

Science AMA Series: I am Dr. Eugene Gu, President and CEO of Ganogen. I have been subpoenaed by Congress for my research involving fetal tissue but will continue to press on. AMA!

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¹Affiliation not available

April 17, 2023

Abstract

Hi Everyone! I hosted a previous Reddit AMA and thoroughly enjoyed all of your thought-provoking questions. I am back now because I want to discuss how the Congressional subpoenas issued by Chairwoman Marsha Blackburn of Tennessee and her House Select Panel on Infant Lives is creating an atmosphere of fear and political intimidation that is hindering important, life-saving fetal tissue research. I am also happy to entertain any questions about my research transplanting human fetal hearts and kidneys into animals in the hope of ending the pediatric donor organ shortage. The following links may provide a little background info if you guys are interested: <https://www.theguardian.com/science/2016/apr/01/congress-subpoenas-fetal-tissue-research-abortion> <https://www.statnews.com/2016/03/31/fetal-tissue-congress/> http://www.nytimes.com/2016/03/31/us/politics/house-panel-issues-subpoenas-in-fetal-tissue-research-inquiry.html?_r=0 <https://www.washingtonpost.com/news/powerpost/wp/2016/04/01/higher-ed-associations-join-protests-of-house-fetal-tissue-subpoenas/> Thanks and I will be back at 1 pm ET and I very much look forward to answering any questions you may have! Edit: Wow, I very much enjoyed my Reddit AMA with you guys. There were lots of interesting questions and I learned a lot as well! Signing off now, but feel free to PM me with any questions!

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EUGENE_GU [R/SCIENCE](#)

Hi Everyone!

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I am back now because I want to discuss how the Congressional subpoenas issued by Chairwoman Marsha Blackburn of Tennessee and her House Select Panel on Infant Lives is creating an atmosphere of fear and political intimidation that is hindering important, life-saving fetal tissue research. I am also happy to entertain any questions about my research transplanting human fetal hearts and kidneys into animals in the hope of ending the pediatric donor organ shortage.

The following links may provide a little background info if you guys are interested:

<https://www.theguardian.com/science/2016/apr/01/congress-subpoenas-fetal-tissue-research-abortion>

<https://www.statnews.com/2016/03/31/fetal-tissue-congress/>

http://www.nytimes.com/2016/03/31/us/politics/house-panel-issues-subpoenas-in-fetal-tissue-research-inquiry.html?_r=0

<https://www.washingtonpost.com/news/powerpost/wp/2016/04/01/higher-ed-associations-join-protests-of-house-fetal-tissue-subpoenas/>

Thanks and I will be back at 1 pm ET and I very much look forward to answering any questions you may have!

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Good afternoon and thank you for giving us your time. As a member of the general public, I often see the results of congressional subpoenas as being quite negative to the individual/corporation being interviewed. Do you foresee any positive outcome that would potentially benefit your research or do you feel that you are simply trying to hold up a wall that is determined to collapse?

[DonQuesoDeLaVega](#)

That is a great question. The Congressional subpoenas create a slew of negative hurdles not only for Ganogen, StemExpress, and other corporations but also for the individual researchers trying to tackle important health concerns such as the Zika virus and the pediatric organ shortage. It forces us to use our limited resources hiring lawyers and assigning people (who are scientists at heart and would much rather do research) to instead search for old email records, financial transactions, and emails demanded by Congress. Moreover, the House Select Committee on Infant Lives released the names of researchers from Ganogen, StemExpress, Harvard, Stanford, Yale, MGH, and other institutions which included home addresses and even cell phone numbers of the researchers to the general public. They have since redacted the names but since it was made public for more than a day, other news outlets and conservative organizations such as the Center for Medical Progress (CMP) have since

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been able to repost the unredacted version. This obviously poses a risk to the lives of the researchers involved, especially considering the recent shooting at the Colorado Springs Planned Parenthood where three people were killed. In fact, the attacker was quoted as saying, "no more baby parts," rhetoric encouraged by David Daleiden of CMP and Congresswoman Blackburn. Despite the horrific killings, the official Mission Statement of the House Select Committee on Infant Lives continues to use the term. You can find it here on the official Congressional website:

<https://energycommerce.house.gov/select-investigative-panel>

"The mission of the Select Investigative Panel on Infant Lives (as it is informally known) is to gather information and get the facts about medical practices of abortion service providers and the business practices of the procurement organizations who sell baby body parts."

Obviously, with all the tragic shootings going on in this country recently, especially in Orlando, many researchers including myself are quite frankly scared for our personal safety. Part of the reason why I am holding this Reddit AMA today is to raise awareness of the danger this Congressional investigation poses to us. It heralds a chilling effect for the entire scientific community that our quest to save the lives of others through our research may come at the cost of our own. I hope Blackburn and her colleagues have, at long last, some sense of decency to bring this McCarthyist witch-hunt to an end.

Hi Dr. Gu, thanks for doing this AMA.

I'm really curious to hear your thoughts on perceptions/misconceptions Congress and politicians might have about your research. Have you come across any notable misconceptions?

I'm also interested to hear your thoughts on how science is perceived and understood by people in power. I feel as though research and science is vastly misunderstood within Congress. Is this true? Are there any people in particular that are the exception to this "rule"?

[Austion66](#)

These are some very insightful questions. There are in fact a slew of misconceptions that Congress and other politicians have about fetal tissue research in general. The biggest misconception is that fetal tissue is being procured and sold at a profit, in violation of federal law. Nothing could be further from the truth. In fact, both Ganogen and StemExpress are operating at a loss when it comes to fetal tissue procurement and research. The Planned Parenthood clinics only receive anywhere from \$30-\$50 for each procurement which does not nearly cover the cost of the clinic space and the wages for the clinic personnel. StemExpress officially loses money for each procurement, which is highly detailed in their accounting records submitted to Congress. Also, we at Ganogen have not made any profits with regard to fetal tissue and are actively spending and losing money performing our research. The reason why we are doing what we do is because our hope is to save the lives of all the infants and children suffering from severe congenital diseases.

In answer to your second question, research and science is definitely vastly misunderstood in Congress. In fact, the Chairwoman of the Congressional Committee on Infant Lives, Marsha Blackburn, has been found speaking on record as completely rejecting the theory of evolution (<http://www.bbc.com/news/science-environment-34342808>). She also denies climate change by saying, without evidence, that "I think we've cooled almost 1 degree (F)." (https://en.wikipedia.org/wiki/Marsha_Blackburn).

Fortunately, there are definitely exceptions to this rule. In particular, Congresswoman Jackie Speier, a Democrat also on the Congressional committee, has been very supportive of scientific research protecting the identities and the lives of the researchers targeted by Congress. Other Congresspeople on the Democratic side have generally been very supportive and vocal about the witch-hunt nature of

this Congressional investigation.

Are you trying to grow the hearts and kidneys inside the animals so that they can later be transplanted into children, or simply keep them viable for fairly quick transplants? Your research sounds fascinating!

[miseducater](#)

We are trying to first address the pediatric organ donor shortage because the hearts and kidneys we have developed are most appropriately sized for this particular population. Many infants born with hypoplastic left heart syndrome, Tetralogy of Fallot, bilateral renal agenesis (which is 100% fatal in utero), and other severe congenital diseases may have a second chance at a normal life with an organ transplant. In fact, some of the hearts and kidneys that we resuscitate in the laboratory are ready for immediate transplantation into a fetus suffering from bilateral renal agenesis through open fetal surgery. Our eventual goal is to someday develop these hearts, kidneys, and other organs in SCID pigs to address the adult population as well. But first we would like to address the pediatric population first.

What ethical parameters do you wrestle with, and what ultimately was the "ah ha!" moment that motivates your research regardless of controversy?

[rompydompy](#)

As a physician, my number one priority and the primary reason I went to medical school and signed up for an inordinately long residency in surgery is to save as many lives as possible. Since my research does not encourage abortions nor does it increase the number of abortions performed, I haven't wrestled with the ethical parameters of using fetal tissue for research. Whether a woman chooses to terminate her own pregnancy because of rape or incest, because it presents a danger to her own health, or because she is a high school teenager who simply was not ready to be a mother yet, it is not my place, nor any scientist or politician's place, to question her right to choose. The "ah ha!" moment was when I saw that the hearts and kidneys I transplanted into immunocompromised rats not only survived but grew larger and more functional over time. This is when I realized that this could be the answer to ending the pediatric and eventually adult organ donor shortage and save hundreds of thousands of lives. During my pediatric surgery rotation I saw too many babies in the NICU suffering from HLHS and other congenital diseases and felt powerless to help them. It is my long-term goal to eventually find a way to give these babies a second chance at life.

What are some of the more rational criticisms of your research and why are they either valid or invalid?

[netpoints](#)

I am always open to any rational criticisms of my research. One of the top criticisms I have heard so far is that stem cell research and 3D printing should be able to completely replace the need for fetal tissue. After all, there are so many reports in the news about bioengineered kidneys and hearts and lungs made from scratch. I would be more than thrilled if such reports were true and that we could in fact make fully functional 3D printed organs in the laboratory. Unfortunately, we are light-years away from making this a scientific reality. Organs such as the heart and kidney are vastly complicated networks of many different types of cells working together. No artificially manufactured 3D printed organ has shown any type of sustainable in vivo function at all. We, however, have shown the human fetal kidneys transplanted into anephric rats can give these animals an almost normal lifespan with full renal function.

I think everyone can agree that the damage done by the [undercover "fetal tissue sale" videos](#) heavily tarnished the images of both Planned Parenthood and the medical research community using fetal tissue. While the video itself [has been discredited](#) and the producers of the videos [are facing felony charges](#), it seems like many Americans (especially politicians) jumped straight to the conclusion that it was true.

I think the general public's lack of knowledge about medical research and how dependent it is upon tissue sources (fetal or otherwise) is partially responsible for this outcome. What do you think can be done to better educate America about the difficulties of conducting medical research in this country? How do other countries handle fetal tissue? What would you change (if anything) in the laws regulating the exchange/transport/usage of human tissue in research?

[shiruken](#)

This is a very insightful question. David Daleiden's undercover Center for Medical Progress videos has brought this controversy to the fore and initiated the Congressional investigations currently underway. Much of the videos were heavily edited and obviously biased to make it appear that Planned Parenthood was participating in nefarious dealings. David Daleiden, as you alluded to, is facing felony federal indictment for the way he unlawfully obtained his undercover videos by recording people without permission and forging government documents.

The general public's lack of knowledge about medical research and the terminology we use in medicine can make the videos seem very off-putting. Even during my surgical residency, when we receive a trauma patient we use terms like "subdural hematoma with 3 cm midline shift" to describe a 5 year old girl coming to us intubated with a severe head injury while her mom is crying and holding her child's teddy bear. Cold clinical terms are ways we efficiently assess, triage, and take care of patients to save the most lives possible but they can often come across as callous and unfeeling. The public's lack of knowledge of the clinical terminology we routinely use can make it appear like we have no respect for the donated fetal tissue, which is far from the case.

I think what can be done to better educate Americans about the importance of medical research involving fetal tissue is to remind them about all the therapies we have today because of such research done in the past. Without fetal tissue, Jonas Salk would not have been able to develop the polio vaccine that has saved millions of lives. Without fetal tissue, we may not be able to stop the Zika virus which threatens to cause debilitating microcephaly in thousands of infants born to infected mothers. I believe other countries, such as the UK, Canada, Singapore, etc have much less political hangups with regard to fetal tissue research. However, since I am an American I feel it is my duty to advocate for fetal research here in this country rather than run away to another country and ignore the issues here in my place of birth. In terms of the laws currently regulating the use of human fetal tissue, I think they are fair and allow researchers to use such tissue in an ethical and responsible manner. What I am afraid of is future laws driven by the Planned Parenthood controversy that would fundamentally change the laws and make fetal tissue research impossible to pursue.

As a scientist, what do you think are the long term impacts of the negative attitude and culture surrounding scientific research of this kind?

[Sleepyhead777](#)

Unfortunately, the long term impact of the negative attitude and culture surrounding fetal tissue research greatly hinders medical progress that could go towards saving millions of lives. Fetal tissue research has been instrumental for the development of the polio, chicken pox, and rabies vaccines. It also appears to be instrumental for the future development of a vaccine for the Zika virus. By having

Congress actively trying to suppress fetal tissue research and intimidate the researchers, many life saving therapies are being delayed or blocked entirely.

Hi there thanks for your time.

So basically your work involves the growing of fetal organs with animals as surrogates (be it immunocompromised) in order for them to reach a suitable size to be transplanted in humans is that right?

- 1) do you need to say connect it heterotopically or orthotopically in the animal?
- 2) is an animal actually required or could you model an incubator to grow organs instead?
- 3) would this work on other organs that have yet to form proper in the foetus? Especially composite allografts? Or would you guess it would only work on homogenous tissue types?

Thank you.

[chloh_yy](#)

Yes, my work involves growing the fetal organs in animals for them to reach an appropriate size for clinical transplantation.

1. For the hearts, we connect them heterotopically within the neck of the animals. In essence, we anastomose the brachiocephalic artery of the human fetal heart to the common carotid artery of the rat and the pulmonary artery of the human heart to the rat's external jugular vein. This allows the coronary arteries of the heart to be perfused but there is no preload or afterload. The heart essentially beats and survives but does not support the life of the animal. The human kidney is a different story. We connect the renal artery of the human kidney to the abdominal aorta and the renal vein to the vena cava. There ureter is connected to the bladder. This allows the kidney to have actual life support functions for the animals. In medical terms, these kidneys are orthotopically transplanted because we place them closer to the iliac vessels and not in the same location of where the rat's own kidneys were.

Hi Dr. Gu, and thank you for doing this AMA.

I've always been somewhat struck by the lack of transparency in the medical community regarding donated medical waste. Patients have little control over their donated tissue, and receive little information about how it is being used. This is especially true for medical waste stemming from abortion procedures. For example, [here is a medical waste donation waiver from Planned Parenthood](#) I can't speak to how widely used this form is (it was the first Google result), but it says blood and tissue from abortion procedures "has been used to treat and find a cure for such diseases as diabetes, Parkinson's disease, Alzheimer's disease, cancer, and AIDS". To my knowledge, there are no cures for any of these diseases. Nor is the bulk of donated fetal tissue used for these purposes (unless you use loose definitions of "find a cure"). It does feel like they are misleading the women here.

So I was hoping you could shed some light on the process by which your company acquires fetal tissue. How much money do you pay per kidney? What is the application process like for purchasing this tissue? Does any of this have to pass an ethical review board? If yes, what was that process like? In your opinion is this process sufficiently transparent? If not, what steps can be taken to make it more transparent?

[SirT6](#)

The humanized BLT mouse, in which human fetal bone marrow, liver, and thymus is transplanted into

an immunocompromised mouse, was instrumental in scientifically proving that the HIV virus causes AIDS. (Namikawa, R., et al. "Infection of the SCID-hu mouse by HIV-1." Science 242.4886 (1988): 1684.) This is very similar to how human fetal neural tissue has been instrumental in proving that the Zika virus is responsible for microcephaly in infants. ([http://www.cell.com/cell-stem-cell/abstract/S1934-5909\(16\)00106-5](http://www.cell.com/cell-stem-cell/abstract/S1934-5909(16)00106-5)). So I would not say that the donation waiver is misleading. Human fetal brain tissue has been transplanted into patients with Parkinson's disease in the attempt to search for a cure as well. (<http://www.nejm.org/doi/full/10.1056/NEJM199211263272201#t=article>). The process by which Ganogen obtains fetal tissue is identical to how Harvard, Stanford, Yale, MGH, and other institutions procure and have procured fetal tissue. It is identical to the way Jonas Salk procured his fetal kidney tissue to find a cure for the polio virus. The process is very transparent.

Can you comment on the anti-intellectual / anti-rationalism movement that has helped voters believe the misinformation about fetal tissue research?

[ademnus](#)

Yeah, the anti-intellectual Donald Trumpism that is fueling misinformation about fetal tissue research is doing this country a great disservice

What do you think is the main reason for the opposition of many people to fetal research similar to yours?

[JDizzleD1337](#)

I think much of the opposition is due to a misunderstanding of how we obtain fetal tissue. None of us encourage abortions in any way. We obtain tissue that would normally be discarded. Therefore, we are not creating a demand for abortions in any way, which would obviously be morally objectionable.

About the organ transplantation, how many years are we away from doing this thing at scale?

[perseusprime](#)

It is hard to estimate the number of years it will take. I know that for performing fetal surgery to transplant a human fetal kidney or heart into a baby with bilateral renal agenesis or hypoplastic left heart syndrome that this can essentially be done tomorrow. This is the reason why I am training to become a pediatric transplant surgeon to hopefully perform this exact procedure as soon as I become an attending physician.

What are some of your biggest hurdles to your work? In what ways have you overcome some of the worse ones?

[jzakprice](#)

The biggest hurdle is the political controversy surrounding this type of research, as evidenced by the Congressional subpoena which essentially came out of the blue. My way to overcome this hurdle is to raise awareness about the importance of fetal tissue research in this country. Hosting this Reddit AMA and answering all the great and thoughtful questions from my fellow redditors is one way I hope to achieve that.

Good evening, Dr Gu.

In regards to the gene-editing system, CRISPR, what role do you see it playing in the future of genetic research & technology, and what would you like to see done with the technology going on into the future?

(Context: <https://en.wikipedia.org/wiki/CRISPR>)

[JimmyL2014](#)

Great question. CRISPR may play a large role in our research. Obviously, it would be unethical to use CRISPR technologies on human patients without establishing their efficacy and safety. We have in vivo human heart and kidneys models that can be used to study CRISPR on human tissue without harming human patients. Moreover, CRISPR technology may be harnessed to genetically edit host animals to make their immunological profile more favorable for xenotransplantation.

What do you suppose you could do to end public fears about your research?

[toastghost77](#)

I think the best way to end public fears about my research is to show how it can actually save the lives of thousands of babies suffering from severe congenital diseases. Showing how a fetal heart transplant can save a baby with HLHS will go a long way in convincing the public that using fetal tissue to directly save lives is much better than allowing the tissue to be simply thrown away.

What do you suppose you could do to end public fears about your research?

[toastghost77](#)

Raising awareness about how fetal tissue research benefits millions of patients, especially the pediatric and infant population suffering from severe congenital diseases.

How close are you to achieving full organ regeneration through stem cells?

[Revolunate](#)

I think we are not even close of achieving full organ regeneration through stem cells. As far as I know, all clinical trials attempting to cure heart disease and neurological diseases with stem cell transplants have failed to show any efficacy in human patients. There was a lot of promise in animal models that did not bear fruit on actual human patients. Our research with fetal tissue fills the necessary gap in knowledge to make actual stem cell therapies work for real.

Is there a way to specifically donate to your cause instead of donating in general?

[Rianne764](#)

We are currently in the process of converting to a 501c3 non-profit so when that is done we should be able to accept donations on our website. Bur first, we are focusing our limited resources on the Congressional subpoena.

Thank you for doing your research, and this AMA.

What can we, ordinary citizens, do to help you be able to continue your research? What do you think might shift public opinion to be more pro science?

[RagingOrangutan](#)

Thank you for your question! I think the best way to support fetal tissue research is to make your opinions widely heard. Writing letters to the editor of your local newspaper or your local Congressperson can go a long way.

Do you see a trend of researchers in this field leaving the U.S. to work in less restrictive countries (i.e. China)?

[elZaphod](#)

I have not yet seen this trend and believe that most researchers in the U.S. love their country and want to fight for fetal tissue research here rather than capitulating and moving to a less restrictive country

I'm probably too late but oh well... How do you feel about the use of HeLa cells in terms of the whole backstory with Henrietta Lacks? I'm just curious as to how a physician feels, ethically. Recently started reading a book on that, figured I'd ask. Thanks!

[ashleyhoward22](#)

I think that the story of Henrietta Lacks is tragic and that it was highly unethical to culture and use her cells, and commercially profit from the HeLa cell line, without the patient's permission.

You've previously noted that your work resulted in preservation of donated kidneys for up to 4 months.

On average, how long do the donated kidneys *actually* need to last, to reach a patient in need?

[SacredWeapon](#)

It was 4 months in a rat where their lifespan is anywhere from 1-2 years. This is a significant portion of the rat's life and when the rats died often the kidneys were still healthy and viable on histological analysis

Personally, I think what you are doing is great, and I hope we will all benefit from it one day.

But from some of your comments, it almost sounds like you feel that you should be able to operate outside of the constraints which society and it's lawmakers impose on you, in order to pursue your own personal goals.

I understand that the laws made might sometimes jar with your own ethical views, but would that excuse breaking those laws in your view? For example - what if what you are doing is just wrong in some way that you couldn't see? Would society have an obligation to prevent you from doing it?

Or do you think that science and medicine should ultimately be as accountable to society and its laws, as any other industry?

[Drillbit99](#)

Science and medicine should be held accountable to society and its laws but fetal tissue research has been widely accepted in this country in the past with even support from Ronald Reagan. Moreover, it is widely accepted internationally. Rather, there is a more recent push to ban such research and it is my responsibility as a physician and medical researcher to defend and advocate for what I believe is important, lifesaving research of great benefit to society at large.

Do you see any way to breach the lack of scientific understanding in the political elite? I was mortified when Prof Nutt was thrown out for summarising his field (which has since become almost accepted in the public view).

[sBoon](#)

I think the best way is to vote in office those who appreciate science and the health of their constituents

What is your largest personal dream of achieving through this particular field of science? Do you have any future ideas if your current projects or ideas succeed/fall through?

[Bobthebadass](#)

My biggest dream is being the surgeon who transplants a fetal kidney or fetal heart into a patient with bilateral renal agenesis or HLHS in utero.

I ask my question as a foreigner, so my knowledge of American politics isn't that well honed, but what political motivation stands behind all those subpoenas?

I find it hard to believe that any rational person (could be a bit of a stretch when talking about politicians though) would feel so strongly against life saving research conducted on foetuses which would have never been born anyway.

[Nitarbell](#)

I agree and find it quite confusing as well.

How do you think the Zika Virus might affect the availability of fetal tissues for studying?

[LadyKittenFarts](#)

I don't think the Zika virus will have any impact on the availability of fetal tissue for study. Fetal tissue, on the other hand, will be instrumental for finding a cure for Zika

In your previous AMA you stated the following:

... to intentionally create human life for the sole purpose of organ harvesting is clearly unethical, even if the human patient is aborted before becoming self-aware.

I disagree that it is clear. Can you explain why you feel this is unethical?

[tehboored](#)

It is highly unethical to me because you would in essence purposely create a life that you are responsible for and then terminate it for your own use. With regard to abortions, the researcher is not responsible for the abortion at all and is just making use of what would have already been there if the researcher did not exist at all.

What is the biggest, or most important, part of your research that was impeded by Congress that could have potentially changed the future of medicine?

[amrij](#)

Ending the pediatric organ donor shortage. But we are not giving up!

If it weren't for the fear-mongering and craziness around foetal tissue research, how much closer to actual cures for diseases would we be?

I guess, as a layman, what I am trying to ask is, if existing regulations weren't such major handcuffs, as they seem to be for you (and others), how would this change things, both for the better and for worse? How have important discoveries and research been greatly retarded by these laws? Could you propose more sensible changes? By how much would research timetables have changed if sensible laws had been implemented, say, way back at the start of the stem cells "revolution", so to speak?

Sorry if these questions seem weird - I guess I'm trying to get an understanding of the balance of laws, versus the inevitability of scientific research, if you know what I mean?

Edit - remembered how English works...

[HexenHase](#)

I think we would have advanced medical science much faster and much more profoundly without all the time wasted on fear mongering

First, let me say that I support fetal tissue research in general. I do have to say I do feel a bit of discomfort at the idea of aborted fetal tissue research in general. After reading about your particular idea, which is that aborted fetal organs might someday be used to fill the huge gap currently resulting in 22 deaths per day while waiting on a suitable organ for transplant, I do have some questions.

1. My understanding is stem cell therapies using cells grown from existing cultures is showing great promise in treatment of many of the diseases which can lead to the need for an organ transplant, but most of these treatments are not yet ready and available for the public at large. Do you see your program as intended as a stopgap to fill the need until such time as the numbers needed comes down in line with donations because these treatments have hopefully lessened the need?
2. My understanding is even adults have some stem cells in many places in their bodies and some research seems to indicate those stem cells can possibly be utilized in treatments sometimes. Do you think aspects of your research may be applicable in future to growing replacements from a person's own stem cells or if absent donor stem cells harvested from adults?

[Gertiel](#)

1. Stem cell therapies have been overhyped in the scientific literature and the media, which is why we haven't seen any real meaningful use of these therapies at the bedside despite the billions of dollars spent on this area of research.

2. Adult stem cells have less pluripotency than fetal and embryonic stem cells unless you convert them into induced pluripotent stem cells, which essentially any cell can be converted into

Hi Dr. Gu, thank you for doing this AMA. I think that your research sounds very promising. What do you envision Genogen's roadmap to be like, in terms of funding, partnership with other researchers and doctors etc to ultimately transplant a lab-grown organ into a patient?

[liaoying](#)

Thank you for your question! In terms of our roadmap, I plan for Ganogen to start developing human fetal heart and kidney models within SCID pigs. This will allow us to transition to clinical applications and transplantation in human patients. We would love to partner with large transplant centers to begin clinical translation.

Just wondering, but couldn't you avoid the legal headache by using induced pluripotent stem cells?

[kaiserwilly](#)

If I could grow iPS cells into whole kidneys and hearts, then yes. But that is impossible with the current level of technology

Which countries would you say have the best environment to be doing your kind of research?

[glfharris](#)

I hope I can say the United States after advocating for this research here where we have the brightest minds, talent, and resources

I'm with you. This material is discarded. Why shouldn't it benefit humanity in some way? But I don't think you should be able to patent this material.

[puckersnout](#)

Nobody is trying to patent this material to the best of my knowledge

Biomaterials/Tissue Engineering PhD student here. Our goal is the same: Overcome the organ shortage issue.

The field of 3D printing scaffolds with seeded Stem Cells for fully functional organs is still some time away from clinical viability. An "off-the-shelf" product won't be feasible for a long time. However, partial organ defect (heart valves, vessels etc) could definitely benefit from 3D printing as opposed to unnecessary full organ transplants.

Your research is fascinating but how would it be implemented into clinics? Will these organs constantly be produced and stored in biobanks until required?

If the idea is to grow the organs in pigs won't there be the issue of the alpha gal epitope? Would you have to use knock-out pigs for this purpose?

Ignoring the ethical discussion, what's the next step in progressing with this research?

Lastly and hypothetically, if everything goes well and we get this to the point of regular transplantation therapy, the commercialisation of this concept would lead to the sale and purchase of aborted foeti. I'm not sure about numbers but will there be sufficient availability of acceptable foeti to directly overcome the organ shortage issue? If not and maybe I'm thinking quite deeply into this, would this not lead to a "foetal black market".

Thank you for this AMA!

[DoktorDe](#)

You bring up some good points. I am sure that 3D printing can be used for partial organ augmentation and replacement of heart valves and the such but we are a very long way from using these organs to functionally replace a whole heart or kidney. The carbohydrate epitopes should hopefully not be incorporated into the human organs growing in the pigs, and if they are incorporated, hopefully there is a way to selectively eliminate them. This is completely different from using a pig's organ to replace a human organ, as the epitopes are an intrinsic part of the organ in the former case.

Hey Dr. Gu, I want to thank you for what you do. Heaven forbid I ever am placed in a situation where a termination is needed, but it is comforting to know that donating tissue may result in a better tomorrow for someone. How hard is it to get funding for this research? I work in a medical school, and funding is very hard right now for any research. Do you feel given the stigma attached to your work that is harder to obtain funding?

[Sjb1985](#)

Yes, funding is very hard to come by, especially with the political controversy surrounding such research. But some of the most rewarding things in life require the most effort and persistence!

What do you think the limits on Fetal Stem Cell research, that have been imposed on researchers effect has been on finding cures for diseases, etc? Have they slowed research and by how long. What could have been solved already and we only have the research ban to blame.

[yopd1](#)

It is impossible to fully flesh out what the political firestorm over embryonic research has done to the field. I am sure many bright researchers as well as funding opportunities were turned away as a result of the controversy, which may have curtailed development of some revolutionary therapies. It is like the situation with losing our rainforests and not know what life saving drugs from a unique plant is forever lost because the plant became extinct. It is hard to know or measure.

This is a bit off topic but I hope that you would weight in, do you think that an opt-out system would significantly improve that donor problem or are there barriers and draw backs that I am not aware of.

[lulzmort](#)

Yes, I think the opt-out system where everyone by default is opt-in unless they object would significantly improve the donor problem and should be implemented

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We are in the process of converting to a non-profit because we are mostly focused on the research implications of our work rather than any profit motives

does religion play a part in this flack you are getting from congress?!

[bongdreams](#)

Yes definitely