DEBATE: RAY GREEK VS. ANDREW SKOLNICK
MAY 1, 2005

THE MODERATOR: So the debate in front of us is let it be resolved that animal models are an outdated paradigm for discovery of cures and treatments for human diseases and testing drugs. And Dr. Greek will be the first speaker who will present his case.

Dr. Greek.

(Sound checking.)

DR. GREEK: Okay. How's that? Is that good? All right.

Okay, well, before I begin, I would like to thank the University of Buffalo for having me and the honors program, of course. I would also like to mention the UB Spectrum for writing that very nice article. Sean Vaughn, the reporter, did a very nice job on that. I appreciate it.

Of course I'd also like to thank the Center for Inquiry and Andrew Skolnick for participating; David Triggle, for being brave enough to be the moderator. Of course I would not be here were it not for Dr. Nobis and Truly. They were very kind and allowed me to spend the night with them last night. And I do appreciate that.

And finally, I'd thank you, the audience, for giving up your Sunday afternoon to come listen to a blowhard talk about scientific stuff. So thank you.

Now, the first slide, it says in summary what I'm going to try to explain in a very limited amount of time. And this is kind of sciency stuff, and if you don't have a science background, I do apologize, but this is really the heart of the argument.

And the slide says, "Because of differences in gene regulation and gene networks vis-a-vis evolutionary and molecular biology, we now understand why even two nearly identical complex systems, say, a chimpanzee and a human or even identical twins, may respond differently to the same stimuli and, hence, why one complex system or species cannot reliably predict response for a different complex system or species.

"Current biomedical research is studying disease and drug response at the level where the differences between complex systems, be they two different species or even two different humans, manifest. Hence, using animals as causal analogical models for human disease and drug testing is a scientifically invalid paradigm."

And at the end of the lecture we're going to see that same slide again, and hopefully you'll know what all those little words mean by then.

Our second slide, before we talk about using animals as causal analogical models, I need to define our subject a little bit better. Animals can be used in roughly nine different ways in the pursuit of scientific knowledge. Now, what I am going to be addressing today is only numbers 1 and 2. And you might want to refer back to this slide on your handout as I continue to lecture.

I am going to be addressing the use of animals as models for human disease and animals as test subjects or models for drug testing. And I'm going to claim that it's scientifically invalid. Now, that leaves us seven ways that animal rights people might object to animals being used, but these seven ways are scientifically valid.

For example, you can use animals as spare parts. I'm from California. Our beloved governor recently had an aortic valve replacement, and where did that valve come from? A pig. Yes, I've heard all the jokes.

Animals can be used as factories. For example, animals were used for decades as a source of production for insulin, and many lives were saved because of cow and pig insulin.

Animal tissue can be used to study basic physiological principles.

Animals can be used for dissection.

They can be used as a heuristic.

And so on and so on. All of these, numbers 3 through 9, are scientifically valid. Okay. But they are not what we call causal analogical models. That's what CAMs mean. And it will be my contention that when animals are used as CAMs, that is scientifically inappropriate.

Okay, there's five parts to the lecture. And again I apologize because I've got to go pretty fast. There's five parts to the lecture, and the first part is that physics sets the standard for science. Sir Isaac Newton said many, many years ago, he said, quote, "Therefore to the same natural effects we must as far as possible assign the same causes." And he went on to say that this rule applies to respiration in man and beast and the descent of stones in Europe and America.

Now, Newton and his follower Claude Bernard, who really made animal experimentation what it is today -- he's really the father of modernday animal experimentation -- believed in what is called the resolutio compositive method of study, or what we might today call the method of analysis and synthesis. And this revolves around causal determinism. Again, if something caused X to happen in Europe, that same thing would cause X to happen in the U.S.

Well, Newtonian physics is and was a wonderful paradigm. But other paradigms have come along since Newton, including relativity, quantum theory, chaos theory, complexity theory, which we're going to discuss a little bit, and string theory. Now, none of these

things have replaced Newtonian physics, but they had expanded on the way we look at the physical world.

So let's talk a little bit about what complexity is. Today you see a lot in the press, in the literature, both scientific and lay literature, about complex systems or complexity. And these are some of the characteristics of a complex system. Emergence is one.

Of interest to us perhaps is the fact that relationships are not linear in complex systems. A very small stimulus, for example, may cause a very large effect, or it may cause no effect at all.

And extrapolating from one complex system to even an almost identical complex system is very difficult. The relationships contain feedback loops and, most importantly, vis-a-vis reductionism and determinism, the parts cannot contain the whole. Newtonian physics was all about reductionism and determinism. And that was what Claude Bernard took from Newton and applied to research with animals. And it worked very well for a while, but as we will see as you study complex systems, like this one, the paradigm fails.

Now, the causes -- this is a complex system. This is actually a gene in a fruit fly. And you can see there's a lot of lines. That means these genes interact with each other, there's feedback loops. Sometimes you can delete one of the genes and have no effect at all. Sometimes you can delete the gene and you see a huge effect. This is a diagram of a complex network.

The causes and effects of the events that a complex system experiences are not proportional to each other. The different pats of a complex system are linked to and affect one another in a synergistic manner. There is positive and negative feedback in a complex system. The level of complexity depends on the character of the system, its environment, and the nature of the interactions between the system and the environment. And again, this leads us back to nonlinearity.

Now, in the past society has learned to understand reality through simplification and analysis vis-a-vis reductionism. And it worked great. Some important simple systems are successful idealizations of primitive models of particular real situations, for example, a perfect sphere rolling down an absolutely smooth slope in a vacuum. Now this is the world of Newtonian mechanics, and it ignores a huge number of other simultaneously acting factors.

Although it might sometimes not matter that details, such as the motions of billions of atoms dancing inside the spheres of material, are ignored, in other cases reductionism may lead to incorrect conclusions. Now, this is especially true in complex systems.

In complex systems we accept that processes that occur simultaneously on different scales or levels are important and the intricate behavior of the whole system depends on its units in a nontrivial way. Here the description of the entire system's behavior requires a

qualitatively new theory because the laws that describe its behavior are qualitatively different from those that govern its individual units.

What we are witnessing in this context is a change of paradigm in our attempt to understand the world. The laws of the whole cannot be deduced by digging deeper into the details. And there's a name for this. It's called systems biology. And Leroy Hood and others are founders of this field.

So as with chaos theory, the behavior of a self-organizing complex system cannot be predicted by studying a different system. And complex systems do not observe the principles of additivity. And what I mean by that is their components cannot be divided up and studied in isolation vis-a-vis reductionism.

As I said, the causes and effects of the events that a complex system experience are not proportional to each other. The different parts of a complex system are linked and affect each other in a synergistic manner. And I hope you can kind of understand what I said when you look at that system of genes and how they interact. If you can't, I brought another slide that looks remarkably like the first one. Okay.

Now, living systems, such as chimpanzees, mice, and humans, are obviously examples of complex systems. It should be equally obvious therefore why extrapolation between species will be problematic. Small changes on the genetic level can lead to very large differences between species. Indeed, that's what evolution is.

So the claim that humans and rats are the same animal, just dressed up differently simply isn't true. Moreover, it is irrelevant to point to observed similarities and genetic makeup between species, since the details of the differences are in the interactions between the conserved genes, not in the genes themselves. It is as though humans and rats have a common genetic keyboard on which different phenotypic tunes are being played. What matters is not the similarity with respect to the keyboards but the difference with respect to the order and timing of the activation of the keys.

Predicting human response based on an animal model is not an example of applying a relatively simple set of well-established scientific principles, as we see with Newtonian physics. Indeed, living organisms are much better examples of complexity theory than Newtonian physics.

Using the example of a model airplane, as so many defenders of the animal model do, is a good example of this. Studying a model airplane, especially a paper airplane, will allow the
observer to demonstrate the basics of flight. For (inaudible) equations hold true. But if anyone seriously believes this method can be or is used to build or repair a 747, they're deluded. Just as animal models can be and indeed were used to demonstrate very basic facts concerning anatomy and physiology, so a model plane can be used to demonstrate basic physics laws concerning flight.

But today when we want to know why a 747 crashed, we don't build paper airplanes, and neither should we suggest to the public, who is paying for animal experiments, that a cure for AIDS, cancer, or stroke will be derived from animal models.

Now, this leads us to part three, which is the regulation and expression of genes. The mouse, we know, has about 30,000 genes. We also know that humans have about 30,000 genes. And what's more, 99 percent of those genes are shared. And what I mean by that is humans have about 300 genes that mice don't have, and mice have about 300 genes that humans don't have.

Mice and humans both have the same gene that when activated in mice grows a tail. Okay? Humans, perhaps with the exception of myself, don't grow a tail. I've been accused of having horns and a tail. But most humans do not grow a tail, even though they have this gene. And the reason they don't is because the gene is not turned on.

Now, in the old days, if you'll look to the left of the diagram, this is how we thought biology worked. A single input, whether it was the environment, or a genetic switch or a genetic signal, led to a single output.

Today, because of the human genome project and other research, we know that genetic networks actually control what goes on in the body. And these genetic networks have multiple inputs and multiple outputs. And even if you have a genetic network that is identical in a mouse and in a human, because of all this interaction that's involved, you can get two entirely different outcomes from the same stimulus.

Not only that, but because of very small differences in just one gene, say, the gene at the top, you can have a cascade effect that will turn the stimulus into something very different when it gets to the bottom. So genes work in networks. They're interconnected. One influences another. And any small change at the appropriate time will result in a cascade effect that will have major implications.

Now, this is kind of a little mathematical formula of what I've just said. If you have inputs or stimuli or genes, A-sub 1 through A-sub n, that are interacted on by environmental factors or other genes, for that matter, as represented by B, you can have multiple different outcomes, even though you start with the same conditions.

Well, here is what that means. This is a slide that was in Drug Discovery Today. It's a magazine that relates to drug development. And this was a slide that was done by Dr. Bob Coleman in his article. And what he looked at was one gene -- it's the CFTR gene -- and he assayed the amount of this gene that was turned on in mice and in humans in all these different tissues.

Now, as you can see, in every single tissue the gene is present. But in the mouse, except for the salivary glands, which is the first one, in the mouse it's turned on far greater, sometimes by 10,000-fold, than it is in the human, okay. This is the difference between you and a mouse. Okay, same gene regulated and expressed differently.

Now, the Public Library of Science has a new journal called Biology, and in an editorial they said this about mouse models' autoimmune diseases. And they were basically talking about all the things that I've talked about so far. They said, "These results fall in line with mounting evidence that background genes are not silent partners in gene-targeted disease models but can themselves facilitate expression of the disease. This finding underscores the notion that genes are not solitary static entities. Their expression often depends on context. With genetically complex diseases, having the requisite combination of susceptible genes does not always lead to the decease."

And again, we get back to the network. Same network in you, same network in me. I may suffer from cancer; you may not.

Okay, part four. How are animals used in biomedical research? The way that they are primarily used is as causal analogical models. Causal analogical models assume several things. Number one, the first condition that must be met in order for a thing to be considered a CAM is that X, the model, is similar to Y, the object being modeled, in respects A, B, C, D, and E.

Now, we know that X, the model, also has additional property F. So while F has not been observed directly in Y, we reason causally by analogy that Y also has property F. And I'll give you one just simple example. Guinea pigs and humans have a lot in common. So if you give a drug to a guinea pig and it kills the guinea pig, you might want to think twice about giving it to the human, right? Make sense? Unfortunately, penicillin kills guinea pigs. And that's what's wrong with the theory.

Animal models suffer from what is called causal functional asymmetry. What we assume when we do an experiment on an animal is that the same function in species has the same causal mechanism. But we know this is not always the case. For example, causal functional asymmetry notes that the same function can be derived by different evolutionary pathways.

For example, birds ventilate through an entirely different causal mechanism evolutionarily than humans, but they accomplish the same purpose. And there are many other examples of this. So causal functional asymmetry has major implications for extrapolating data between species.

Now, CAMs must satisfy two further conditions. The common properties that the model and thing being modeled share, A through E, must be causal properties. You can't just say the guinea pig has a heart, humans have a heart. The properties that you're comparing have to be causally related to what you're studying, what outcome you're considering.

And number two, the properties -- the common properties, must be causal properties, which, number two, are causally connected with the property F that we wish to project. So specifically F should stand as the cause or effect of A through E in the model. And this leads us to systemic disanalogies. Complex systems, like rats and humans and mice, are

by definition going to be different in very subtle and unknown ways. We do not know everything there is to know about drozofila. We certainly don't know everything there is to know about Homo sapiens.

And we know for a fact that the same exposure often causes very different reactions in different species. So for a CAM, or an animal model, to be predictive there should be no causally relevant disanalogies between the systems. And this is just flat out impossible until you know everything there is to know about each system.

You can usually find an animal that will mimic a human response. Mice respond pretty much the same way to penicillin that humans do. The problem is you can't have that knowledge except in retrospect.

Okay, part five. This is the last part. So far the discussion has been somewhat abstract. I'm sure I've explained complexity theory to you such that you now can all go home with a vast understanding of it, but perhaps my skills are not that good. But this slide hopefully illustrates in a more tangible way the problems of complexity and, hence, of extrapolation.

Of ten medications that were withdrawn from the U.S. market between 1998 and 2001, eight were withdrawn because of side effects that occurred almost exclusively in women. Okay. Men could take the drug and by and large do well; women took the drug and by and large died or wished they had.

Now, men and women are obviously similar in terms of evolutionary biology and gene regulation. But they responded very differently to these drugs.

Similarly, a study in Science revealed that one strain of mouse could have a gene removed without obvious adverse effects while another strain would die without that same gene. Now a strain of mouse is like a breed of dog. Okay, that's basically what you're talking about.

The anticancer medication Iressa was thought to be ineffective, but upon further analysis it was found to be very effective for people with a specific genetic mutation. Now, today, because of pharmacogenetics and other advances, we are on the verge of what is called personalized medicine. And what this means is that drugs and treatments can be tailor-made for you as an individual. This again, illustrates how very small differences between complex systems, in this case, humans, can result in profound differences in disease and drug response.

If men cannot predict the effects of a drug for women and one strain of mouse cannot predict what will happen to another if a gene is removed, perhaps we are studying organisms at the level of organization or complexity that defines not only one species from another but actually defines one individual from another.

Evolution, complexity theory and molecular biology predict that animal testing should not be an effective means of conducting biomedical research. And most importantly, empirical data supports this. Most physicians will tell you that they do not even look at the results from animal-based experiments because it does them no good in their clinical practice (inaudible).

Now, since the early days of Newtonian physics the important implications for causal determinism theory in biological science have come to light. And this has mainly happened because we've united Darwinian evolution with our knowledge of DNA, genetics, genomics, evo-devo, complexity theory, and so forth.

First of all, we know that animals are examples of complex systems and that therefore small differences between them can lead to changes in the system as a whole in a nonlinear fashion. And example of this would be the fact that most of the time identical twins do not suffer from the same severe diseases such as cancer or multiple sclerosis. And obviously only a very small difference accounts for this because we're talking about identical twins.

Gene expression has been studied in numerous animals, and the same genes are found to express very differently depending on the species, as we saw in that slide. Again, this is because very small changes between initial states in complex systems can propagate into extreme variations.

Number two, the level of examination has changed since the nineteenth and early twentieth century. Our examination of living systems has become increasingly fine-grained. We have found that subtle differences between organisms tend to outweigh gross similarities as explanations for biological activity.

Science could and did use animals to shed light on shared functions, such as the basic function of the liver or pancreas, and so forth. But today we're studying drug response and disease at the level that defines not only a species but most of the time actually defines the individual.

Now, the intact systems argument has historically been the animal modelers' main argument. And it goes something like this: we must test on animals because no experimental system, be it in vitro, in silico, mathematical modeling, and so forth, can predict what a drug will do to the intact living human system. That's basically the argument.

Now, ironically, it's the fact that each intact living system is a different complex system that invalidates the use of animal models. Complex systems, as we have seen, are more than the sum of their parts. And different complex systems respond differently to the same stimuli. The implicit claim in the intact systems argument, that humans and other animals are the same biochemical animal just dressed up differently, simply is not true.

Yes, we all have mitochondria, we have ATP, (inaudible) cells, and so on and so forth, but that is not the question that we're addressing today. Today we're addressing the question of drugs and disease.

When we humans were ignorant of the function of the lung, this reductionistic approach vis-a-vis Newtonian physics worked very well. But the level of our examination has so greatly advanced that interspecies extrapolation is no longer useful. And as I said, it is irrelevant to point to observed similarities in genetic makeup between species, since the reasons for the differences are in the regulation of these conserved genes and the resultant interaction between them, not in the genes themselves.

As I said, its as though all species have a common genetic keyboard on which different phenotypic concertos are being played. What matters is not the similarity with respect to the keyboard, but the differences with respect to the order and timing of the pressing of the keys. Studying Mozart's keyboard could not have predicted Ray Charles. The piano itself does not predict the noise or music that emanates from it. Though genes are causal, as the PLOS Biology Journal said, "They alone do not determine outcome."

Early on medical research was almost solely the domain of the experimental physiologist. But today medical research, even the theories supporting it, is multidisciplinary. Physicists and mathematicians are involved vis-a-vis complex system analysis. Evolutionary biologists, molecular biologists, mathematicians, computer scientists, physicians, and many, many others all play different but vital roles.

It is incumbent upon all involved to understand the implications of knowledge gained from other fields. And that means that researchers should abandon modes of inquiry based on unexamined assumptions from the sixteenth, seventeenth, and eighteenth centuries.

Historically medicine has been practiced based on statistics. If you suffered from high blood pressure and research showed 98 percent of people with high blood pressure responded to medication X, then you wanted medication X. Now, you might be among the very small minority that responded better to medication Q. But because we had no way to determine that, I would prescribe for you medication X.

Today we are on the verge, indeed we are experiencing, personalized medicine, that is, drugs designed, tailor-made for you, not me, not your mother, not your sister. So in light of that, considering the implications of personalized medicine, basing treatments on the response of a different species is like using phrenology to study mental illness or trephination to cure malaria. It simply isn't going to be effective.

So finally we come to the harm to humans from studying animals. Now, one question I'm often asked is, you know, why don't we do animal experiments? You know, so what if we waste a little money? Big deal.

Well, I grant you as an American taxpayer I'm accustomed to the government wasting my money. But when we experiment on animals and we extrapolate those results to humans, humans die. And I have a problem with that. And these are just some of the examples. Smoking was thought to be noncarcinogenic for years because we cannot reproduce lung cancer in dogs. High cholesterol diets were recommended. Indeed we were giving high cholesterol, high-fat diets to patients who had just suffered heart attacks. Asbestos and many other environmental-induced cancers were given to the general public without any hesitation because of studies done in animals.

And again, we can go on and on and on down the list. To put it in a little bit more modern context, this is a study from Science in 1997. And the National Cancer Institute tested 12 drugs that were currently being used successfully to treat cancer in humans. And they studied mice that were called nude mice, or xenograft mice. And these mice were growing the same cancers that these drugs were used to treat. And indeed they were human cancers because they took a bit of the human cancer, implanted it into the mouse. The mouse would grow it, and then the scientists would give the mouse the appropriate drug.

Well, what this study showed is that 30 out of 48 times the drugs were ineffective. Okay. So 63 percent of the time, even though we knew that these drugs were effective in treating human cancer, they were ineffective in treating mouse cancer. Now, that same article goes on to suggest that perhaps we have lost cures for cancer because they were ineffective in mice. Okay, and that's the National Cancer Institute saying that; that's not me.

Drug testing has come under fire for many decades. Here is just four studies. And there's about 10 to 20 studies out there that have looked at drug testing just like these have. I picked these because they really show the range. These studies show that animal models failed to predict drug toxicity between 43 and 95 percent of the time. And you'll see they failed to predict 43 percent, 67 percent, 83 percent, 95 percent. I don't care how you do the statistics. It doesn't work. Okay, predicting toxicity based on animal models is a failed paradigm.

So why should we abandon it? Well, very simply, because it doesn't work. Okay. I don't care what alternatives you have, we don't do blood letting today. We don't do phlebotomy to treat malaria. And the reason we don't do that is because it just doesn't work. All right. So regardless of all the other reasons, animal experimentation using animals as CAMs to study
human disease and test drugs should be abandoned. It diverts money from bioresearch modalities. We have better options. It misleads researchers, and so on and so on and so on.

Okay. Now, does this slide make a little bit more sense since you saw it for the first time?

I'm running out of time, so I'm going to go ahead and go to the next slide. This is a very complicated subject, okay. I essentially have read hundreds of books to get the knowledge that I need to give even this very short, much too fast presentation. And if you really want to understand why the animal model is not a scientifically valid paradigm, you have to

know about gene networks, you have to know about gene regulation, you have to know about complexity theory, you have to know about evo-devo. And these are just some of the books that we recommend that you read. And we have a much longer list on our Web site.

Let me close with this slide. What a difference a little DNA makes.

Thank you very much.

(Applause.)

THE MODERATOR: Thank you Dr. Greek. I will now call on Andrew Skolnick. But we will take a couple of minutes. I think he needs to set up his PowerPoint.

(Discussion off the record.)

MR. SKOLNICK: It's an honor to be here taking part in this debate. I want to thank you Dr. Nathan Nobis and Dr. Ray Greek and others who made this possible.

Is there an echo? I'm getting a -- or am I lisping here?

I am a medical journalist who for more than nine years served as an associate editor at the Journal of the American Medical Association, which gave me a unique position as a journalist and investigative reporter to observe medicine at its best and at its worst.

I understand a lot of what's wrong with the American medical system and also with medical research. But I don't agree with Dr. Greek's arguments that because the water is a little murky we need to throw out the baby with the bath water.

He argues that because animal experiments don't always yield reliable results, animal research must therefore be halted. Dr. Greek's views serve the animal liberationists who support him. I don't believe they serve any human being who is prone to disease. And that's each and every one of us.

I came to Amherst from Chicago a little over a year ago to head a new division of the Center for Inquiry called the Commission for Scientific Medicine and Mental Health. The commission was established to defend science-based medicine and mental health practices against the attacks of medical quacks and other opponents of evidence-based health care. We sponsor two peer-review journals, the Scientific Review of Alternative Medicine and the Scientific Review of Mental Health Practice.

So why am I here defending the use of animals in biomedical research? I'm here because animal experiments are an essential tool for biomedical studies. This vital tool is now being attacked not by researchers but by spokespersons for animal liberation groups, such as PETA -- that's People for Ethical Treatments of Animal -- and its front group,

Physicians for Responsible -- I'm sorry, Physician Committee for Responsible Medicine, which is neither a committee of physicians nor an advocate for responsible medicine.

Today science is coming under increasing attacks from a wide variety of groups that have agendas inconsistent with free inquiry and reason, which are what the Center for Inquiry and the Commission for Scientific Medicine and Mental Health were established to defend.

However, today I am speaking only for myself. I am not speaking for either CFI or the Commission because the Commission has not yet adopted a position on these issues. I therefore speak only for myself.

While I reported on the animal liberation movement 10 to 15 years ago for the Journal of the American Medical Association, I haven't kept up with the issues or on the escalating acts of violence against scientists who use animals in their research. But less than two months ago Dr. Nobis gave a talk at CFI which brought me back to the subject and to agreeing to this debate. I've been working on it in my spare time, and I regret that the talk is only half finished. So you'll have to forgive me later on when I have to wing it.

What motivated me most were the attacks on the March of Dimes that Dr. Nobis, Dr. Greek, and other animal rights extremists are conducting, such as they do in the publication like this magazine published by the PETA-sponsored Physicians Committee for Responsible Medicine, or PCRM.

A few weeks ago on April 12th, I and many others throughout this world celebrated the fiftieth anniversary of the conquest of polio. On that day in 1955 March of Dimes-funded researchers announced the results of the Salk polio vaccine field trial. The whole world rejoiced when it was announced that the vaccine was safe, effective, and potent.

That was just 17 years after President Franklin Roosevelt established the National Foundation for Infantile Paralysis in 1938, which became known as the March of Dimes, following a comment by comedian-actor Eddie Cantor, who told the radio audience that he wanted to see a march of dimes right into the White House to fight this terrible disease.

And march those dimes did. It took the contribution of more than 100 million Americans to do it. But in less than 20 years March of Dimes let researchers develop two vaccines -- not just one -- to conquer polio and wipe it from our planet. But they had to do it with the help of tens of thousands of monkeys and other animals, which is why animal right extremists now despise the March of Dimes.

But let's look at what the sacrifice accomplished. Five years ago only -- I don't think I have -- no, I don't have the slides. Five years ago only a dozen or so countries were reporting cases of polio. And last year that number shrunk. I had slides, but they -- apparently they're not here. There's only a handful of countries now where polio is isolated, India, some parts of Africa. Thanks to international efforts to eliminate the remaining pockets of polio with the polio vaccines, this dreadful disease is close to being completely eradicated the way smallpox was.

Few -- I would say there's probably only one other person here that -- that remembers what the terror of polio was like. Many of you probably don't know anybody who was crippled with polio. Few of you can ever imagine the terror that this disease caused. One of the great polio epidemics struck New York City in 1916 which caused thousands of people to flee the city in a panic, only to be met by armed citizens in the neighboring communities who threatened to shoot them if they didn't turn around and go back.

The epidemic of 1952 was far worse. It crippled or killed more than 58,000 children and adults in the United States alone. And the following year in the fall of 1953, the March of Dimes began the largest clinical trial ever conducted. More than a million school children were vaccinated with the killed virus vaccine that Dr. Jonas Salk developed by using 17,000 monkeys to establish that that vaccine could produce immunity to every strain of polio virus in the world.

Another 3 million children served as controls. I was one of those children. I was in the second grade. And I remember seeing the volunteer children getting vaccinated in my school's gym. And I remember the news a little over a year later announcing the spectacular success of that vaccine.

It's hard to describe the terrible fear that returned every summer, the season when polio was by far the worst. Parents wouldn't allow their children to go to swim in public pools. And like my parents, many wouldn't let their children go to movie theaters. I was ten years old before I was first allowed to go to a movie theater. And I remember that day. I saw James Cagney in A Man of a Thousand Faces, in case you were wondering. Excellent film.

And it's just -- it's not just the disinformation campaign that animal rights extremists are conducting about the history of the polio vaccine. In fact we saw a slide here saying that the polio vaccine was delayed because of animal research. That's categorically not true.

I am also dismayed by their attacks on the foundation's current efforts to defeat birth defects. After conquering polio, the March of Dimes rolled up its sleeves even higher than it did before and turned its impressive fund-raising and research-granting machinery to the goal of conquering birth defects, all several thousands of them.

I know how impressive this machinery is, because after graduating Columbia University, Graduate School of Journalism, I went to work for the March of Dimes as a science writer. It was my job to study the research funded by the foundation and explain it to the news media and to the public. I worked for the foundation for three and a half years and came away with the utmost respect and appreciation for what this remarkable charity has done and continues to do.

So when I learned about the campaign of disinformation that animal rights extremists are conducting against the March of Dimes, I volunteered to speak up here. Because the

March of Dimes refuses to be blackmailed to discontinue the funding of animal research, animal rights extremists are trying to persuade groups to stop donating to the foundation.

Let me -- yes. Many of you haven't seen an iron lung. You may not even know what it is. But back a half a century ago hospital wards were filled with iron lungs that did the breathing for children and young adults. Today they're relics of museums.

This is a Web site that PETA has up, "March of Crimes" Web site, where it vilifies the March of Dimes. And it says what -- I don't have the copy of a letter that Dr. Nathan Nobis, identifying himself as a representative of Physicians Committee for Responsible Medicine, sent to the executive board of the Spanish and Latino Students Association of the City of Rochester in attempt to stop them from raising money for the March of Dimes Birth Defects Foundation.

Quote, "You might not know that the March of Dimes sponsors exceedingly cruel research that in no way helps children," he wrote. Nathan referred the Spanish and Latino Students Association to a Web site run by PETA called the "March of Crimes." PETA and its pseudoscientific front group, PCRM, are also attacking other leading charities that refuse to stop funding animal research, such as the American Cancer Society and the American Heart Association, the Arthritis Foundation, and others.

For example, here's a sidebar published -- oh, by the way, this is a little handwritten note from the March of Dimes campaign coordinator of PETA that was left on the front stoop of the president of the March of Dimes. It's a little intimidation tactic. It mentions how she visited all the neighbors and told them what terrible things the president and the March of Dimes are doing.

Well, you'll find out how intimidating this is when I talk a little bit more about PETA's operations and the people they support.

This is a sidebar that appeared in that Good Medicine magazine of PCRM. It encourages people instead of donating to the Arthritis Foundation, which conducts great research in the treatments and cure of arthritis -- instead it says to donate to the Arthritis Research Institute of America and the Arthritis Trust of America. So let's take a look. Here is the Arthritis Research Institute of America.

First let me tell you, the Massachusetts -- do I have that? -- yeah. Here's the Massachusetts chapter of the Arthritis Foundation. It has a three-star rating. 86 percent of its donations, the people give, goes to funding programs.

Now, let's take a look at the charity that PCRM is recommending. 35.3 percent goes to programs. The rest goes to salaries, expenses, and fund-raising efforts.

Let's take a look at the other organization that they're telling people to donate to. The Arthritis Trust of America, this is a fringe group that claims to have already found the cure for arthritis and other immune diseases. Its Web sites state, quote, "We tell folks how to

get well from so-called autoimmune or collagen tissue diseases, such as the rheumatoid diseases and related diseases, by means of physician referral, publications, and when money is available, we fund alternative complementary holistic medical research.

Of course if this foundation does have the cure for so-called incurable arthritis, why would they spend any money on research, alternative or otherwise, when they should be using it to provide the cure to sufferers?

So is this responsible medicine that PETA and PCRM is offering? I'd like to tell you more about PETA and the so-called Physicians Committee for Responsible Medicine, but I first want to tell you about some of the March of Dimes-supported research involving animal studies that have already saved hundreds of thousands of children from death and crippling birth defects.

Respiratory distress syndrome, also known as hyaline membrane disease, was a great crippler and killer of low birth rate babies. Babies born before their lungs are mature enough to function normally would often develop this mysterious devastating disease that would cause their tiny lung sacs to collapse, leading to suffocation. March of Dimes-supported research with animals led to the development of a very effective treatment that has cut the death rate from respiratory distress syndrome in half. It also greatly reduced the incidence of lasting disabilities among survivors of respiratory distress syndrome.

The treatment involves coating the baby's lungs with either an animal-derived or artificial sulfactant into the lungs mature enough to produce their own natural sulfactant. This research was conducted on animals first because you can't do this with human babies.

Another great killer of newborns was a birth defect called persistent pulmonary hypertension. This defect causes increased blood pressure in the blood vessels of the baby's lungs and prevents the lung sacs from expanding and contracting normally. A major advance in the treatment of babies with this defect came about through March of Dimes-supported animal research.

The treatment involves a tiny amount of nitrous oxide, a powerful but toxic gas that causes constricted blood vessels to relax. The safe and effective amount of this gas for babies was worked out using animal models for the disease. The treatment has significantly reduced the toll of injury and death from this birth defect.

Patent ductus arteriosus is the most common birth defect involving the baby's heart. Before birth there is an opening between the fetus's aorta and the pulmonary artery to circumvent the lungs, which of course aren't used in utero. In some babies that opening doesn't close after birth, which prevents the baby from getting sufficient oxygen through his or her lungs. Severe cases had to be treated with risky and traumatizing surgery.

Thanks to March of Dimes-funded research involving animal models, the causes of the birth defect were worked out and effective drug treatments were developed to safely close

that opening. Animal research showed how prostaglandins keep this opening from closing after birth. And animal research showed that prostaglandin inhibitors could safely close it.

So now drugs like indomethacin are being used to treat babies with patent ductus arteriosus instead of hazardous heart surgery. That same research led to a successful treatment for another common birth defect of the heart that once killed many newborn babies. Hypoplastic left heart syndrome results when the left side of a baby's heart is too weak to pump enough blood through the heart to keep the baby alive. By treating those babies with prostaglandin, doctors now are keeping the baby's ductus arteriosus open instead of closing it. Creating a patent ductus arteriosus in these babies allows the right side of the baby's heart to pump blood through the lungs to keep it alive long enough for doctors to surgically repair its malformed heart.

These are just a few of the many advances brought about by animal research, the research that animal rights extremists insist do not help babies.

Let me -- this old photograph of a miner carrying a canary into the mine, they used to be used as an early warning for miners because they were sensitive to carbon monoxide poisoning than humans. So when the canary staggers and falls off the perch, the miners knew to get the hell out of there. Carbon monoxide is a -- is a odorless, tasteless, colorless gas. It's -- you probably know just how dangerous it is in the home where it can't be detected if you don't have a device.

Well, we didn't have carbon monoxide devices to test for carbon monoxide until recently. So they used canaries because, as Dr. Greek said, the respiratory system of the canary is quite different from humans, but a difference that makes no difference is no different. The fact the sensitivity, the fact that a canary is more sensitive than humans to carbon monoxide allows it to be used as a model, as a safety warning.

And that's exactly what many animal studies are doing. They are not, as Dr. Greek claims, they are not predictors of whether human beings -- whether a drug is safe in human beings. They are models to tell us something about the drug, how it's metabolized, how it's -- how the body of a mouse or a mammal uses it. It gives us the information that we can then use in developing the drugs.

Steps in drug development. Preclinical toxicological tests -- I'm sorry preclinical, that involves toxicological tests, animal studies. Next comes the phase one clinical trial, which uses -- requires about 20 to 80 healthy volunteers. Then there's the phase two clinical trial, which will use about 100 to 300 volunteer patients. Phase three clinical trials require up to 3,000, 3500, or even more patients. Following the completion of phase three trials, the FDA will review the data submitted.

The animal studies are submitted to the FDA, and they use that too in order to see things about the drug, such as carcinogenicity and teratogenicity, meaning, you know, does it cause birth defects? You can't do -- it's not ethical or legal to conduct a carcinogenic test or teratogenic tests on a human being. So they're not done.

So they use those -- they use animal models, a number of different species to learn something to see whether these drugs might -- not will but might cause cancer or birth defects in humans. This is the canary in the mine. This is not the -- not used as a test to see if these things cause cancer or birth defects in humans. This is a misrepresentation of the facts. They are guides to the clinical -- clinical trials.

So put it another way. Animal studies of drugs are not used to determine whether these drugs are safe and effective in humans. They are done to generate hypotheses. The hypotheses are then tested in clinical trials using humans.

This is a graphic to show you just how complex the drug approval process is. But animal testing just collects the information that's useful for doctors and researchers to test them in humans.

Accutane. Accutane is a vitamin A -- it's similar in structure and function as vitamin A. It's -- the actual name is isotretinoin. Accutane is the product name, the trade name. It's insert warns -- very, very, very strong warning -- it causes birth defects. It is a major, a very powerful teratogen causing about -- I think about 20 percent of pregnant women who take this drug during the critical time will have a child with birth defects.

This was not discovered in humans. It was discovered in animals. Or I should say it was predicted by animal studies. Vitamin A, high doses of vitamin A, causes birth defects in animals. So when this drug came along and was about to be marketed, the FDA and researchers knew they had to watch this very carefully because vitamin A, large amounts of vitamin A in the body, a small amount of it is turned into isotretinoin, which was a very powerful teratogen.

Well, sure enough, they watched. And when the first defects, birth defects, started to appear in women who had taken isotretinoin, the alarm really went up and they started getting very serious about this warning.

So again, the animal studies was a canary in the mine. It was not a test to see whether it's safe in people or not. Clinical trials are done to determine that.

Vioxx. This -- there's that article in the -- all right, don't have it. There's an article in Good Medicine which blames the Vioxx debacle on animal studies. And Dr. John Pippin, a cardiologist, a member of the so-called Physicians Committee for Responsible Medicine -- by the way, did -- did I tell you the Physicians Committee for Responsive Medicine has very few physicians? Only five percent of the members are physicians. As is often said, Physicians Committee for Responsible Medicine is neither a committee of physicians nor a committee that advocates responsible medicine.

Dr. Pippin, cardiologist, wrote, "Good science could save consumers from the next Vioxx because -- but that won't happen unless the government stops relying on antiquated animal

tests." And he said, "As a first step to keeping consumers safe, the FDA must stop pretending that animal tests accurately predict results in human."

If you take a look at the labeling, FDA-approved labeling, that goes with Vioxx and try to find anything in there about animal studies, except for teratogenicity and carcinogenicity, you'll find nothing because the approval of Vioxx by the FDA was not based on the animal study; it was based on clinical studies, phase one, phase two, phase three. Animal studies use about 14, 1500 animals. That's the preclinical research that's necessary. Following that, as I said, there's the clinical trials, up to 3500 people.

Now, the problem with Vioxx had nothing to do with animal studies, contrary to what PCRM and it's propagandists have been saying. The problem with Vioxx is two-part. One is the advertising. In the old days before drugs were advertised on television, all over the place, it took time for a new drug to get out into the market. By then doctors tended to see adverse effects. Now a million, 10 million people are taking the drug within a year. So lo and behold, there are rare events, adverse events. They show up in large numbers as it did with Vioxx.

How were they to detect a serious adverse effect that occurs in one in 10,000 people when they're only testing it on 3500 people? That's the problem.

There's also a problem with postmarketing surveillance. It's inadequate in this country. It's not required by the FDA. There's no real good system for it. That has to change. That's the problem with Vioxx. That's the problem with all the other drugs that Dr. Greek talked about that pulled off the market. Had nothing to do with animal research, because the clinical study, the studies that the FDA required, were done in people, with the exception for testing for cancer and birth defects because you can't do that with people, although some people now are arguing that we should. I do not agree.

One of the things that Dr. Greek says over and over is that 20 percent of -- what was it? When drugs are tested, when they enter clinical trials, about 80 percent of them fail. Only about 20 percent get through the approval process. And he blames animal studies. Claims that's the problem, because the animal studies didn't show that 80 percent of the drugs are -- have serious adverse effects with humans or may not be effective.

Well, he's not discussing the other numbers. The other numbers are this. When drug companies are trying to develop a drug, they'll go through 5,000 different compounds screening. Only 250 will make it into the laboratory, for the preclinical research involving in vitro studies and animal studies. And of the 250 the in vitro studies and the animal studies will show that 245 of them, 98 percent of them, are ineffective or too toxic. They will not be used on human beings. So that's the number that he doesn't like to confront you with.

Yes, 80 percent of the medicines, new drugs that enter clinical trials don't get through. But that's not because animal studies failed. What the animal studies did was it highlighted, it told the researchers what to look for, what organs may be affected. So that in the clinical

trials they watched more carefully looking for signs of toxicity. And that's the reason many of these drugs do not get through phase one or phase two or later on phase three.

Science moves by making mistakes and then correcting them. What opponents of science love to do is to shift through the scientific record and pull out studies that were wrong while ignoring or even denying those that were right. Dr. Greek unfortunately does this. He's filled three books with things taken out of context, things misconstrued, and things just plain falsely stated.

I am going to jump to some examples. Before I do, I wanted to say -- tell you what Dr. Thomas Starzl, the noted pioneer for transplantation, said about animal studies. He said about his own pioneer work for animal -- for organ transplantation, he said that the first study he did most of the subjects died. He learned from that and adjusted his technique. And the second round of studies for the transplantation experiments he did, most of the subjects actually survived, a majority did. The third set of experiments that he conducted there was only one or two deaths. Nearly all the other subjects survived.

His fourth experiment every one of the subjects survived. The difference, the most important difference between these study was that the first three were done on animals; the fourth one was done on babies.

But Ingrid Newkirk, cofounder and president of PETA, says there's no rational basis for saying that a human being has special rights. A rat is a pig is a boy is a dog. And ask Dr. Starzl. Let me get to this.

PETA spokesman Bill Marr, I love his politics more or less, but he's a staunch spokesman for PETA, and he conducted a campaign against Columbia University recently calling on them to stop their Frankensteining of primates. Unfortunately, Marr doesn't believe in vaccination either, he says. That's another theory that I think is flawed. And that we go by the Louis Pasteur theory, even though Louis Pasteur renounced it on his own deathbed, and said that Beauchamp was right. It's not the invading germs; it's the terrain.

David, did you know that Pasteur said that on his death bed? Yes.

He doesn't believe in the germ theory of disease. And he says, "To those people who say my father is alive because of animal experimentation, I say, yeah, well, good for you. This dog died so your father could live. Sorry, but I am just not behind that kind of trade-off."

Well, that's what PETA and that's what PCRM is all about. PCRM is a front group. It's funded and it's basically run by PETA.

Physicians Committee -- the AMA in 1991 censored -- cenured PETA -- sorry, PCRM, saying, "The Physicians Committee for Responsible Medicine has been formally censured by the AMA for purposely misrepresenting the critical role animals play in medical research."

I wanted to make a comparison -- but I'm running out of time. So I'm going to rush ahead -- between some of Dr. -- because I spent a lot of time reading through Dr. Greek's books, and I tracked down his references. And I found so many examples where he left things off, misquoted, misrepresented, distorted or made things up.

He quotes Stephen Schneider, this noted biologist -- environmentalist, saying, "Each of us has to decide what the right balance is between being effective and being honest" as a way of showing how some scientists are a little less than honest. Only he left out the last part of the quote, "I hope that means being both."

In one of his books he has a reference to show that dog -- research with dogs did not lead to information, knowledge about diabetes. He quotes some obscure publication. And he says in 1995 Hansen (inaudible) reviewed the literature and found 72 cases of diabetes accompanied by lesions of the pancreas.

Well, several years before they were -- experimented on dogs where they removed the pancreas and the dogs became diabetic. So I don't know what this reference is supposed to mean. This is not -- this is not legitimate scholarship.

Yeah, that was that. Okay.

Dr. Greek in one of his books says that there has been no -- despite all these animal researches there's been no improvement in the overall mortality, the adjusted mortality, of cancer in humans.

Well, let's take a look at the facts. Look at the cancer incidence of -- and death rates in children. The incidence from 1975 to 2001 has gone up, but look at the mortality. Dropping.

Adult males. Even lung cancer is taking a sharp turn beginning in 1990. And most of the other cancers are going down.

Adult females. Likewise. You could see how lung cancer went up, but it's flattened out, and it's on its way down, as most of them are. And if you look at combined cancer death rates, it's dipping down. What Dr. Greek said is simply not true.

Perhaps he doesn't think someone like -- there are people like me that are actually going to check these things out.

"Nicotine withdrawal symptoms were scientifically confirmed in humans in the 1970s. Nevertheless rats were still being studied for signs of nicotine withdrawal in 1994." Well, I looked up that reference. And it wasn't to see if rats can become addicted to nicotine. What it was was it was a test to see if a drug called -- I can't say this right -- nic --

UNIDENTIFIED MALE: (Inaudible)

MR. SKOLNICK: Thank you.

-- whether it can interfere with nicotine addiction. And that was done in 1994. And as a matter of fact, a year later they moved on to clinical trials in humans.

That representation that Dr. Greek did, he took -- you know, you didn't think people were going to go and look that reference up. Well, I did. And it didn't say what he said it did.

Okay. Listen to Dr. -- here is a debate in 2004 -- 2002, between Dr. Greek and Dr. Robert Speth. It doesn't work. Well, Dr. Greek corrected or -- Dr. Speth said that about a -- that many veterinary medicines are human medicines because of the similarities. Human beings and animals, or pets, share about 200 of the same diseases.

Well, Dr. Greek said, "Well, they were already using animal -- human medicines because no pharmaceutical company will invest any money to develop drugs that they don't have to. There's no money in coming out with new drugs." Well, just look at all the current dog vaccines available. There's something like 11 -- well, one, two, three, four, five, six, eight, nine, ten, eleven -- about eleven different vaccines that are just developed for cats and dogs. And this is something that's new.

Now, Dr. Greek's wife is a veterinary doctor. Why doesn't he know this?

Here's a new tablet for dogs. One a month, and it prevents fleas. It interferes. It's a novel drug. Interferes with chitin, formation of chitin, insects use. Their exoskeleton is made out of chitin. The flea drinks the blood, gets the inhibitor, can't make chitin. The eggs are sterile. And they've got an injection. Once every six months for cats.

Now, I can go on with numerous other examples of how he's misrepresenting the facts. This is not science. This is -- oh, here's a -- here -- oh, this is -- this was a good one. Maybe I'll get to it. Oh, no, I don't get a rebuttal. Well, maybe in the question-and-answer period.

Let me -- and I can't play sound. Well, I wanted to play you the -- what Dr. Jerry Vlasic, an associate of Dr. Greek's, said at an animal rights conference where -- it is an incredible chilling soundbyte where he's recommended the assassination of animal researchers. Not low ones but the higher up ones. Send a message to stop this.

Well, Dr. Vlasic has been a partner of Dr. Greek and in fact he was your science advisor, I believe, and in fact as of last summer your newsletter has him listed as a science advisor. This man and his wife have been barred from Great Britain because he's a danger.

I don't have time to show you all the other people that are associated with PETA, that work for PETA, that work for PCRM who are involved with arson, who support arson, violence, intimidation. This is all a plot to stop people from abusing animals in their minds.

Thank you.

(Applause.)

THE MODERATOR: Dr. Greek, you now have five minutes for reply.

DR. GREEK: Thank you. Thank you very much.

Well, first let me thank Mr. Skolnick for agreeing to participate in this debate. As I listened to his arguments, though, I got the feeling that we were attending two different debates.

To begin with, I represent Americans for Medical Advancement, okay. We are an organization that is a patient advocacy group. We have in our mission statement, which you can find on
the Internet, that if animal experiments cure humans, we're all in favor of it, okay. The board is comprised of six individuals. Five out of six eat meat, wear fur, and hunt.

So to confuse us, purposely or not, with an animal rights group, such as PETA or PCRM, I think is slightly disingenuous. We oppose all illegal activities. We don't just oppose violence. We oppose illegal activities en masse. We oppose the whole thing.

Yes, Dr. Vlasic was on our scientific advisory board, and he was recently fired. Matter of fact, we fired him before he made his outrageous statements about violent activities, because we thought he was going in the wrong direction.

So you can condemn us because of past company that we have kept and fired. I guess that's up to you.

The other theme, I guess, if you will, is that we're somehow part of the animal rights movement. Again, when five out of six of your board members eat meat and wear fur, I don't see how you can get that.

But let me just say this, if we were to veto every idea that had a fringe or lunatic supporter, no idea would ever be taken seriously. And I mean clearly a lot of the animal rights movement love what it is that we do. I wish they loved us enough to donate their money. But they don't.

One reason the vested interest groups choose invective instead of explanation is that they have no scientific support for their position. Now, you'll notice that I did use references in my talk. For example, when I talked about the National Cancer Institute saying they lost cures for cancer, that had reference in Science which you can go and look up.

And our books have over a thousand references to peer review scientific journals. And I implore you, please, look them all up and come to your own decision about whether or not we've been honest. I stand by every statement we've made.

By using the phrase "animal rights activist" in the same diatribe about animal models, vested interest groups seek to avoid engaging in true debate and instead imply that those who disagree with them are antiscience, inflexible, irrational, antihuman, and so forth.

With regards to the polio vaccine and some of the other things that Mr. Skolnick said, we had some disagreements but not really. No one claims, no one seriously claims, that animals were used as causal analogical models in the development of the polio vaccine.

Where they were tried as CAMs they failed. For example, one vaccine was developed in the 1930s based on using monkeys as CAMs. And children ended up losing their sense of smell for the rest of their life. I've actually met someone who was involved in that study.

In terms of animal models delaying the polio vaccine, I wasn't alive then, okay. I had no firsthand knowledge. Al Sabin, I think, has firsthand knowledge. And again, as you go to our books or our Web site, you'll find a reference from the Congressional Record, okay, where Al Sabin's testified under oath before Congress, raised his right hand and said, quote -- or I shouldn't say it's a quote. He said that animal models delayed the polio vaccine for decades. Hey, if he says it, you know, I believe him.

Now, when the polio vaccine was finally produced -- you remember in Nos. 3 through 9 that I had on the board, you can use animal parts. And that's how the polio vaccine was produced. It was produced using kidney tissue from monkeys. I mean, I'll -- I'll give you that. That's not our argument. Our argument is that you cannot use them to test drugs and study human disease.

Just a couple of things. We don't give nitrous oxide to babies, Mr. Skolnick. Nitrous oxide is something that I as an anesthesiologist give to people who don't want to be awake anymore. We give them nitric oxide. Nitric oxide was, again, an example of something that was discovered in the aorta of a pig. Now, if you don't know the difference between nitrous oxide and nitric oxide, that doesn't impress me.

Cancer mortality rates. Yes, cancer mortality rates are coming down. Not because of treatments. Because of two reasons. Number one, people are stopping the habit of smoking. And number two, we're diagnosing their disease earlier. We're not curing them. We're not curing anybody of cancer. I shouldn't say -- this is a sweeping generalization. But by and large we're not curing cancer. I mean I think -- I don't think I need to defend that point.

This really gets down to the canary in the coal mine. I think that's an excellent example. In the 1930s if I was going into the coal mine, I'd want that canary on my shoulder. I wouldn't want him on your shoulder. Because we might be ten feet away from each other. So using the canary in 1930 was a very viable thing to do. Today if I went into the coal mine, I'd want (inaudible) CO2 monitor or PO2 monitor and PCO monitor. And so that's what you can do.

You know, in the old days we used canoes to cross oceans. And you still can. I mean that's the look you're going for, good luck to you. We can also use the Concord, or at least we could until they retired it.

Phase I clinical trials. The actual number is five out of a hundred drugs that pass safety tests in animals and they go on to phase I clinical trials in humans, five out of a hundred make it to the market. Now, I don't care, we can have an argument about what are animals used for in drug testing. But if your batting average is five out of a hundred, man, that's not good. That's not good if you're playing hockey. Okay. So that's just not a good thing.

Lastly, if I can get through it, Mr. Skolnick did show us some so-called victories from using the animal model. But these are really a Potemkin village. It's an impressive facade, but it hides an undesirable fact or state.

Now, he did present some interesting, albeit misleading, anecdotes, but the poor old anecdote, even if these anecdotes were true, is not data. And science is concerned about data.

And I think you'll notice the difference in our two presentations. I mean, I gave you a very scientifically oriented probably over somebody's head -- some of it was even over my head -- debate. So the question, when you use anecdotes, is, is this a fair presentation of the general case?

And what I tried to do is give you the scientific theory along with some empirical data from peer review journals that supported my case. I don't think my opponent did that.

Also, in arguing for the importance of animal models, he used a shotgun strategy, and I don't have time to pick out everything that was wrong with every one of them. I just don't have the time. But to give a couple of examples where a certain animal species reacted similarly to humans and from those limited examples to conclude the animal model as a paradigm is viable is the fallacy of loaded conclusions. It would be like profiling several lottery winners and concluding that playing the lottery is the best way to save for retirement.

Thank you.

(Applause.)

QUESTION: I have a question for Ray Greek. And when I was listening to Andrew Skolnick's presentation, one of the things that spoke to me a bit is that animal trials are not used to prove the efficacy of drugs but they're used to narrow down or to perhaps weed out what trials should go into clinical trials, that it's really clinical trials that prove the efficacy of drugs.

And I wonder if you could speak to that and clear that up or say how that's relevant to this.

DR. GREEK: Sure. Thanks for the question. Animal trials, if you read the drug company's propaganda, are done for one reason and one reason only. And that's to save the general public from death. Okay. And even if you read Nature Review, Drug Discovery, Nature, the pharmacology journals, and so on, so on, they're very blunt about that.

So I don't know where this concept came from that we test on animals, vis-a-vis drug testing to get an idea or to use it as a heuristic. If there's one place that animals are used as CAMs and are meant to be predictive, it's in drug testing.

Now, where the confusion arises sometimes is that the animal testing stage is sometimes done first, and that's when we talk about Phase I human clinical trials. And that's the data that I talk about when I say a hundred drugs under Phase I clinical trials and 95 of them fail. That's really what animal testing is for; it's to protect those people in Phase I, II, and III clinical trials, okay.

Now, they would also like it to protect the people in the general public when the drug is marketed, but it's a distinction without a difference. Because if you feel safe taking a drug that was part of a hundred that got weeded down to five, I mean, that's just not a good batting average.

And you have to flip that argument on its head. Remember, the National Cancer Institute says we think we've lost cures for cancer. Well, I think Mr. Skolnick's data is roughly correct; you know, you do get 250 drugs, two animals, and from the animals, you know, you're left with a hundred. What makes you think those other 150 weren't a cure for breast cancer? You don't know. I mean, if the animal model as a predictor is so bad that at best you're getting five out of a hundred right, that's terrible.

And that's not just my opinion. Mark Levin, the CEO of Millennium Pharmaceutical, showed a real nice slide one time where he tested drugs on rats and on humans. And there's no predictive value whatsoever. It's like a coin toss. It was hepatotoxicity. But we can go into that further later if you want.

MR. SKOLNICK: Well, let me show you why we do and why we're required to do preliminary studies on laboratory animals before we do the studies on people. Here are some of the pictures that became evidence in the Nuremberg trials of the Nazi doctors. You may be surprised to know that the only modern country to totally outlaw animal experiments, animal studies was Nazi Germany. Adolph Hitler in 1933 outlawed it.

I'm not saying that that's the reason he turned to humans. He had other reasons to turn to humans. These were people whose lives were not worth living. These were the infirm, the mentally retarded, the handicapped, the Jews, the gypsies, the war prisoners, and anyone else that got in his way.

Hyperthermia experiments where these Nazi doctors submerged people in ice water until they died. Then these -- to research for, you know, like pilots, their Luftwaffe pilots bailing out at high altitudes, they -- they put prisoners into decompression chambers.

And this was a cute one where they just starved the women and then removed their genitalia, their ovaries and sent them to the universities for study.

Out of the Nuremberg -- out of the Nazi holocaust and the Nuremberg trial came a code that the judges at the Nuremberg trial drew up that defined what is ethical for human experimentation. No. 3 states, "The experiments should be so designed and based on the results of animal experimentation as a knowledge of the natural history of the disease or other problem of the study that the anticipated results will justify the performance of the experiment."

And from the Nuremberg Code, which was written in 1949, in 1964 modified several times, the latest in 1983 and accepted by all, by the World Medical Assembly, which represents over 80 -- the medical societies of over 80 nations, they drafted the Helsinki Declaration moving -- oh, I don't know if I have it. It moved the rule to No. 1, all human experiments to be ethical must be done based on a thorough review of the medical literature, of the scientific literature, "and after properly conducted animal studies." That has been the basis of our laws and the laws of most countries. That's why we do the studies.

Dr. Greek in his book says, well, it's the greedy pharmaceutical companies. They don't want to be sued, so they're going to do these animal studies so they can defend themselves in court. Well, that's nonsense. Anyone who follows litigation with drugs knows that toxicology studies, preclinical studies with animals will not save the drug company. A great example has been dectin. This was the most well studied drug in pregnancy.

Am I -- am I (inaudible)? Oh, I'm sorry.

THE MODERATOR: Other questions?

QUESTION: My question is regarding polio. Could a cure for polio have come about without animal experimentation? And if so how long would it have taken?

DR. GREEK: Thank you. Well, again, according to Dr. Sabin, it would have taken 30 or -- 20 or 30 years less long than it did, okay? Again, that's not Ray Greek; that's Al Sabin, who probably knows a thing or two about it.

What animal experiments allowed us to do vis-a-vis polio was allowed us to grow the virus, and it allowed us to test purity of the vaccine. Okay. And again, if you go back to my second slide, where I talk about how animals are used in science and in research, animal tissue today is used ubiquitously to grow thing. It's part of culture media.

Now, we don't have to use animal tissue. We can use tissue from humans, of which there's a surplus. People die every day. Society finds that a little unsettling, and that's fine. But there's a difference between something being necessary and something being functional. And so the original polio vaccine was grown using kidney tissue from monkeys.

Okay, fine, great. I mean that's fine. What paved the way for the polio vaccine -- you got to remember, Sabin and Salk didn't win the Nobel, okay. The guys who won the Nobel were the guys who made the virus grow in vitro. That's what took the brains. I'm not saying Salk and Sabin were dummies. They were far smarter than me. But that's where the great breakthrough occurred.

So it's, again, disingenuous to say we studied polio in monkeys. No, we didn't. And when we did, we thought that polio entered through the nose and went to the CNS. That's what Sabin was talking about when he said it delayed the vaccine for decades. That was wrong. It went through the gut, okay. So, you know, we can't second guess history, but all of the ingredients were there many years before they were all used.

MR. SKOLNICK: All right. Please forget what you just heard. Sabin had been very -- up to his dying day had been very upset about how his testimony before Congress had been taken out of context and has been misused. He has always -- he always defended animal research as having been essential for his work and for Sabin's work -- Jonas Salk's work.

The mistake that happened -- by the way, it wasn't because of the animal studies that an error had been made. The error had been made not because they used animals but because it was misunderstood. There was plenty of evidence already going back quite a while that showed that the gut did get infected. What happened was Sabin, in the late '30s, had conducted an experiment on fetal human tissue. Not animals. He got a fetus, and he made cultures of the cells for different organs of the fetus. It was an aborted fetus.

And unfortunately he got a strain of the vaccine -- remember I said there's well over a hundred strains of polio virus that were extant throughout the world? He got one that was a laboratory specimen. It was grown and grown and grown, not in nature. It was growing in a laboratory for many generations. And it lost its ability to infect the gut. He didn't know that. So he used this strain from Rockefeller University to -- and it did not infect anything but nerve tissue. It was an unlucky break. He could have used a hundred different strains. He picked one that didn't infect nerve tissue (sic). It was a mistake that set them back for about 14 years.

Well, anyway -- so Dr. Greek blames that on animal studies. It had nothing to do with animal studies. In fact it was grown in human tissues.

THE MODERATOR: Perhaps I can also interject here. There was also some enmity between or differences of opinion between Salk and Sabin. I knew Jonas Salk, and the difference of opinion was the use of inactivated virus versus a live attenuated virus. Sabin believed strongly in the latter, and Salk believed equally strongly in former. Salk got there first. And that was the first vaccines that were used. And Sabin was an unforgiving mood

after that because he thought that Salk had got the priority for that -- there's an element in the scientific (inaudible). It's a fascinating history of two great men.

QUESTION: What I heard Dr. Greek say that Sabin said something about animal experimentation. What I hear Andrew Skolnick say is that Dr. Greek made a statement about animal experimentation. And what you're saying by saying that is that Sabin didn't say that. And what you're saying is that Sabin said that. Yes, what you said was that's what Dr. Greek said this about animal experimentation. And Dr. Sabin believed and said something else. But what you said was that Sabin said it. So I'd just like a clarification of what did Sabin say?

DR. GREEK: Yeah, Sabin said it. And that's all I'm saying. To get into how the polio vaccine came about, you know, we could go round and round on every not just the polio vaccine but every aspect of it.
And I tell you, just to hopefully speed this debate along a little bit, look, for the sake of argument, I'm willing to give the animal experimentation industry every discovery up to the year 1990. Let's just assume for the rest of the day that every breakthrough in medicine up to the year 1990 was one hundred percent dependent on animals.

I don't care. That's not the point. Even if that were the case, the point is in the year 2005, status post to human gene gnome project, status post to the discovery of complexity theory, evo-devo, and so forth, folks, the name of the game has changed, okay.

So we can debate history till everybody's blue in the face. And it's not relevant to the argument that I am making.

MR. SKOLNICK: Sabin said that, but it was taken out of -- it was -- you know, he was speaking before Congress. It was taken out of context and misused. He had rebutted the misuse many, many times. And Dr. Greek had been misrepresenting what was said, not misquoting.

Anyway, the 1990, speaking of 1990, in Dr. Greek's third book he has a list of the last 20 years of Nobel prizes. It leaves out 1990. When he was debating Dr. Speth on radio in 2002, Dr. Speth talked about kidney transplantation being essential using a dog model. Dr. Murray had won a Nobel prize for that.

Well, Dr. Greek said, "Oh, Dr. Speth, you should know better than that," something to that effect. "The first successful transplant was in humans, was only successfully done in dogs five years after."

Dr. Speth was dumbfounded. He didn't know enough to contradict him to say that's not true. Unfortunately, it was not true. Might be why Dr. Greek did not put 19 -- the year 2000 Nobel prize in his book. Not 2000, 1992. Because if you look at the 1992 Nobel prize, it was to Murray for doing the first successful human transplant after developing the procedure in dogs. Check out -- go to the Web site. If you doubt this, go to the Web site,

look up the Nobel data log and look up medicine 1990. Dr. Murray had worked on dog model to perfect his technique.

THE MODERATOR: Questions or comments?

QUESTION: The question I have is for Mr. Skolnick. For me in terms of the issue of going forward, what I'm most interested in in terms of the two different viewpoints here is the predictability of one model or another. Do you have available any statistics in terms of the predictability in favor of using animals as models for disease or animals as subject for testing?

MR. SKOLNICK: I don't have data to answer that question, but I do have this observation. There is no -- there is little predict- -- there's inadequate predictability. When they do a clinical trial of 5,000 people here, there is inadequate predictability of how the drug is going to work in the marketplace.

Let's put it this way. I grew up with peanut butter and jelly sandwiches being served in school. Well, one -- there's 3 million Americans who would die -- possibly die eating the peanut butter and jelly sandwich. People -- I mean the 6-plus billion people on this planet are very diverse. And you have -- you have atypical reactions.

Animal studies are not perfectly predictable. It's not that accurate as prediction. But that's not what animal models are mostly used for. They're used to give insights and generate hypotheses for clinical testing.

DR. GREEK: If that were the case, then a vast majority of grant applications to the national Institutes of health would not end with these words, "And we hope our proposed study will lead to a cure for X," Alzheimer's, stroke, Parkinson's, whatever. Okay.

What this debate is in large part about is about what I consider to be the very disingenuous attitude on the part of animal modelers and their representatives who say on the one hand this isn't about predictability. Because they don't have the data. Okay, I got the data that shows that animal models are not predictive.

Now, what this is about is using animals as heuristics. And I'll grant you, if you want to get a new idea, you can do that in a variety of different ways and one of those ways is to study animals. But if you're going to take the American taxpayers' money and if you're going to take the March of Dimes' money and if you're going to take these other charities money, then be honest and say, "You know, I'm looking for new ideas." And look, there's nothing intellectually inferior about looking for new ideas. I probably never had a new idea in my life, okay. But let's not be disingenuous and say, when we're looking for new ideas, oh, we're really looking for the cure for cancer. Because that's the only way they get the grant money.

And again, what you're hearing here today were a lot of facts being thrown back and forth. And you're hearing a lot of just, you know, completely opposite statements. And I would encourage you to read the books. I don't take any money from the books. All proceeds from the books go to AFMA. But read the books. Look up the references, if you have the time.

But if you don't have the time to do any of that, just, you know, use some common sense. Think of the things that I said during my portion of the debate that are kind of theoretical and sciency and somewhat ethereal, but that's the core of the argument.

THE MODERATOR: Could we have another round on this question?

SKOLNICK: Yes, I can give some examples of very important predictability. Let's take a look at 1960. Some farmers, turkey farmers, in England had just devastating loss of turkeys. They were dying of what they -- they didn't know what to call it, but they called it turkey X disease.

Turns out what it was, after much research, using animals, using birds -- it wasn't just turkeys. Ducks and other fowl got the disease. What it was they were -- their liver was destroyed by a liver toxin that was produced by a mold that was growing on the feed, aflatoxin.

Well, sure enough, epidemiological studies later found that aflatoxin is a human carcinogen. It is causing a large number of liver cancers, primarily liver cancers, in humans. And it's something that now they're trying to keep out of our food supply. Now, another more recent, in the '90s. This is about ten years ago. They found that a cyano bacteria, blue-green algae, produce a toxin. And this toxin is liver toxic in animals and carcinogenic. And lo and behold they did epidemiological studies in China, Africa, and other countries where the main water supply comes from surface water. And it is carcinogenic in human beings too.

QUESTION: Mr. Skolnick, if I could comment. I encourage those kind of examples. And No. 7 on one of the very first slides, I interpreted that as animals (inaudible) ideas opposed to what I was asking about (inaudible) animals (inaudible)

THE MODERATOR: Please let Dr. Greek comment. Then you have a chance to follow up.

DR. GREEK: I think if you take nothing else from this debate, take this example. Yes, there are animals who get cancer from the same chemicals that give humans cancer. There's no question about that. But when a scientist says the word, "predictability" or "predictive," that has a very specific meaning.

Now, the last time I checked -- and these numbers undoubtedly have changed. But the last time I checked, there were over 2000 substances, chemicals that were found to induce cancer in rats and cats and dogs and mice. You know how many of those substances cause

cancer in humans? Last time I checked it was 30. Let's say it's doubled. You know, that's not predictive. You know, to say -- I could go out, and I could bet on next year's world series, and I could place a $10 bet on every single team that's playing in the -- in the National and American Leagues. And I'd be right. One of those teams would win. But I did not predict the winner.

Okay, in science we have things like sensitivity and specificity and so on and so forth. And that's what prediction is all about. And I said, I think in my first talk, I said you can almost always go back in time retrospective and find some animal that will react to a chemical or drug or disease or whatever pretty much like the human does. That's retrospective analysis. That's not predictability.

THE MODERATOR: Want one more round with this?

MR. SKOLNICK: Well, what I said was that they didn't go back and test turkeys for aflatoxin toxicity. They didn't go back and test animals to see if they also get cancer from pond water. These were the canaries that alerted scientists of the problem in human beings. They predicted.

Now, I said in my talk that animal research is not primarily used to predict human reactions. They're used to provide insights and generate hypotheses that are tested in clinical trials. Now, we can't give people suspected carcinogen. Dr. Greek kind of misrepresented we know there's -- actually there's about 90 pretty strongly linked -- pretty strongly implicated carcinogens for humans, maybe 30 that have been definitely confirmed. But there's thousands that are suspected because of the animal studies. We can't do the studies to find out if they are indeed carcinogenic in humans. It's unethical.

more. The same thing with teratogens. Many suspected ones; only about 20, 30 that are known to be teratogenic in human beings, causing birth defects. We can't do those studies. We can only infer from the animals because we have no better means.

DR. GREEK: It's actually easy to do those studies. It's called epidemiology. And yes, there are only 30 confirmed. And again, maybe it's 40; maybe it's 50, 60. It's irrelevant. The point is that if the turkey is going to be predictive for carcinogenicity testing, what you have to do is that you then have to take those known human carcinogens, all 30 of them, give it to the turkey, and see how the turkey fares. And the turkey doesn't do well. Okay. That's what drug testing is all about. You have an animal that, quote, according to Mr. Skolnick, predicted thalidomide's toxicity, okay. Thalidomide was a drug that was toxic to humans and given to pregnant moms. And we did find the white New Zealand rabbit reacted the same way.

Well, guess what? The white New Zealand rabbit was then exposed to a lot of other known human teratogens, and those known human teratogens passed with flying colors. That's the difference between predictability and retrospective analysis.

The gentleman was right. You can get ideas from anywhere. And look, if I see cows dying in the field, I kind of want to know what they're eating and then, yeah, let's see if other humans have eaten that, and you know, let's explore it. It's a heuristic. I don't deny that animals -- anything can be heuristic.

But the problem involves around what is prediction. What is predictive? And it's not analysis. It's not a casual relationship. It has to be causal.

THE MODERATOR: Well, perhaps I could just interject, the origin question was on predictability. I would direct you, and perhaps other members of the audience who are interested to an article in Nature Review's Drug Discovery 2003 by brown owe wits from Lexicon Genetics.

What they did was take the hundred most popular clinically prescribed drugs. And they did mouse knockout studies in which you selectively delete a gene. And they asked whether the phenotype of that mouse knockout would have in fact been predictive of the model (inaudible).

And then the conclusion -- you can study the conclusions as you wish -- was that it would. So they would have argued I suspect for predictability.

Any other -- you had one question. Now (inaudible) different questions.

QUESTION: You had stated in your presentation that humans die from medical research or drugs as a result of the human -- or the animal models that they use. But wouldn't that be able to be flipped easily where as if there were no animal models, then more humans could also die due to that?

GREEK: Yes. Thanks. I'll show my age and say that's the $60,000 question. There used to be a game show that was called that. $64,000 question. There you go.

Right. That's what I'm arguing. I am not arguing that animals never get it right. I mean that'd be great, because then, you know, if it caused cancer in an animal it would be safe (inaudible).

What I'm arguing is is that they get it wrong more often than they get it right. And it's not black and white. It's not right or wrong. What it is is it's misleading.

I'll give you one example of that. In the 1980s we knew that HIV was in the French blood bank, okay, that HIV-tainted blood was being given to French citizens.

The French government decided they weren't going to do anything about that because they knew that when HIV was given to monkeys and chimpanzees, it was safe. So the mode of transmission at that time with HIV had not been worked out yet. The result of reasoning from the animal model to the human was that about -- I forget the exact number -- 8,000

French people are now dead because they did come down with HIV and then AIDS and then they died.

So I think we have huge amounts of empirical data supporting the fact that animal models are flat-out dangerous. Now, if you're going to say that animal models work, first you have to explain that in terms of evolutionary developmental biology, you have to give me a theory why it should work. You can't just use isolated examples where animals and humans agreed --

QUESTION: But that's what you're doing in the same respect. You're giving isolated examples --

DR. GREEK: No. That whole first lecture was one long boring theoretical science lecture.

QUESTION: And I agree with science, but I don't agree with what you're saying.

DR. GREEK: That's your prerogative. But when you accuse me of not -- of just being up here presenting anecdotal data, I fail to see how that first 35 minutes contained a lot of empirical data much less anecdotal. I mean that was complexity theory, evo-devo, and so on, so on.

And look, this is cutting edge stuff. You've got to know about evo-devo. You've got to know about complexity theory. You've got to know how all these things interact and relate. And if you don't know that, that's going to be problematic in terms of my theory. But the first 30 minutes of my lecture was theory. It wasn't even empirical.

MR. SKOLNICK: Here we go again. The French -- when the French prevented -- well, let me back up a second. This representation of why the hemophiliac patients in France got infected with HIV is false. The French did not allow -- let me back up.

The United States had marketed a test for HIV to make the blood supply safe. It was used in the United States and other countries. France would not allow it because its own company, the Pasteur Pharmaceutical Company, was working on one and they asked the government to keep it out.

They knew that you get -- can get HIV infection from blood supply because it was already marketed in the United States and other countries, a test to prevent it. So this is just another misrepresentation.

Page 81, Doctor, on his Specious Science, which is appropriately named, he says that animal -- "while animal-based nutrition research typifies the ineffectiveness of animal model protocols. For instance, the need for animals -- the need for vitamins A, D, and nicotinic acid, so powerful in maintaining immunity was discovered in humans."

No it wasn't. They were -- all three vitamins were discovered with dog -- dog -- vitamin A, dogs, mice, and dogs. You know what is really dangerous? spurious science, false science, science that's misleads and prevent us from finding more effective treatments.

THE MODERATOR: Questions or comments? We will take this question and one more question.

QUESTION: I was just wondering how if Dr. Greek thought it was ethical like how exactly you would give the drugs to the human population. What tests would need to be conducted if the animals aren't reliable and if it's ethical to do that?

DR. GREEK: Thank you. That's a good question. Drug testing is actually easy. To begin with, I would do the same things that are being done now, which is a lot of in sill can a modeling, in vitro studies and so on and so forth.

Now, there are a lot of tests that drug companies could do at that stage that they don't do. Okay, there's a movement within the drug companies themselves to do more bench work before the drug is ever progressed along.

Second of all, I would skip the animal tests, again, because the animal tests don't give you useful data. Now, if they give you useful data, then fine. Use them. But again, if you read the books, look up the references and so on and so forth, even the drug companies today in the journal Nature Review Drug Discovery is coming out almost every issue and saying it doesn't work. Okay? I mean, I'll take their word for it.

And the other thing that I would do is going to cost the drug companies a lot more money, and they don't want to do this, and number one, when I exposed a patient or a volunteer in Phase I human clinical trials, I'd use microdosing, spectroscopy and PDT scanning. And there's a really nice article again in the same journal Nature Review Drug Discovery a couple years ago that outlines how that should be done.

And the last thing that I would do is I would increase the number of clinical trials. I would make drug companies actually do tens of thousands. And I would also make them broader and longer. Okay. And you can segue from, you know, if in year one if the drug looks promising you can release it to some people in the population, and then you can release it to more and more and more.

But that's going to cut profits, okay. And that will never happen.

MR. SKOLNICK: That may be the first thing I agree with Dr. Greek about, is that we need to slow down the dissemination of drugs once they've been approved. It's just ridiculous what's happening.

But I disagree with what he said that drug companies want to do animal research. In fact I don't -- drug companies do not want to do almost any of these precautionary, slow, methodic studies. As a matter of fact, they're pressuring the FDA -- and the FDA has

actually put forth -- this is hard to believe -- on behalf of the drug companies, they have put forth a proposal that they will allow drug companies to test new drugs abroad among the developing nations without abiding by the Declaration of Helsinki.

Look, animal -- the pharmaceutical companies are not doing animal testings because they want to. And quoting one or two drug company representatives saying, "Gee, we don't want to do animal studies," that's not good enough science to show that you don't need animal research.

THE MODERATOR: That's worth also noting that the Environmental Protection Agency decided not to go ahead with its decision to study the toxicity of insecticides in children. They withdrew that decision.

DR. GREEK: But that was a political decision. That was (inaudible)

THE MODERATOR: Well, it was a political decision (inaudible) both, I think (inaudible).

One more question.

QUESTION: Thank you. I want to believe that science kind of accommodates some level of false positive or false negative. That's when we talk about probability. Okay, my question in that regards to Dr. Greek is, could you kind of give us an idea of gain, what gain are we going to make if we stop animal experimentation, in terms of drug development, either gain in time, gain in we being able to reduce the false positive or false negative that we are coping with now?

And also to Mr. Skolnick, I would appreciate if you could also tell us what we lose if we stop animal experimentation in terms of, you know, positive, false positive or false negative. Thank you.

DR. GREEK: Sure. I'll make this real quick, as we're running out of time.

What would you gain by eliminating animal testing? I'll quote the National Cancer Institute, Science 1997, we've lost cures for cancer because they didn't work in mice. Okay, period.

And I would also direct you to the drug recalls of late, Vioxx, Celebrex, and so on and so forth, that animal testing did not prevent those drugs from coming on the market.

Now, the fallacy in this we don't use animals to predict what's going to happen to humans is this. The reason the drug companies have historically been able to do very abbreviated clinical trials, when they should be doing longer and broader clinical trials is they sold to the American public and to the FDA and to congress, oh, well, we tested it on animals. So

we already know it's safe. So we only need to test on a couple thousand humans. That's the dirty little secret that they don't want you to know.

MR. SKOLNICK: I'm sorry. What was the question for me? Could you repeat your question, please?

THE MODERATOR: What would we lose if you did not do animal (inaudible)

SKOLNICK: Thank you.

You would lose a very valuable tool for gaining many important insights into how animals, including humans, work, how chemicals interact with genes, how genes work. It's a viable research tool to give us insights.

It's also a valuable prescreening tool to test for extreme toxicity.

When Starzl -- look, how many of you would like your -- you need a surgical procedure that's brand-new that's never been done before, a genitalia transplant or something, anything -- a brain transplant. How many of you would like to be the first guinea pigs for this surgeon to develop the technique? They use animals before they turn -- and see if they can do this and if the animals can survive. If they can't, they don't go on to human beings.

Starzl's first experiments in organ transplants killed the subjects. His first subjects were dogs, not children.

I want to say there's something that we can agree on, something else that Dr. Greek and I can agree on. And that's if one must judge a scientific argument based on opinion, beware the vested interest. Dr. Greek says he's not involved with the animal rights people. Unfortunately, that's not true. He's -- Americans for the Medical Advancement is funded by the National Antivivisection Society.

DR. GREEK: We're also funded by the general public. But I don't make any money from AFMA. I'm the unpaid president of AFMA. I don't make any money from the sale of the books. I don't make -- my wife says I don't make any money at all. But we are completely clean. I don't don't -- how you can label me a vested interest -- again, if you're going to take one thing away from this debate, I think that's a good one to take away. We've made our tax reports public. We've made our financial reports from AFMA public. We don't take any money from this. There's no way you can link me monetarily to this position.

And if any of you, including you, Mr. Skolnick, would like to fund AFMA, we would be happy to take your money.

Thank you.

QUESTION: But your point was that you were not part of an extremist organization. And certainly the Antivivisection Society is.

DR. GREEK: That's between you and the Antivivisection Society. Okay? I am not the spokesperson for the National Antivivisection Society. We take their money.

And let me just point out one minor little difference between the AFMA and the National Antivivisection Society. You know those numbers 3 through 9, 3 through 9 that I said it works, it's scientifically viable? Oh NAS doesn't like that. Matter of fact, they exist largely to get rid of animals in my slide Nos. 3 through 9, okay? So we don't even have the same philosophy. We don't share any board members.

And again, if you would like to give us -- if the Foundation for Biomedical Research would like to fund us, we'd be happy to take their money.

QUESTION: If I understood your point, you're intellectually disassociated but not financially disassociated?

DR. GREEK: Oh, we're intellectually and philosophically disassociated. Yes, they give us money. There's no question about it. So do thousands of other people. But if somebody from the KKK gives me money, I don't think that means there's a white sheet in my closet.

THE MODERATOR: I don't think so.

MR. SKOLNICK: If the KKK offered me money, I'd throw it in their faces.

I just wanted to say one thing I wanted to correct. And that was a statement that the terrorist promoter, Dr. Jerry Vlasic, who used to be, along with you, a spokesperson for Physicians Committee for Responsible Medicine, he was on your mast -- on your magazine. Your magazine has him as a science advisor summer, just last summer. He made those comments that blew up in their -- the animal rights promoters' faces about going out and killing animal researchers. He made those comments in 2003, I think over a year before.

THE MODERATOR: Thank you. (Inaudible)

DR. GREEK: No, he made those comments or I should say those comments came out publicly in the summer. And as you know from editing -- right, that's why I fired him before they came out.

As you know from editing a journal, our lag time in publication is about three months. And so when the board saw that Dr. Vlasic was going down a path that we didn't approve of, we fired him then and there.

Now, he was still on our masthead until, you know, the next round of the newsletter came out. But come on, Andrew. I mean you know what the lag time is for journals. You're the editor of one. I mean that's disingenuous, man.

THE MODERATOR: I think it's time to -- we've taken our allotted two hours. I'm sure the speakers will be happy to converse individually with you to make other points you may wish to bring up.

On your behalf, I'd like to thank both of our speakers. This has been a useful debate. I think it had some emotional points. And all good debates have some of those. It also had some very cogent points, for which I'm grateful to both speakers for bringing up. And I hope it's informed the audience, whatever their prevailing opinions might have been. I hope it's informed us of many of the difficulties that are related to drug development research.

My guess is that if we were here in 50 years' time, we will be talking about paradigms of drug discovery that are quite different from those that were present 50 years ago. Such is the nature of scientific progress. What we do today our grandfathers would look upon with envy and our descendants would look upon with horror. And so this I think is part of the issue with drug development and research, and we've had some of that today.

I want to thank again both of our speakers that devoted their time and the audience for coming and being active and participating quite courteous. Thank you.

(Applause.)

(End of debate.)