Oklahoma Innovations Radio Show

Air Date: September 12-13, 2015

Guests: **J. Kimble Frazer** and **Rikin Shah**, OU Medicine Department of Pediatric Section of Hematology and Oncology

>> From the OCAST Radio Network, this is *Oklahoma Innovations*, a weekly science and technology radio magazine, brought to you as a service of OCAST, the Oklahoma Center for the Advancement of Science and Technology. OCAST is the state's only agency whose sole focus is science and technology. The OCAST mission is to identify and fund promising research and technologies that allow Oklahoma to compete in a global market economy from our own backyard. This program features some of Oklahoma's most gifted scientists, inventors, entrepreneurs, manufacturers, educators and business leaders who all have one common goal: developing technology based economic growth for all Oklahomans. Now, here are your hosts Gary Owen and Chad Mullen.

[Music]

>> Welcome to this week's edition of *Oklahoma Innovations*. Chad Mullen from OCAST is cohosting this week, and, Chad, we're going to talk about zebrafish this week.

>> Well, it sounds pretty exciting, Gary. It's, I think a lot of folks don't know that zebrafish play a very vital role in research, and we're really look forward to hearing more from our guests today about that.

>> Did you ever have an aquarium when you were a kid?

>> I had a dog. That was not --

>> You had a dog. Okay. Well, I was one of those that was fortunate, particular as a teenager to have an aquarium, now, some people have goldfish, other people graduate into freshwater tropical fish and zebrafish, for those of you who might recognize this fish, give you a visual idea. It's one of those little, they're about a size of a minnow, and they've got stripes down the middle. Kind of reminds you of a miniaturized bass fish, maybe, I don't know. But anyway, you kind of get the idea of the kind of fish we're talking about.

>> Gary, I take it you haven't been bass fishing much. [Laughs]

>> I haven't. But -- I haven't. No, I haven't. All right. So, we have two scientists from the OU Health Sciences Center, is that right?

>> That's correct.

>> Okay. They're going to be talking about the research they're doing for children in medical research regarding cancer cells, and, so, it's going to be fascinating. But, in the meantime, before we get to our guests today, you have some OCAST things to talk about.

>> Yeah, Gary, we've got just a couple of quick notes for our listeners out there. One, I want to let everyone know to mark their calendar for November 18th. OCAST is holding a regional innovation form in Durant. It'll be held on the campus of South Eastern University. The idea behind a regional innovation forms or meetings are to bring together a large community, multi counties, I believe there's about 13 counties that will be involved in this one and to talk about

approaches, ways, alignment of resources to really take on the idea of creating an innovation economy in their area. So, very exciting. We're putting together the agenda for that right now. So, we'll have more information about that on our website and on the radio show soon, but mark your calendar now for November 16th. I'd also like to put a plug in. I had the opportunity to visit the campus of OU this weekend and they have a new exhibit called Galileo's World, and it is really fascinating exhibit and they have exhibits at all their campuses. So, they've taken a large collection of works from the period that Galileo was alive --

>> Oh, cool.

>> Books from the, you know, 1500's, 1600's --

>> Wow.

>> Scientific equipment, and they've amassed a pretty large collection. And they have exhibits at the Bizzell Library, the Fred Jones Museum of Art, the Sam Nobel Museum of History, the --

>> Wow.

>> Bird Library here at OUHSC on the campus of Oklahoma City, and at the Schusterman Center in Tulsa, so, they have exhibits. So, no matter where you're at, if you're near Tulsa or Oklahoma City and you have an opportunity to visit and you have an interest or passion for science it's a really fantastic exhibit.

>> Is this going to be permanent exhibit or are they temporary?

>> It is, and I could be wrong on this.

>> It's okay.

>> I believe the exhibit on the OU campus in the Bizzell Library is going to be a permanent exhibit, and they're going to change the pieces --

>> Gotcha.

>> On a rotational basis.

>> Wow.

>> But I believe the kind of larger, broad campus initiative is for about a year, and it just kicked off, so.

>> Very cool. It'll give people a long time opportunity to check things out. Thank you for that. That's great. All right. Let's get into our guests. I think you're going to really enjoy this program, and you're going to learn a lot more about what scientists are doing to help children. Our first guest is Dr. J. Kimble Frazer. He is a socio professor of pediatrics at The OU Medicine Department of Pediatric Section of Hematology and Oncology. Did I say that right?

>> Yeah, pretty much.

>> Okay. And, then, we also have Rikin Shah. Did I say that right?

>> Yes.

>> Okay. And he is an MD who was recently named the first Presbyterian Health Foundation Pediatric Fellowship. So, guys, thank you and welcome to the program. Nice to have you here. Let's, first of all, talk to Dr. Frazer. Tell us a little about your background.

>> Well, the short version, I guess --

>> Yeah.

>> Would be, so, I grew up in a Florida. Went to undergrad at Florida State University. Started combine degree training program, an MD/PHD program at UT Southwestern in Dallas, and when I had been in that program for about six years, the laboratory I was in actually moved to Oklahoma. And, so --

>> Oh, really?

>> I lived in Oklahoma from about late 1997 to 2000. I did my last year of my PhD at OMRF, and, then, my last two years of medical school at OU. So I'm an OU College of Medicine graduate.

>> Wow.

>> And, then, between 2000 and 2012 I went to the University of Utah where I did a residency in pediatrics and fellowship in pediatric hematology/oncology, just like Dr. Shah's doing, and got my own research program up and running and just about three years ago exactly, I moved back to OU and joined the faculty here.

>> And what could you tell the audience that attracted you to that kind of research, to do this kind of research?

>> Well, so, clinically, I'm a pediatric hematologist/oncologist, I mean, what that really means is we deal with diseases of the blood --

>> Right.

>> And cancer in children, and, so, they're actually a lot of different blood diseases and cancer diseases --

>> Yeah

>> In children. But amongst the most common are leukemia and lymphoma, and my graduate training had been in immunology, which is sort of related to leukemia and lymphoma. If you want to think about it, immunology is sort of the study of a healthy immune system, and once you're studying leukemia and lymphoma, then you're studying cancer cells of the immune system. And, so, that's pretty much how I ended up doing what I'm doing.

>> I can see the trail there. Dr. Shah, what about you?

>> So, I grew up in India, and I went to medical school in India. And after completing medical school, I migrated to US essentially to have more further, for further education as well as I wanted to do something in research, so that was a part of it which brought me to US. And I ended up in Fort Worth, Texas where I essentially did master's in public health. I started there for one and a half year then I moved to Amarillo.

>> Amarillo?

>> Yeah. And I did my pediatric training. I did my pediatric residency at Texas Tech in Amarillo, and, then, I moved to Oklahoma for my fellowship, so, for fellowship in pediatric hematology. And after a year, I ended up with Kimble to study cancer in children, like, I wanted to do this research to improve the health in children.

>> Cool.

>> Well, Gary, I'm excited to hear. We have two guests with us today that came from Texas and relocated to Oklahoma --

>> Yeah.

>> And, so, we're excited. We're glad to have you here in our state, and one of the things, I have a question for you, Dr. Frazer, well, for either one of you who wants to answer, one of the things we've heard is that the life expectancy for children who are diagnosed with a variety of cancers these days has dramatically improved over the past 10 or 15 years. Could you talk a little bit about that?

>> I think like any statistic it sort of depends how you frame it. There have been dramatic improvements in how we care for children with cancer over the past four to five decades. Over the past 10 to 15 years, we've had incremental improvement but not dramatic improvement. But I think it's fair to say that in the 1960's, pediatric cancer was essentially a death sentence, and, now, in the new millennium, if you pool all the different types of pediatric cancer, and there are, really, over a 100, so, many different diseases, different situations, but in aggregate have about a 80 percent survival rate.

>> Wow.

>> So pretty dramatic in the, you know, 50 years is a lifetime, so, in a generation, disease that was uniformly lethal to one that is often but not always cured.

>> Now, what would you really, kind of, attribute that tidal wave of success to?

>> Oh, wow. There are a lot of things. A lot of fantastic science. A lot of fantastic clinical research. I think in the case of pediatric oncology specifically, maybe more than anything, great cooperation. So, fortunately, pediatric cancer is uncommon, so there aren't hundreds and thousands of pediatric cancer patients within a state like Oklahoma or even in the country, I mean, in this nation they'll be around 3,000 kids diagnosed with cancer this year. So, that's a reasonable number of patients but it's not a huge number, and once you divide it up amongst 50 states and all the different types of diseases, it's really hard to study these things unless you get cooperative groups that pool their patients and compare them across a large area. And, in our case, at OUHSC, we're part of this group called Children's Oncology Group, or COG, that comprises the vast majority of pediatric oncology institutions in this country and as well as other countries, and I think that's had a lot to do with its successes.

>> And are we seeing, is it kind of a stable pattern as far as the amount of cases? Do you see cancer growing in population among children, or it is pretty much a level out, a level out? And is there anything that has to do with lifestyle or anything like that? Genetics?

>> It's quite different than adult oncology. Where --

>> Okay. That's good.

>> They're clearly recognized risk factors.

>> Yeah.

>> Cigarette smoking --

>> Right.

>> Being the most famous, but all others to where choices that one makes in pass, your likelihood or not --

>> Right.

>> Of developing cancer. In pediatric oncology, it's -- genetics plays a component, but not a component that we can really do anything about. In other words, we can recognize patients that may be at high risk of developing cancer, but, apart from detecting their cancer early, there's nothing that we can do for those patients to really prevent them from developing cancer. And the vast majority of pediatric cancer is what we say "sporadic," in other words, seemingly random. And it's not something that we think is increasing appreciably, having said that, I mean, if you work on the front lines clinically, like Dr. Shah and I do, we recognize that it's increasing. It's not increasing on a percentage basis, but it's just increasing because population's increase. So, I mean, just within the past couple of years, the number of oncology patients we're caring for here at the children's hospital has gone from just a little bit over a 100 a year to nearly a 150 a year, so, that's a pretty dramatic increase --

>> Yes, it is.

>> In a couple years' time.

>> Yeah.

>> But we don't think it's because the rates of cancer are increasing, it's rather just that there's more pediatric aid patients live in in the geographic area that we cater to then you're going to have more cases of the disease.

>> Interesting.

>> Now, an interesting comment you made that you do see the increase of number of patients at OU, at the OU Children's Center, tell us a little bit just about treating patients at OU Children's Center. I mean, I think that it's one of the best in the nation, am I correct in that or?

>> Well, I think I'm going to toss this one over to Dr. Shah --

>> Okay.

>> Because he is just coming off 12 solid months of clinical care.

>> Wow. [Laughs]

>> So, if there's anybody that can tell you about treating patients at the Children's Hospital, he's your guy.

>> I think Children's Hospital does provide topnotch care to our patients comparing to any other national recognized institution. We cater to children with cancer and illnesses, and all of them get compassionate care from our providers, nurses, and all the people associated with that. So, I personally think that it is one of the nicest hospital to work in Children's in US.

>> We're talking about research in pediatric cancer with our guests Dr. Kimble Frazer and Dr. Rikin Shah, and we have a lot more to talk about. When we come back, we're going to, kind of, get into how they use this minnow size zebrafish, which you might have one of those in your tank right now, and talk about how this amazing fish is being used in cancer research for children when we return on *Oklahoma Innovations*.

[Music]

>> Pancreatic cancer is the 4th leading cause of cancer deaths. With a median survival rate of only six months. As an oncologist, I see far too many families suffer from the effects of this terrible disease. We need better treatment options for patients.

>> With the support of the Oklahoma Center for the Advancement of Science and Technology, the researchers at Core Biotechnology have what they hope to eventually be a treatment, even a cure, for pancreatic cancer. They have identified a protein that if blocked, may prevent tumors or keep them from growing. With help from OCAST and i2E, the team at Core was recently awarded an SBIR Research Grant to enable them to continue their research and move closer to a treatment for pancreatic cancer. If you're a researcher or a small business in Oklahoma and are considering applying for a federal SBRI funding, contact OCAST toll free at (866)265 2215 or visit us on Facebook or our website at ocast.ok.gov. [Music]

>> Now in its 20th year, this is *Oklahoma Innovations* on the OCAST Radio Network.

[Music]

>> I can't recall on a program in all the history of OCAST we've actually talked about fish in this type of application, especially, a little minnow sized tropical freshwater fish called a zebrafish, which most people have in their aquariums if they've got an aquarium of freshwater tropical fish, you'll probably find them. But, fellas, where did the, where did the, I can address it to Dr. Shah, where do these fish come from?

>> So, it's interest that zebrafish are more seen in sub quantum of India, like Himalaya Indian, India Bangladesh, all those areas. And those are very nice species to study human development, as well as cancer, which all the years people have recognized and started using to study human development, as well as the cancer and other multiple diseases been started with the help of zebrafish and it is changing the way we look at stuff and do research on.

>> And, Dr. Shah, tell us a little bit, now, why are the zebrafish so good or so excellent for research? What characteristics do they have?

>> So, zebrafish essentially share genetic structure with humans.

>> Really?

>> Around 70 percent of genes from human and zebrafish are carried over, so we can essentially look all the gene structure at zebrafish level, and that would also have implication on humans. It's zebrafish's are easy to maintain and to produce multiple zebrafish is easy compared to other models, which are being used for research like mouse models, so, that is another benefit of zebrafish models, which we use.

>> You know, I've noticed when I had them as pets, they're very hardy compared to some of the other fish that you match with them like neons and some of those other fish. They seem to do pretty well. Am I right on that?

>> Oh, they're awesome. I mean, they're well adapted to the laboratory environment, and that extends beyond just growing them and breeding them and feeding them and keeping them alive. They're actually amazingly hardy when they have serious illnesses like cancer.

>> Right.

>> They can carry amazing burdens of cancer. A large percentage of their body weight can be composed of cancerous cells, and they can still be seemingly healthy. Swimming, eating,

behaving normally, unless you went to, you know, great lengths to quantify the amount of cancer they have, you might not know just to look at them that they, in fact, have a substantial cancer burden.

>> Now, in Dr. Shah tells, is the use of zebrafish, is that something that's only happening at OU and OMRF? Or is this a very common use across the country and across diseases?

>> The zebrafish has been used for various diseases. Cancer is one of them, neuromuscular diseases, another [inaudible] diseases or all those kind of diseases, and it's been used widely in vault. But they are very specific labs who study children cancer in zebrafish. There are not many across the world. It's around maybe 100 of those kind of facilities which we work in who caters the research to children cancer and try the find cures in children cancer.

>> Great.

>> So.

>> And, now, correct me if I'm wrong, too, but the zebrafish is translucent, is that right? So you can sometimes, I think, they're used for the study of developing new therapeutics as well. You can actually see things and move through them. Am I --

>> So, in their first couple of weeks of life, they're nearly transparent and, so, historically, long before people were using zebrafish to study specific diseases like cancer or any of the other diseases that Rikin was just mentioning, people have used zebrafish to study development because, first of all, development happens externally. So, unlike mammals, where development happens within a uterus and you can't see what's going on, they're, in zebrafish, it happens in an egg and the egg's transparent, and, then, once they hatch from the egg, the embryo's transparent for the first couple of weeks. So, this has been great for folks who wanted to study how a brain develops, how a heart develops, things of that nature. Once they're adults, they're no longer transparent, but we actually have some genetically modified lines that, because of having mutations that are similar in nature to those that cause human beings to have albino pigmentation, we actually have adult zebrafish that are also, maybe not transparent, but translucent. So, yeah. You can see what's going on even in a 2 year old animal.

>> Wow. That is amazing. Now, tell us a little bit about your labs. I mean, is it one giant aquarium, or are there a bunch of aquariums? [Laughs] A little bit, kind of, give our listeners a peek inside your labs.

>> Yeah. So, one of the efficient things about zebrafish is you can house a large number of animals in a very small space. So, we have a room, what we call the fish room and, I don't know its exact dimensions, it's, like, 270 square feet or something like that. And within that room, they're actually two different circulating water systems, so, no, it's not one big aquarium. In fact, it's really important for us to know which fish is which, and many of them look identical, and, so, you can't just take a gander at them and know who's who. So, we actually have hundreds of plastic acrylic tanks that zebrafish, in some cases house one fish or maybe a dozen fish, as many as up to 60 fish in a tank that can hold eight liters of water. And, so, anyway, in this whole room, they're probably about 10 to 12 thousand fish within 270 square feet. So, it's really efficient use of research space, and it's one of the big advantages that has, relative to mice, I mean, people first started using mice in research because they thought, well, this is a small animal. We can -- this will be cost efficient. But on a per animal bases, a zebrafish cost about 1 percent of a mouse, so, I mean, it -- you can have a 100 zebrafish for a year in your lab for the same cost that you can

have one mouse. And, so, for some projects, the difference the anatomic differences don't matter. Like for us.

>> Sure.

>> Leukemia and lymphoma. We don't care that zebrafish don't have lungs. We're not studying lung cancer so --

>> Yeah.

>> Zebrafish are literally as good as mice.

>> And the maintenance and care of these fish is, compared to mice and so forth, is also an asset, right? Is a benefit.

>> I guess.

>> Yes? No?

>> Well, it depends a little bit how you look at it. So, because OUHSC doesn't have a whole lot of zebrafish researchers, one of the things that, I guess, is a little bit of a burden for us, we take care of our own animals, so, it's unlike -- so, people probably don't know this, but labs that use mice, they don't feed their own animals. Generally, there's a mouse house or multiple.

>> Oh, okay.

>> So, there's a core facility that houses the animals.

>> Okay. We got to stop right here. Take a break, guys. This is fascinating. I'm learning stuff I never knew about zebrafish. This is wonderful. We'll return with our guests on, and talk about what they're doing in the lab with cancer research for children, and when we return on *Oklahoma Innovations*.

[Music]

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>> As a police officer, one of the most dangerous parts of my job is arriving on a scene where an armed suspect is barricaded himself or where we suspect some type of booby trap. We're most vulnerable when we don't know what kind of explosives or weapons are on the other side. It can be deadly.

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>> Research and development. Technology transfer and commercialization. Creating high paying jobs in Oklahoma is what OCAST is all about. This is *Oklahoma Innovations* on the OCAST Radio Network.

[Music]

>> Welcome back. September is Childhood Cancer Awareness Month. I didn't know that. Families and caregivers, charities, and research groups across the United States observing September as Childhood Cancer Awareness Month. In US, 15,780 children estimated under the age of 21 are diagnosed with cancer every year. Approximately 1/4th of them will not survive the disease, but thanks to wonderful research going on in labs around the country and right here in Oklahoma, there are new treatments which enable more children to survive cancer than ever before. It's a wonderful programs going on at the OU Health Sciences Center. We have two guests this week. Dr. Kimble Frazer, who is a socio professor of pediatrics at the OU Medicine Department of Pediatrics section of hematology/oncology, and, then, we also have a colleague of his, Dr. Rikin Shah, who is an MD who recently named the first Presbyterian Health Foundation Pediatric Fellow. So, congratulations on that.

>> Thank you.

>> Well, yes. Thank you. Thank you for joining us today. We've had, we were talking in the last segment a little bit about life in the lab, and I think it's an interesting note to point out to our listeners at home, Gary, that a lot of times you see these pictures of labs in the movies or in the magazines and there's these beautiful shiny clean things. But it's actually, they're a little more, kind of like your Uncle Tom's plumbing project gone wrong sometimes, is how I can describe some of them, so, it's -- they're pretty interesting, but a lot of great work goes on. Dr. Shah, speaking of the work that you do, as Gary just mentioned, you're the Presbyterian Health Foundation's first pediatric fellow, and for those at home that don't know much about PHF, the Presbyterian Health Foundation began with the sale of the Presbyterian Hospital to the OU Medical Center system, and they took an endowment and they've been supporting research right here in the innovation district in Oklahoma City at OU, at OMRF, and at institutions around the state. So, it's a great, great program, and we're -- I think it's quite an honor to be named the first pediatric fellow. So, tell us a little bit about that, and how you came to get that grant and, then, what you plan to do with it.

>> It's a great honor to receive first Presbyterian Health Foundation fellow award. It's an award to support my research, which I would do for next couple of years. This would give me opportunity to grow my research from grass root level and make it a success and, essentially, help kids do battle with their own cancer. So, I really appreciate Presbyterian Health Foundation to support my research the way they have done. My research is essentially focusing on trying to transplant human cancer cells into neuro deficient zebrafish. Our lab have acquired zebrafish, which is genetically modified to become immunodeficient, from Boston. So, those fish would not have their own immune system. So, what we were, we want to achieve, strive to, inject human cancer cells into zebrafish and study those cancer behavior right there in zebrafish and try

different therapies on zebrafish and use those therapy for our patients. So, that's the nutshell overview of our research project, which would essentially help the effected relapse patients, and, also, there is different types of pediatric cancer that this project.

>> How do you get cancer cells into a little minnow sized fish like that? That's -- you might have an incy wincy [laughs] incy needle, or how do you do that?

>> That's a great question. So, we cultured the human cells in the lab and, after culturing them, we make them into solution and we use very micro needle. It's a --

>> Microscopic needle?

>> Right.

>> Yeah.

>> Microscopic needle. We seeded the fish. So, we anesthetized the fish and, so, that they are very still, and we use the microscope to inject human cells into them. That's how this project works. And the cell which we inject into the fish, they are florescent. So, we inject florescent cells, so, then, we look under the florescent microscope. We could see the injected cells, different from zebrafish background, and once we give them treatment, we should see their cells going down, the florescent cells. So, that's the whole science and logic behind this project.

>> Well, that's amazing. Tell us a little bit -- help us at home understand a little bit more about -- okay. So, you, you know, inject these fish, look at the fish, now, how does that translate to cure or a therapy, I mean, tell us a little bit about the process.

>> So, very good question. Right now, we are in the process of developing a protocol and developing a model which would help us do what we want to do. What we would want to achieve, finally, would be to take human samples when they get their biopsy, we take some of their cells from their biopsy of their cancer, purify those cells, label them with florescent labels, and, then, inject into the fish and, then, study different therapies. So we could inject hundreds of fish with same human cells, human cancer cells, and study different therapies. Hundred different therapies we could try on fish. And, then, once we've actually worked on the fish, we can give to the patients because they're very similar and this would help, not trying on the patient, itself, but trying on to hundred zebrafish. Finding the perfect medicine for that particular cancer or combination of medicine for that, say, and give to the patient so that patient have better chance of curing their cancer. So this would be the ultimate point of that research.

>> Now, are you able -- the therapies that they're trying out are these, are these pharmaceutical? Are they radiation therapy? Is it a combination? Or are you even able to do radiation therapy on the fish or? [Laughs] Or chemo therapy or?

>> Both, yeah.

>> Okay.

>> We haven't used radiation for clinical purposes, but, for Rikin's project, we would use radiation for immunosuppressive purposes. In other words, we would take a normal healthy zebrafish, radiate it in such a way that it's immune system would become temporarily disabled, and, then, we would inject cancer cells into them and this is how we would engraft. But this was for a number of reasons. This was a suboptimal way to do our experiments partly because if you radiate them too much, the animals die, and if you don't radiate them enough, their immune

systems comes back really quick and eradicates the cancer cells before you can do any useful study. So we wanted a system that would allow us to inject cancer cells and allow them to live for weeks or maybe even months that would allow us to do lots of experiments. One other thing that, I guess, on this side of the table, we kind of take for granted but maybe we should make clear for our listeners is that, you know, I mean, physicians and scientists have been killing cancer cells in Petri dishes for decades. It's easy to kill cancer cells on a plastic dish.

>> Sure. Sure.

>> If you believed that everything that worked in the lab would work in a patient, we'd all be out of a job by now. Although, cancers would be cured. So, this project is really getting at that core problem. The fact that most of the medicines that work in the lab, when you put them into a human being, they either don't work or they work so well that they kill, not only the cancer, but they cause a lot of bad side effects. And, so, the notion of putting human cancer cells in an animal isn't so much because zebrafish are magical. They're just a host. A way to let the cancer cells grow in an environment that's a lot more similar to being in a human being than just growing in a Petri dish.

>> And, to, kind of, kind of elaborate on that a little bit. Tell us a little bit about, once you see something that is effective in the zebrafish, I mean, you're a long ways away from somebody being able, a human, to be able to take that as a treatment. What do you have to do at that point? Do you have to replicate it? Do you have to, you know, tell us a little bit, just, you know, basic overview of the FDA process.

>> Well, I don't think I can give you an FDA overview because I've never developed a new medication to put it through the FDA, but what I can tell you is this. Is that the drugs that we want to test will span the gamut from things that are already FDA approved --

>> Okay.

>> But may not be used currently for leukemia and lymphoma. As you can imagine, it's a lot easier to get those drugs in the patient because they've already been studied. We already know their side effects. We already know whether they're going to cause harm. And, so, if we have preliminary evidence in zebrafish that would be accompanied by other preliminary evidence that other people studying leukemia and lymphoma would need to replicate. But I think if there was a body of literature that said, "Hey. This drug that we haven't used for cancer before, this might really work well." Then, if it's already FDA approved, it's quite easy to get into patients. And it usual gets incorporated in the clinical trials that are already going just by adding it in the simplest form. It would take whatever the standard therapy is, and, either, add this new drug or not. And see if the addition of the new drug either, A) improves outcomes, or, B) causes unintended side effects. The road to take a brand new molecule that is not FDA approved and isn't manufactured for clinical use is very different enterprise and one that, while some laboratories have undertaken, it's not really what I see my calling as. And, so, I think, frankly, you know, we're not making these new compounds anyway. They're going to come to us from collaborators and, so --

>> Sure.

>> If some collaborator sends us a compound in it, works great against human cancer, and graft it in zebrafish, then, we'll of course tell them, "Hey. Your drug works really well. You should

prioritize this and move it toward FDA approval." But, personally, I don't want to be part of a pharmaceutical infrastructure.

>> Sure.

>> I'd be happy to test new medicines and see if they work and somebody else can take it from there.

>> Wise man, indeed. We're learning a lot about how long and how challenging it is to try to develop new therapies. We're talking about children in children with cancer and some of the research going on at the OU Health Sciences Center. Got a lot more to talk about when we return on *Oklahoma Innovations*.

[Music]

>> This is the OCAST Radio Network.

>> When I invented my new product, I faced a lot of challenges from securing capitol to recruiting qualified employees. It's a very complex path from innovation to the marketplace, and I needed some help navigating the process,

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>> This program is about the scientists, innovators, and investors, educators, manufacturers, and many others who are contributing to Oklahoma's successes in science and technology. This is *Oklahoma Innovations* on the OCAST Radio Network.

[Music]

>> We hope you're learning a lot about what's going on here in Oklahoma when it comes to pediatric cancer research. By the way, I owe Dr. Frazer a little apology here to the audience. I kept calling it an associate, it's not associate professor, he's an assistant professor [laughs] of pediatrics. I gave him a promotion.

>> [Laughs] A promotion, yeah. That was great. I appreciate it. I'd like a raise while you're at it.

>> It's my eyes. I'm sorry. I'm seeing it on the paper, but it's not coming out of my mouth that way. Anyway, Dr. J Kimble Frazer and Dr. Rikin Shah both doing, collaborating together. You guys work together in the labs? Or separately?

>> Yes.

>> I would assume so.

>> I have a research.

>> You have your own project. But I assume you collaborate together, right?

>> Well, Dr. Shah's a trainee in my --

>> Oh, okay.

>> Lab, would be the way to phrase it.

>> Oh, okay.

>> So, our lab has about seven people and folks have different backgrounds but Rikin is one of two MDs in the lab, and, then, I have two other PhD level scientists --

>> Okay.

>> In the lab, but all of them are post-doctoral fellows, if you will.

>> Okay.

>> In the sense that they have a doctorate, and now they're getting further training.

>> Better clarification. Thank you.

>> Well, and Dr. Shah tells us a little bit, so, you came to OU from Texas, and we're excited about that. Tell us a little bit about your experience here in Oklahoma, about the community of support, that, around research, so. I know we have folks, of course, our agency OCAST, OMRF, OUHSC, the Medical Center at OU, the Children's Hospital Foundation. There seems to be a lot of support, could you talk a little bit about that in your experience so far?

>> Yes. It's a great, great question. I believe we have great community support here at OU. Among the name you mentioned, Children's Hospital Foundation has been doing great work with our patients and our patient population. Toby Keith's Kid's Corral is very, very, very helpful for our patients who are coming outside the city. We cater for children with cancer, not only in Oklahoma City, but all across the state. So, we help patients coming to us from three, four hour driving distance. So, that provides them place to live and taking therapy while they're staying there. Along with that, Presbyterian Health Foundation is doing great stuff. There's other community support which is essentially very helpful for us. Childhood cancer needs more funding altogether as well to enhance care of the children as well as to the, for the research and finding new cures. We cater for not only national patients, but we have around 30 to 40 patient yearly coming from UK to get --

>> Wow.

>> Therapy here. They get, they come from UK to get proper radiation therapy. While they're getting their therapy, they get their chemo at OU Health Center and OU Children's, so, which is very nice to take care of those patients as well.

>> Well, I think that's interesting that you bring that up. We hear a lot, Gary, about, you know, the OU and the Health Science Center and all the researchers kind of an Oklahoma City thing.

>> Right.

>> But it really sounds like many of your patients are from, you know, from all four corners of the state and across the pond, so to speak, if they're coming from the UK as well, so that's exciting. So, tell us a little bit about, kind of, the patient care experience. Are most of the kids that are being treated, are they staying in the hospital or are they just traveling in for short periods of time or?

>> So, it's mix of both. Some of the patients, we have great outpatient facility. We help patients getting their chemo therapy in our outpatient clinic, and they go home after their therapy and come back whenever therapy's needed. It's a great facility, and I invite the audience to come visit us at OU Children's to see how we take care of those children and there is great inpatient facility where we admit patient who is getting impatient chemotherapy and monitored there. Labs, we examine them. We have great inpatient team as well. Along with those two, we have great bone marrow transplant unit as well. Where we do bone marrow transplants in Oklahoma for children with cancer who need bone marrow transplant from Oklahoma. So, we have mix of all the facility to provide the care.

>> And I think that they have for children that, under your care, in addition to really just topnotch therapy and treatment, there's also a lot of extracurricular --

>> Yes, yes, yes, yes.

>> Activities that occur, so.

>> It's a very good thing. I feel to treat children with cancer because they are going to be children at the end of the day. So, there will be very good days where they are playful. They want to play. They play with us. They play with nurses. There are excellent child life support which we have in Children's Hospital. They play with them. So it's a very good, happy environment at certain points, and, that, it's compared to the aided with cancer and children with cancers. I find that a big reward for us.

>> Oh, sure. Do you, because you're working with children, by chance, when they come, I assume they come to your labs periodically or into the facility? Or how does that work? I mean, you talk about when you're working with children. I guess my question is, wherever they go, is there, like, an aquarium set up where they can, kind of a fun thing that says, "These fish are helping"? [Laughs] Do you know what I'm saying? Kind of an educational tour?

>> That's a smart idea. We don't really have something set up like that. So, our labs --

>> But I'm saying where they go, wherever they go for treatment or.

>> Yeah. So --

>> Or your part of the project is involved.

>> As it turns out, they actually have aquariums for decorative purposes --

>> That's what I'm saying.

>> In the clinic.

>> Yeah.

>> But they don't have zebrafish in them and they certainly don't have the zebrafish.

>> No. But I just thought it would be cool --

>> Yeah.

>> If they had a display that says, "These fish are helping cure cancer." You know?

>> That's a cool idea.

>> You know what I'm saying? I think that would be a very educational and very cool thing.

>> For sure. For sure.

>> Yeah. So I just thought I would bring that up. Where do you see, where do you both hope to see your research going in the next five or ten years? What do you hope, what do you hope your research will --

>> So, I am very hopeful that in years coming, I can design this personalized medicine for children with cancer, what I aim to do with my current project. That would be my dream to achieve where kids can come with cancer. We design a medicine which would work to their cancer according to our zebrafish model and use that into the patient. That would be the dream for my research.

>> That's the end result for you. Yeah.

>> And that's what I want for this project to end.

>> And you have a goal in mind of how long you think it might take to get there?

>> I am hoping that I can do it in two to five years.

>> Okay. So, five years is realistic for you. What about you?

>> Wow. My goals are different. So, you know, I've been here about three years, and I've been incredibly fortunate in terms of the support streams that I've received in terms of funding and a an endowed chair from the Children's Hospital Foundation --

>> Nice.

>> A grant from OCAST, grants, first, from a program called COBRE, which is NIH funding mechanism. This particular COBRE grant was routed through OMRF that I applied to and was supported by for a time. Another grant called INBRE, similar mechanism that is money from NIH funded through UHSC that currently supports us. Hyundai Hope on Wheels. So, I mean, you'd hear me say this and it sounds like we're rolling in dough, but we're not and it's -- research is expensive.

>> It's very expensive.

>> Even when you're trying to be efficient and use zebrafish where you can have thousands at a penny per.

>> Yes.

>> Running a research program is an expensive enterprise, and, while all these fantastic mechanisms of support that we're currently benefitting from are keeping us afloat, they're these funding mechanisms are designed as starters to get you going.

>> Yeah.

>> Just like Rikin's grant --

>> Sure.

>> Is designed to be a starter to get him going. And so my goal going forward in the next 5 years and the next 15 years and the next 25 years and, frankly, the whole rest of my career is to get larger grants that come from mechanisms, primarily like NIH, but there are other funding mechanisms that bestow larger increments of money. Leukemia and Lymphoma Society would be an example that's appropriate for the kind of research we do. To me, it's important to get

these kind of grants that frequently are for five or six years at the time. Large amounts of money that are sustainable.

>> Yeah.

>> Because right now we're making ends meet but we're, you know, we're a year and a half out at any time from, if there's not a new grant coming, we'd have to restructure the lab.

>> Wow.

>> And I don't want to have to do that.

>> Wow. Of course not. So you've always got to stay on the --

>> Yeah. And, I mean --

>> On the edge too.

>> Grants are hard.

>> Yeah.

>> You have to apply for many just to get lucky enough the get one funded, and, many times, you have to apply to the same grant two or three times. So it's difficult from a budgetary standpoint to sort of predict when the next windfall will come.

>> Dr. Shah, you were going to say something?

>> No.

>> Oh, okay. I'm sorry. I thought you were going to elaborate.

>> No. That's okay.

>> Well, now, I think it's an important note to make that you spend a lot of time pursuing the grant rather than doing the research that --

>> It's true. That's why I have the Dr. Shah's of the world in my lab, I mean, in terms of the hands on research I do these days, virtually, none. My research, if you will, is by virtue of guiding Rikin and others in the lab and in their projects.

>> You guys have been a wealth of information. I am impressed with what you're doing. I know our audience is just grinning because when it comes, you know, to children, obviously, in cancer, it's just a very emotional thing for families and for friends and, of course, just the public to know that you guys are doing some wonderful things in the laboratory, and what a unique tool in integrated zebrafish. That's very cool. So, the next time we're in the pet store, we see zebrafish, we'll be thinking about that.

>> Yeah. And they're a bargain there, too. Like 79 cents a pop. [Laughs]

>> Yeah. Hey. So, tell me, Chad, I don't know about you, but I've learned quite a bit today. This was a quite a great show.

>> Fantastic show. Thank you both for being on the show.

>> Thank you.

>> Well, thanks for having us.

>> And we want to thank you, our audience, for joining us. And we hope to, hope you'll join us next time for another edition of Oklahoma Science Radio Magazine. *Oklahoma Innovations*. Have a good week.

[Music]

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