

Episode 6: Breaking Barriers to Use Glass in Healing

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[ANNOUNCER, MUSIC UNDER]

“This program is a production of Rutgers Global.”

[MUSIC UP FULL]

[OPEN MONTAGE OF SOTS FROM TV SHOW, MUSIC UNDER]

“Rutgers’ vision//globalized world//international learning//unique opportunities//global health//study abroad//impact on human lives//expand my horizons.”

[MUSIC UP FULL]

[HOST JAYNE CHACKO, MUSIC UNDER]

“This is... Rutgers Around the World— a finger on the pulse of all things global at Rutgers.”

[MUSIC STINGS]

HOST: Hi I’m Jayne Chacko, Rutgers junior and host of the podcast, Rutgers Around the World.

Each year, Rutgers Global offers Rutgers faculty, departments, and units seed grants to grow the university’s international research and teaching. On the fifth anniversary of these grants, we turn to one grant recipient who is using this funding to work with colleagues at the University of Sao Paulo in Brazil as well as other partners. They are digging deeper into how glass can be used to heal tissue and repair bones in the human body.

Dr. Ashutosh Goel is an assistant professor of materials science and engineering at the Rutgers School of Engineering. Rutgers Global recently awarded him an international collaborative research grant. Dr. Goel joins us in the Rutgers Global studio. Thank you for being here today!

ASHUTOSH GOEL: Thank you, Jayne. Thank you for having me here! It’s my pleasure.

HOST: You’re an expert on glasses and their functional applications. How did you get into this field?

ASHUTOSH GOEL: Well, It was I think it was in 2004 during my master’s thesis back in India. It was an accident you know, it wasn’t something pre-planned. I wanted to work in the field of nuclear physics, atomic physics. But the professor didn’t have a vacancy with whom I wanted to work. So he asked me why don’t you go to the professor next door and see if he has something and that’s how. That professor wanted to work in the field of glasses. I got on board. But no regrets! Since then, I’m just in love with glasses.

HOST: What’s so special about glass as a material?

ASHUTOSH GOEL: It’s been hundreds of years that glasses have been studied. But still today in science, there’s a big part of it, we don’t still understand it. And, the way that glass is transforming mankind today. So for example, look at your iPhone screens. Who knew they’d be made of glass, right, gorilla

glass? And by the way, the inventor of gorilla glass is a Rutgers alum. You don't even know that glass is everywhere around you. You use glass in so many applications every day without even realizing that you are using it. So that's what make it unique and that that's what motivates me to work in this field.

HOST: What is bioactive glass and how can that be used in tissue engineering?

ASHUTOSH GOEL: There are biomaterials, what we call bio-inert materials where you know if someone meets with a traumatic injury, any accident and the doctor, they insert a steel rod. A hip implant, let's say, in old age. So that kind of material is made of metals, alloys which goes into your body, stays over there, it provides you strength, but it doesn't interact with your body. It doesn't help the bone to regrow or tissues to regenerate. With bioactive glasses they don't only provide you a mechanical stability, but they also interact with your body, with the body fluids and slowly and slowly they corrode and the ions that comprise that glass, they get released into the body and then they stimulate specific genes, what you call genetic response and that genetic response further helps the bones or tissues to regrow.

HOST: So based on this science, Rutgers Global awarded you an international collaborative research grant for your project. How will this grant help you further your research and internationalize the student experience at Rutgers?

ASHUTOSH GOEL: In the framework of this grant, one of my grad students is already in Brazil right now for four months. He is learning a spectroscopic technique over there called Nuclear Magnetic Resonance which is a state-of-the-art technique used to study the atomic structure of any material, like you know how the bonds are connected with each other. And, in Brazil we have a world renowned expert in this field. So he kindly agreed to accept my student in his group and he collaborated with me on this proposal. So my student is there already, working with him. And, my other grad student is just waiting for the visa. They'll not only get to learn a new technique under the mentorship of a world renowned scientist, but they'll also get to live in Brazil. They'll get to know the Brazilian culture. On the second aspect, that was the aim of the grant, that with this grant can be a seed to future proposals, future funding. So this proposal, with this collaboration with Brazilian professor now, I have already written a half-a-million dollar proposal to NSF, the National Science Foundation in the U.S. where that Brazilian professor is a main, integral component of the proposal. So if this proposal, you know, gets approved from NSF, so basically this Rutgers grant will be turned into a half-a-million dollar, five-year proposal, five-year project right and that's just the beginning.

HOST: Other Rutgers Global Grant recipients, they used to be called GAIA grants, have gone on to receive additional funding from other organizations like NSF as you mentioned. What research outcomes would you like to see once this project is complete?

ASHUTOSH GOEL: The grad student will get a Ph.D., no doubt, one. Two, it'll turn into a number of really good, high quality international research papers in collaboration with Brazil, Brazilian professor. Apart from that, proposals will come in, more money will come in to Rutgers, funding, grants. And then, what we are doing, the aspect that we're working on is really a fundamental science part of it. Once you understand the structural drivers that govern the corrosion of these glasses in the human body, that fundamental science can help you develop new products or new glass compositions which are practically applicable for tissue engineering.

HOST: You are looking at other applications of glasses. You recently received a three-million dollar grant from the U.S. Department of Energy to conduct research on nuclear waste glass. As you have said, storing nuclear waste as glass is not new. What's different about your project? Do you want the glass to corrode in the same way as you it would in a healing application, or no?

ASHUTOSH GOEL: I hope not because if the nuclear waste glass corrodes like the way it corrodes in the healing process then all the radioactive waste will be out in the soil, in the ground, wherever you dump that glass. So you don't want that kind of stuff. The link that connects bioactive glasses with nuclear waste glasses is the chemical durability, is the glass corrosion. In bioactive glass, you want the glass to corrode. In nuclear waste, you don't want the glass to corrode, right. Definitely, you know, I'm not the one to come up with the idea of nuclear waste glasses. So what's new about my project? So since the 1980s when they started working on this nuclear waste thing until today, just for an example you know, if in today's date, if you can convert this nuclear waste into glass, 100 tons of glass, everything is going out of taxpayers money so more glass you have to produce, more you have to run the facility over there right, more money it'll cost. Can you reduce that 100 tons of volume to 80 tons? In other words, can you add more waste to the glass without compromising its chemical durability? So what is the science that's governing them and how can we use that science to develop more you know robust glasses with high wastes in them? So that's what we're working on.

HOST: So with all of your research, would you say that it relates to the United Nations Sustainable Development Goals, which include responsible production and consumption and good health and well-being?

ASHUTOSH GOEL: I'll say yes, definitely. You know, one aspect on bioactive glasses deals with health, well-being. And you can, one way or another you can even correlate the nuclear waste thing with the environment, with responsible production, safe management right, so yah definitely!

HOST: Dr. Goel, good luck with your research and thank you so much for joining us today!

ASHUTOSH GOEL: My pleasure. Thank you.

HOST: Interested in applying for a grant like the one Dr. Goel received? Rutgers Global will be hosting a symposium on November 16 where you can hear from past grantees about their experiences, learn about the types of projects that get funded, and get some tips for preparing your proposal. For more details on the symposium or how to apply for a Rutgers Global grant, go to global.rutgers.edu. You'll find it on the funding opportunities page under the programs tab.

That's all for this episode of Rutgers Around the World. Join us next time as we discuss all things global with members of the Rutgers community. Thanks for listening!

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