



Healthy
Pregnancy
SUMMIT



David Harris, PhD

The Benefits Of Cord Blood Banking

SUMMARY KEYWORDS

cord blood, stem cells, cord blood banking, cells, stored, child, generally, collect, therapies, conditions, blood, transplant, bank, treat, repair, company, regenerative medicine, people, donate, potential

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So welcome to a healthy pregnancy session on cord blood banking. I'm Dr. James Adams and with me today is our guest, Dr. David Harris. He's a professor at the University of Arizona. And he's the director of their health sciences bio repository, which includes many types of biological samples, including cord blood. Thanks for joining us today, David.

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Happy to be here. Thank you.

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So to begin with, can you tell us a little bit about what is cord blood banking.

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So cord blood banking is actually a very simple concept in nature. Corporate banking is harvesting the leftover blood in the placenta and put it away for future use. So with a with the understanding that cord blood contains stem cells. This was discovery that was made back in the 1980s. A variety of work went into proving stem cells could be used in place of bone marrow to treat kids with cancer. And then the idea came about to go out and collect that leftover blood, and then stored away in large bio banks like the University of Arizona bio repository.



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That's great. Can you tell us a little bit more about stem cells and why they're so special.

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So stem cells are the sort of the master cells of the body. You have every every tissue and organ has stem cells. Some of those stem cells are what we call multi potent, they can do lots of different things. Others are very restricted, they can only help repair that one specific tissue. So for example, if we look at the liver, the liver has its own stem cells, and it actually helps to repair the liver over the course of an individual's life. However, there are other sources like the bone marrow or like cord blood, where the stem cells can do lots of different things. And so not only can they give rise to the cells of the blood that also appears that they can also help to repair regenerate other organs and tissues in the body as well. So it's important to have a source of these stem cells when we talk about treating patients who have cancers. But it's now even more important to have a good source of these stem cells. When we talk about doing things like regenerative medicine, to repair a heart after a heart attack, or to repair the brain after a stroke, or to treat a child who's born with cerebral palsy. All of these instances have utilized stem cells in order to develop new therapies.

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That's very exciting. I mean, it sounds like many different types of uses, and potential uses for stem cells. Can you say a little bit about why it's so special to store the child's own personal stem cells, as opposed to getting them from someone else?

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Well, there's a couple of reasons. So when we first started doing cord blood banking back in the early 1990s The idea was to be able to collect these stem cells and use them to transplant individuals with cancers of the blood like leukemia. And in that instance, you normally would use somebody else's stem cells because your own stem cells had the cancer in it. We know that's not always the case, but the idea was there. So you would go in and you would treat these individuals with chemotherapy or radiation, destroy their their cancer, and replace their blood and the immune system. And you could do that using your own stem cells if they were cancer free, or you would use somebody else's who didn't have cancer. But we realize now as we've gotten into the the field of Regenerative Medicine, is that we're not going to do those sorts of preoperative therapies for those patients, they won't receive chemo, they won't receive radiation. And so they have an active immune system that would recognize the stem cells as foreign if they weren't their own stem cells and reject them. So here you are trying to repair of the heart or the brain with somebody else's stem cells. And it starts to work. And all of a sudden the immune system kicks in and rejects that tissue. So in that instance, you want to use your own stem cells, which are called autologous stem cells for that purpose. And so that really has



set up this this dichotomy of cord blood banks across the country, where you have what we call donor banks, where you can donate stem cells and use them to treat these kinds of cancers. And we have the family's stem cell banks, where you can store it for your own family and use those stem cells for Regenerative Medicine. And so now we see that about 80% of all of the transplants are done for Regenerative Medicine using autologous stem cells. And about 20% of done for patients who have cancers using somebody else's stem cells.

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So it's really much better to use your own stem cells in many of these cases. And that's why it's so useful.

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But it's so useful because the odds of us when we talk about, you know, tearing up your knee and needing an orthopedic hip seizure, or having a heart attack when you're in your 40s, or a stroke, when you're in your 60s, is much more common than having blood cancer like leukemia. And so we look at the odds of you needing a transplant for leukemia, it's about one in 2000. But the odds of you needing to have a procedure to fix a heart or a knee, or your brain after a stroke is more like one in 10. So, you know, if you're thinking about, should I put these stem cells away for my family's use, and you think about the odds of use, the odds of use are much greater in this non transplant setting the regenerative medicine setting, and in that case, you're gonna really want to have your own stem cells. And you're gonna want to have a really good source of stem cells. That is you want to have the youngest and the purest sources stem cells available. And that turns out to be cord blood, those that are harvested at the time of birth.

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So that sounds very, very valuable a great insurance policy for people to have in case of a future medical need. those odds are the odds today and as medicine improves when we find new uses for stem cells, and may even be more potential use for them in future,

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is that right? That's correct. That is correct if

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and so can you say a little bit about how the cord blood is collected?

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The effects are quite simple. So the mother goes into labor and comes into the delivery suite, just as she would normally. She goes through the laboring process. The baby is born, whether it's the vaginally or by susteren section. Once the umbilical cord is cut and clapped. Generally



we're waiting for the placenta to be delivered during the third stage of labor, which generally takes five to 10 more minutes. It's that that time after the The baby has been removed from the birthing field, and taken over to be weighed and cleaned up and brought back to the mom, that you can actually step in and about two to three minutes. Collect the leftover blood by simply inserting that needle into the umbilical cord while you wait for the placenta to be delivered and collect that leftover blood. So very simple procedure takes generally less than five minutes doesn't interfere with the birthing process. Since the placenta has separated from the mom and the baby is separated from the cord, there's no loss of blood by either one. There's no pain that you might be concerned about. actually a very, very simple procedure much actually much easier than collecting blood down at the blood bank.

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That's great. So it's essentially a painless procedure. Very easy, totally safe doesn't affect the mother or the child. It just leftover blood in the in the umbilical cord that can be then safely stored otherwise it would just be discharged away.

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So normally, the placenta is delivered after the child is born. They check it to make sure there's no abnormalities they should be concerned about. And then it ends up in the incinerator down in the bay. At the hospital, so of the 4 million births every year in the United States, about 3.8 million of those end up in the trash can.

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Wow. So a lot of people don't know or are able to store that cord blood. But now an increasing number of people are doing it. So roughly how common is it now is about 5% of

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people are storing cord blood for future use, I

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think the best estimate is somewhere between three and 6% of individuals having a baby each year are made aware of their opportunity and elect to have the cord blood either donated or stored for their family. So there are there's still a long ways to go in terms of both education and opportunity. Okay,

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and that again, as we learn more about the potential uses of it, certainly that percentage is probably going to grow. Can you say a little bit? Yeah, so Can you say a little bit more about the potential opportunities for this? Do most hospitals allow? cord blood banking?



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Yes. And so this this is actually quite commonplace these days after remembering that the first cord blood was collected in the late 1980s. So now, you know, 25 to 30 years later, I don't think there's a single birthing suite in the United States where you can't collect the cord blood. Normally what happens is parents who wish that they have that cord blood collected and stored for the family, they contact one of the commercial companies and they obtain what's called a collection kit that they bring with them. When their mom goes into labor. It contains everything that's needed to collect the cord blood and send it back for banking. So very straightforward procedure. The only place that we have an issue is for individuals who want to donate to the To the common good that is to the public cord blood banks, you actually have to give birth at a place that has a has a donation bank. And there's only maybe eight or 10 of those across the United States now. So generally, most people who want to donate because they would rather give it to someone else and worry about their own family. They don't have the opportunity to simply because there's no resource available. And I think that's probably why most of those portlets end up in the trash can, because moms who wants to save for the family can always do it. moms who want to donate to somebody else, rarely have the opportunity to do that.

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Okay. And so can you just explain a little bit more about the storage process so after the blood is collected, then the hospital will send the blood to the cord blood bank I'm assuming

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generally what happens for for parents who want to store for their family as the blood is collected by the obstetrician or the nurse, midwife. After the child has been born using that collection kit, the cord blood then goes gently collected into a small bag much like a blood bag goes back inside this shipping container that the company has sent out. And then is generally picked up at the nurse's station by one of the overnight delivery companies and brought back to the cord blood banking company. So it's chilly, very, very straightforward, very self contained. We don't ask the the hospital really to do much. Obviously they have enough things to do. Mom and Dad are busy, you know, with the newborns, we don't ask them to do much. And so usually just you know, if you go into labor, you generally usually dial in number telling the company that you've gone into labor. And after the cord blood is collected, you dial another number that signals them to come and pick it up. And all of that is included in the overall price of the process where it gets a little more involved is when you want to donate generally for places that have a cord blood bank that you can donate to. They have a dedicated professional that will go from room to room and collect those cord Bloods and then bring them back to the hospital or to the university's corporate bank where it can be processed. Generally, what that means is that you normally need to give birth between, you know, eight and five on a Monday through Friday,



because these places don't have the resources to staff, a birthing suite 24 hours a day, seven days a week.

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Sure. Okay. That sounds like a very easy and convenient process for families. So that's great. Um, in terms of storage, how is the blood stored

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in there, what happens is that the Bloods come back to the cord blood bank, where there's simply red cell depleted, that is 80% of the volume of the core blood is red blood cells don't need those because they have a very short lifetime. They're they're not beneficial for either gene therapy, regenerative medicine, or transplant. And so the red cells are removed and the white cells that contain the stem cells are then concentrated in stored at the core blood bag. And they're generally stored in liquid nitrogen, and about 400 degrees below zero. So as cold as we can feasibly get them, which allows them to be banked, essentially for the lifetime of the individual.

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So that's great that they're able to be stored in such extremely low temperatures, because that's going to ensure a very long lifetime. How long do you think is the stability of these samples? How long can they be used in future?

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Well, my laboratory as well as some other laboratories have shown that you can actually take these out or throw them out 20 years later and use them for transplant. And that's kind of where the limit is today in terms of how many how many have been banked. for that long, we've shown that we can throw them out 22 years later, and then use them to generate these iPS cells in the form of disease models. We know they're viable for at least 22 years. And the FDA has now said, if they're stored properly, like, like we've discussed, then there is no expiration date of a sample. So essentially, they should be there forever. That's particularly important because if you're a donor bank really going out and collecting samples from somebody else, you really don't want to have to start over every 15 or 20 years, you want to be able to keep those samples around as long as possible. And the same is true on the public side. That is, some of these diseases will occur later in life and want to make sure the stem cells are still good later in life, as well as some that occur really early in life where we know you can use those stem cells. So there does not really appear to be any expiration date or time limits on how long you can keep the stem cells as long as it's done properly,



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that's really amazing. Again, these incredibly low temperatures, allowing these cells to be stable for many, many years and perhaps indefinitely. That's, that's a great potential help for people. Can you say a little bit again about what are perhaps some of the more common potential uses of these stored stem cells during childhood or later in adulthood? Maybe let's start with childhood.

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So for childhood The, the original reason for storing these was to treat kids who had leukemia. And then these were kids who didn't have a brother or sister available to them to be a donor or who came from ethnic minorities where there weren't bone marrow donors available for them. And we thought that that was going to be the primary use because there was several thousand of these kids every year that that needed to go to transplant and could not. What we came to realize is that as more and More uses of these these stem cells became known with other other things that were much more common during early childhood that you could use these stem cells for and that were things like traumatic brain injury. So if a child falls off a bicycle or is hit by a car, anoxic conditions, say drowning, and we've done several kids who drowned and suffered brain injury and they were able to use their stem cells, and even things,

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talk a little bit about the efficacy of that, that those therapies doesn't really help improve brain function and those children who have suffered drowning or other brain injury

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for the for the kids who have suffered from these anoxic or lack of oxygen injuries, and that would include stroke as well as the drowning. My experience has been is that the efficacy is about 80%. There's several several of those that I've met personally and seen before and after, where they go from being paralyzed and then they can talk talk on one side of the body to within a month to two months after the therapy to be up and running around just as if nothing had happened. So it does seem to be extremely efficacious in children with those conditions. And so adults are going to be a little bit different. But, you know, the kids are the sort of the ideal setting because they're young, they're growing, the brain is still growing, it provides an ideal environment for the stem cells to work in. Unlike, you know, the older adult where the brain is not quite as flexible as this one that younger, but even still, for older adults as well. It seems to have quite a bit of benefit. We had been involved in a number of trials treating kids with cerebral palsy when I was at cord blood registry, and you know, that efficacy was more in the order of around 30 to 40%. But with a realization that we don't really know the cause most of the time. So the cerebral palsy Some of it is due to anoxia. Some of its genetically caused and some



unknown. So that may not be unexpected that you don't see, you know, routine benefit from from those types

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of therapies. But even a rate of 30 to 40% is great for a condition it's otherwise extremely hard to treat.

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Exactly, exactly. And maybe that is, because, as I say, as it may be, as time goes by, and we learn more, we we would hope to be able to identify those patients or those kids who are the best subjects that is, if you have this particular condition, this is the best way to treat you. Much the same way that you know, we currently treat infections these days, we don't give everybody the same antibiotic or the same therapy. We identify what the cause of the problem is, and then we treat it appropriately.

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And what's great is this is really such a natural treatment just giving people back their original stem cells that can then grow and mature into brain cells or other cells throughout the body?

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Yeah, it appears that there's very, there's very few side effects when it's done properly it is given your back your own stem cells, there's little chance of, of giving you an infectious disease that somebody else might have. As long as the laboratory has processed, it has done the correctly, you have all the necessary checks and balances, you can be assured that the cells are viable, and they're going to be functional. I think what we've come to realize now over the last, you know, 10, or 15 years, is that generally when these stem cells go in, they generally don't become the other cells that we thought they were going to become. So when we go in and treat these kids with brain injury, they don't become brain cells. They actually serve as we talked about is the master cell, and they orchestrate the self repair of those tissues. And so those tissues have their own stem cells, which under the right conditions can repair the damage and these stem cells seemed to facilitate and direct that repair. So we and others have looked for a long time to try to figure out, when we put the stem cells in did they go to the site of injury and it's true, we can track them going into the damaged part of the brain. But when they're there, they don't become neural cells, they don't become brain. What they do is they call in the brain stem stem cells, and those stem cells become brain. So again, it's it's a very sort of indirect method of repair, but very effective method of repair. So, you know, if you want to repair the brain, probably brainstem cells are the best to do it. If they're told what to do, and these guys seem to be doing that.



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That's very interesting. Thanks for explaining the mechanism. And so, there seems to be also interest in exploring treatments for other conditions. I know there's been some research on stem cell therapy for autism and other conditions are also underway. Can you say a little Little bit more about that.

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So Autism is is another one of these sort of catch all terms for a condition that has many different causes, much like cerebral palsy. And so we know that there are some genetic forms of autism. There's some other forms of autism that appear to be due to inflammatory brain disease. And then there's some other forms that are sort of unknown, and so cautiously because it is such an emotionally charged topic. So several trials have started over the last few years, examining in a very limited setting the possibility that you could use stem cells to treat certain forms of autism, at least the initial results that I've that I've seen, have been very encouraging. Now, it's not to say that all forms of autism that you won't be able to generalize it that to treat every kid that's identified as being on the, you know, the autism spectrum. But it may be that for certain forms, this could be a very effective therapy. Again, if which there is currently no really good therapy. Similarly, the other neurological disorders like Parkinson's and Alzheimer's, have now started to undergo this type of investigation as well. And I think one thing to remember is we're still at the beginning. It was only 20 years ago that we found these cells and started to bank them away, was only 10 years ago that we started to use them in regenerative medicine. And so we're still in the early days of trying to figure out the best cell for the best patient and their particular

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condition.

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But it's very interesting to see that we still have a lot more research to do, but there's the potential to help with childhood problems, as you mentioned, and with issues later in life and even near the end of life. And so,

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we think so yeah, I mean, I you know, if you think about, probably the most common things that people can relate to is having an orthopedic injury. That is You know, a broken finger or torn up knee or a bad hip or a bad shoulder. And in each of those instances, which certainly tend to occur more towards midlife, they the use of these stem cells to treat those conditions has been very effective. And so I think, yes, not only will these stem cells be useful in early life, but I think they'll continue to be useful at other stages of life, but for a different set of conditions.



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So it really can be a wonderful gift for a parent to store a child's umbilical cord blood to help that child later in life. Yeah, and it again, no risk and very safe. And cells are stored for a long time. Really the only downside currently is it's generally not covered by insurance, I believe. And so families do have to pay for it. Could you give some estimate what the typical cost is for this?

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So we'll say if you do have a child needs. So if you had a child and this was what we started 25 years ago, if you had a child that had leukemia and needed a transplant insurance would cover the collection of banking of cord blood from a subsequent child. So that part is covered just like they would cover the transplant. But if there's no need, if there's no reason, then yes, the insurance will not typically cover that, although some may provide us some discount. Normally the the cost of cord blood banking, whether you do it for your family, or whether you donate it to a donor bank, and they do it as soon as the same and it runs between \$1500/\$2,000 upfront that includes the registration into the system, obtaining a cord blood collection kit, having the kit delivered and then picked up and brought back to the bank, having the sample process evaluated and then stored. And then after that, there's just \$100 a year storage fee, which is really minimal. So, cost is about the same and it runs anywhere from \$1,500 to \$2,000.

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Okay, great. Thanks very much for sharing. So again, I think of it in the same way we want to try to protect our children, putting them in car seats to protect them from injury. This is a, again, a type of insurance where if the child does have some condition or health problem, then this is a potential help for them down the road, and just a question of if they have the money to spend and they can decide if it's worth that potential benefit. And already, you've mentioned some benefits we know about today. And it sounds like there's certainly potential for more benefits as we do more research.

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And I will say that most of the cord blood companies that offer the the family banking do offer payment plans, where that initial say \$2,000 can be spread over, you know, two or three years versus paying it all up front. So they they But very clever about making sure people if they really want to do it can do it. As well as having you know, when you you normally have a baby list when you're when you're pregnant, they have the same sort of thing with with cord blood for the grandparents etc. I think the important thing here to remember is to make those decisions in advance so that it's a truly informed decision that you get all your questions answered. That it's not a decision made out of fear that my child is going to be sick and I will be a bad parent if I don't do this, but rather I know what it can be used for today, what kids it could be used for



tomorrow, and then more importantly, what it cannot be used for. And then having that information in hand I make a reasonable decision

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based on what I want to do with Okay,

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and in choosing a company because there are a few out there any guidance or general suggestions without getting into specific companies, what sort of things should provide Look for an a cord blood banking company.

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Well, I think if you go to the aabb, the American Association of blood banks website, they list all of their accredited cord blood banks, at the private banks, and there's quite a few. And so, you know, how do you choose between, you know, 10 or 20 different banks that may have accreditation? One, it's important that they have accreditation, because it means that they're doing things appropriately, that they meet all the basic guidelines and standards and requirements, and they've been inspected. And they've been found to, to know what they're doing, essentially. So then it comes down to then how do I make the decision, you know, from all those guys. And so we look at and say, you know, which of the companies have been around the longest? You know, how big are they because, you know, the company needs to be profitable in order to stay around and provide you your stem cells back when you might need it 10 years from now.

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And then have they ever used their stem cells

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Has it been once or twice or two been, you know, 100 or 1000 times? And what has been the results of that? So that that's generally what and that really narrows it down to maybe half a dozen companies. They can say they've been around for 20 years that they're profitable that they've done hundreds and hundreds of, of transplants and therapies, that they, you're confident that they know what they're doing, they'll be around and, and be able to assist you. And then it really becomes a sort of a word of mouth saying, you know, who did my friend use? Or who do I feel most comfortable with? And I think you can make your choice for about three or four based on that.

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Great, well, it's great to know that there's an accreditation program. That's very helpful for



people to know about. And then again, I think you gave some some good advice. If you're looking to store samples for 10/20 or more years, you want a company that is hopefully going to be there when you need them.

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Exactly. I mean, it's the same thing that you know, if you buy a nice fancy new car, like to make sure that the guy who sold it to us there a couple years later when you bring it back in for service. So now we're talking something that's a step up from that. You know, when we come back a decade or two later, is he still around? Are my samples still good? You want to know that they've actually made those kind of assessments?

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Great. Well, David, thank you very much. You shared a lot of valuable information. It's great to know that you were an early researcher in this and continuing to be involved in the field. Is there anything else you'd like to say before closing?

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No, I again, I would emphasize the parents, I think this is a viable resource. These will be the youngest healthiest, best stem cells you'll ever have available during the course of your lifetime. And if you have the opportunity to, to do this, to consider this this stem cell banking opportunity. Then I think make sure you get all your information in advance that you you make an informed decision. You get your questions answered. And then you act accordingly. And then again, it seems like a large expense upfront when you can spread it out over several years. It's not. But I think the long term benefits of having that resource available is extremely important. And actually, that's how we got into my son was the first one to ever have this done, because we were the first ones to do it. He's never had to use it, but just in case he would, you know, in another 10 or 15 years, we know the cells are there. So I think the potential is fantastic. Make a decision out of being informed decision not to be afraid.

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Right. Well, thank you so much. It's been very valuable discussion and I appreciate you sharing all our experience all your experience with us.

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Thank you. Happy to do it.

