory and your attitude, your personality and your life outcomes?

James Kelly:

Sir, first of all, let me ... let me keep my train of thought here. Mr. Reeve mentioned some poll figures. Gallup released polls on May 14th, finding that 61 percent of those polled opposed cloning human embryos for medical use, or medical research. Gallup also said a slight majority, 51 percent of adults favored cloning in human cells from adults for use in medical research. In other words, it's all a matter of words. If, when you take a poll, if you throw the word embryo in there, or human embryo, then 61 percent of the people were opposed to it. If you leave that word out, and say, are you favor of cloning human cells for use ... from adults for use in medical research, then 51 percent are in favor of it. It's just all a matter of the words. If you use the word ...

Craig Venter:

So does that mean you have a majority to support imposing your moral view, (Laughter), on the rest of us? (Overlap)

James Kelly:

I'm no ... no, I'm not ... I'll tell you the truth, sir, I don't care what the majority is. Okay? My ... what I care about ...

Craig Venter:

But shouldn't that matter in a democracy with ... (Overlap)

James Kelly:

No, sir. No, sir. As a matter of fact, it should not, okay? (Overlap)

Craig Venter:

You've been talking to the White House way too much. (Laughter)

James Kelly:

Well, sir ... (Laughter) Let me explain something to you, okay, sir? Mr. Reeve happened to say ... another thing that he said in his Senate testimony was that the purpose of the government is to do the greatest good for the greatest number of people. If that were the case, Mr. Reeve and I would probably be killed. Twenty-five million people a year get heart disease. Ten thousand people a year get spinal cord injury. If it were ... if what Mr. Reeve said is true, in that we need that therapeutic cloning for spinal cord research, and the cost of therapeutic cloning is going to be astronomical, I'm sure Mr. Thompson knew what he was talking about, heart disease, they already have repaired hearts with adult stem cells that when the left ventricle of the heart degenerates after a massive heart attack, they're in clinical trial with this in Australia right now, okay? Adult stem cells have been used to treat 75 different types of cancer, they're listed in my paper and that CD I left out on the table there for you, all right? What would happen would be, we ... if we tried using cloning as a justification for spinal cord research, it would not wash.

Craig Venter

Dr. Jaenisch, you're trying to get a point in. (Overlap)

Rudolf Jaenisch:

I think, let me just state clearly, because I already looked at this very carefully. Adult stem cells, with the exception of bone marrow stem cells have unfulfilled promise at this point. We don't understand these cells, they're only two or three years old. Embryonic stems we know for 20 years, we know that works, and we need much more research, so we ... I would not be ... so this, many of these papers are becoming very questionable of new evidence. But let me come to the interesting argument of the slippery slope, which you brought, I think it's an interesting argument. So could it be 14 days or 15 days? I don't think it matters. What matters is implantation. It doesn't matter what the days are. I think this is a black and white, clearly defined border. There's just no question about. So I think in the British, they have a law, if our laws in this country are not good enough, let's change the laws to do it that you can enforce these issues. So I think that's a, to my opinion, a better way ...

Craig Venter:

... but isn't it the argument that's used against that the artificial womb, we'll come up with an artificial womb, and change implantation. (Overlap)

Rudolf Jaenisch:

... in this point, I think this is really future music(?), and I don't know how far this will go. And there seems to be major obstacles to that. So I believe really that indeed I totally agree with you, the fertility clinics in this country are totally unsupervised, and they're doing things which maybe they shouldn't do, this is historical and this historical roots because in Europe fertility research was funded by the government, in this country it was not. In Europe this is all open research in academic institutions, high quality. In this country it's driven by the commercial sector, and I'm afraid if cloning, therapeutic cloning gains is not supported by NIH and goes to reputable academic institutions, which are open to scrutiny, it will be exactly the same happening as in vitro fertilization, it will be unsupervised and we probably all deplore what comes out of it.

Craig Venter:

We only have a few minutes left. I want to make sure every ... in the back, we have ...

Greg Hampikian:

Well, it seems that there's two ...

Craig Venter:

Please say ...

Greg Hampikian:

I'm sorry, I'm Greg Hampikian, from Clayton State, freelance. But it seems that there's two competing moral questions. I have a question (Inaudible). One is if we want therapeutic ... for therapeutic purposes you want to say that it's not a human being, right? An individual to be

protected by rights. And for reproductive you want to say it's a normal, it's a twin. Right? We've split an embryo, it's a twin, it's going to be a normal human being. Something like that, the moral equivalent of a twin. So it really seems to come down to the question that Augustine says happens 90 days after quickening, and in the 1800s, they said happens at conception, when does each of the panelists think that it becomes the human being that we need to treasure, nurture, protect, whatever it is you want to say, from each of your perspectives?

Christopher Reeve:

Well, I'll begin, if you want, by saying that I believe, throughout history, there has been common agreement in societies around the world that the life results because of the union of male and female. Whether it's done in a test tube, or whether it's done through intercourse. And fertilized embryos in clinics are still the union, result of the union of male and female. Therapeutic cloning takes an egg that is not fertilized, and is left in the cellular stage, in the very early stages, about three to five, seven days, then the nucleus is removed and the DNA from a patient. Either male or female can be put into it. Now, that is an aberrant life form. If you were to take it further and implant it, then only insane people would want to do that, in my opinion. But considering the fact that they're talking ... you're talking about the difference of life as we've understood it for hundreds of thousands of years, versus a collection of cells that will never become a human being, and I don't even believe deserves a status of the word embryo. It could be called a pseudo-embryo, it could be called, you know, some other name should come up from it, because just like test tube babies scared people before, the buzzword embryo scares people today. Cloning scares people today, but this is simply a manipulation of cells that are not equivalent to life as we've always known it.

Craig Venter:

Dr. Newman?

Stuart Newman:

I can't tell you where life starts, I don't know myself, and I don't have any firm beliefs about it. But I will tell you that 15 years ago, when a group of people at the Council for Responsible Genetics, scientists and social scientists and community activists, were discussing the prospect of these technologies coming down the line, one of the things we began to talk about was the potential commodification of human beings. The fantasy scenario was that once we'll be able to genetically engineer embryos or clone embryos, somebody will obtain patents on these things. These embryos or fetuses will be able to be brought to any arbitrary stage, and they will be property, they will be commodities, and the organisms that are born from these manipulations will not be accorded the status of human beings, since they will be considered inventions and objects of manufacture. And when we presented these fantasy scenarios 15 years ago, people said, you know, that's crazy, no scientist would ever get involved in this kind of thing. But now we're already hearing that these clonal embryos are not really embryos, they're something else, which you can grow any time you want them. Dr. Jaenisch is against implanting them, but others are for implanting them. When they are implanted by those other people and they're born, what are they then? Do the patent rights over them dissolve and they then become human beings? Or are they so defective that they're still manufactured objects and we can do something "useful" with them? This is the concern that we had back then, and I actually see us moving towards it.

Craig Venter:

Well, to stick to the rules, we're going to have to let Dr. Newman have the last word for the panel. It's a shame we didn't get to other issues. You know, the promise of therapy with new science is always held up, but we lose the track of just doing the basic science research is one of the greatest avenues we're going to ever have to understand our own developments and our own biology, and as one of the people who sequenced the human genetic code, I feel it's the only way we're going to ever understand the human genome thoroughly. Sometimes the therapies greatly exceed the basic science predictions, and sometimes they don't live up to them. I don't think those are the issues. You've heard a wide variety of arguments here, I think we have very serious issues to face as for the first time Congress is attempting to criminalize research and also criminalize families and individuals from getting therapy. I would really like to thank the panelists, particularly Christopher

Reeve and James Kelly for making the tremendous effort to come here and share their feelings with us ... (Overlap)

James Kelly:
Excuse me, sir.

Craig Venter:
... and I'd like to close by all of us thanking the panelists. Thank you. (Applause)

Panelist:
Thank you.

James Kelly:
Excuse me, Mr. Reeve. If ... for your ... no, no, I want to ...