WEBVTT

00:00:06.047 --> 00:00:07.924 When we look at tissues, if you look at your skin,

00:00:07.924 --> 00:00:10.552 it's a very stable system of cells, right?

00:00:10.677 --> 00:00:13.179 It doesn't just spontaneously turn into liver tissue

00:00:13.179 --> 00:00:15.265 or into lung tissue or into pancreatic tissue,

00:00:15.849 --> 00:00:18.935 and that's kind of remarkable because the genes in the cells,

00:00:19.477 --> 00:00:23.690 within your skin are all the genes that are there to make liver are there.

00:00:23.690 --> 00:00:25.692 All the genes that are there to make lung are there.

00:00:25.692 --> 00:00:27.569 They're just silenced or they're turned off

00:00:27.569 --> 00:00:30.405 or some of them are turned on, but in specific combinations,

00:00:30.405 --> 00:00:33.908 and when you get a certain set of cells expressing certain genes in certain ways

00:00:33.908 --> 00:00:35.702 and talking to each other in certain ways,

00:00:35.702 --> 00:00:37.871 you get this thing that we call skin tissue.

00:00:37.871 --> 00:00:39.622 So that question of why,

00:00:39.622 --> 00:00:42.292 why are tissues stable in this way?

00:00:42.292 --> 00:00:46.671 That's like one of the very central questions right now within tissue systems bio.

00:00:52.385 --> 00:00:55.305 One of the things that my lab has sort of started to specialize in

00:00:55.305 --> 00:00:59.184 is the cell to cell communication within these multicellular systems.

00:00:59.184 --> 00:01:02.020 So like lung tissue is one that we study very deeply

00:01:02.020 --> 00:01:04.939 and when you look at the lung, it's a community of like 50

00:01:04.939 --> 00:01:08.193 to 70 unique cell types or cell states that are, that are quite distinct

00:01:08.193 --> 00:01:11.196 and you might have a couple dozen of those cell types really close together,

00:01:11.446 --> 00:01:14.115 and they're all talking to each other in these very complex ways

00:01:14.115 --> 00:01:17.077 and the ways that they talk to each other,

00:01:17.077 --> 00:01:18.995 reinforces that tissue's stability.

00:01:18.995 --> 00:01:21.539 It sort of keeps lung tissue behaving like lung tissue

00:01:21.539 --> 00:01:24.334 and stops it from deviating out of homeostasis

00:01:24.375 --> 00:01:27.879 and so when we study cell to cell signaling it gives us a window

00:01:27.879 --> 00:01:31.674 into how these cellular communities in our body are talking to one another

00:01:31.674 --> 00:01:33.593 and how they're reinforcing that stability,

00:01:33.968 --> 00:01:37.472 and we can also see during pathology during disease,

00:01:37.472 --> 00:01:40.016 how this cellular communication deviates from the norm

00:01:40.266 --> 00:01:43.853 and the holy grail would be to be able to get involved in this conversation

00:01:44.020 --> 00:01:47.816 so that we can take disease tissues that we see in human beings in clinical pathology

00:01:47.816 --> 00:01:50.527 and actually encourage that, like steer them back to homeostasis,

00:01:50.527 --> 00:01:54.072 sort of tell them, oh, stop being diseased, come back to the norm,

00:01:54.197 --> 00:01:57.200 and this is this is what I think of now when I think about regenerative medicine.

00:02:03.039 --> 00:02:04.290 We've really started to develop...

00:02:04.290 --> 00:02:06.626 the technologists in this space are doing wizardry.

00:02:06.626 --> 00:02:08.795 They're doing amazing things, and they're starting to develop

00:02:08.795 --> 00:02:11.798 what are called spatial transcriptomics or spatial multi-omics.

00:02:12.090 --> 00:02:13.716 You get a you take a tissue,

00:02:13.716 --> 00:02:16.386 you can suction it and take a look at what's going on under a microscope

00:02:16.386 --> 00:02:17.679 and you can also in parallel

00:02:17.679 --> 00:02:21.141 you can measure using spatial transcriptomics or spatial proteomics

00:02:21.141 --> 00:02:24.769 the character of each individual cell that's within that slide,

00:02:24.769 --> 00:02:27.730 and also if your panel is enriched for ligand receptor mechanisms,

00:02:27.730 --> 00:02:29.816 you can get very, very detailed profiling

00:02:29.816 --> 00:02:32.569 of how the different cells are interacting and communicating with one another.

00:02:32.569 --> 00:02:34.571 So that's what my lab specializes in.

00:02:34.571 --> 00:02:37.574 We started to leverage these spatial transcriptomics techniques

00:02:37.782 --> 00:02:40.785 and take that data and try to generate really good quality data

00:02:41.077 --> 00:02:44.706 and from that data we developed primary source computational algorithms

00:02:44.706 --> 00:02:46.624 to study cell to cell communication.

00:02:46.624 --> 00:02:50.253 With using these data, it gives us this beautiful window into

00:02:50.253 --> 00:02:53.840 how cells are talking to each other, how they're influencing with one another,

00:02:54.007 --> 00:02:57.343 and also how, it sort of allows you this bird's eye view where it's like,

00:02:57.677 --> 00:03:01.055 oh, it's not just this one cell has done something deviant.

00:03:01.598 --> 00:03:04.517 It's that this set of cells as a whole

00:03:04.517 --> 00:03:09.272 has sort of lapsed into this other way of behaving and communicating,

00:03:09.522 --> 00:03:12.525 and that opens the window to say, oh, well, what could we do therapeutically?

00:03:12.859 --> 00:03:15.820 Could we block that shift that we don't want to happen?

00:03:21.576 --> 00:03:24.287 I'm really hoping to develop regenerative therapeutics.

00:03:24.287 --> 00:03:26.831 So I think that since we now have this data

00:03:26.831 --> 00:03:28.666 and we have these computational algorithms

00:03:28.666 --> 00:03:31.085 that can really teach us what's going on within tissues,

00:03:31.085 --> 00:03:34.631 I'm very much hoping to be able to develop therapies that can sort of,

00:03:34.964 --> 00:03:37.926 help disease tissues to regenerate themselves,

00:03:37.926 --> 00:03:42.013 that we could give safely and that we know very clearly, or we have a strong,

00:03:42.013 --> 00:03:44.390 you know, ability to predict how these,

00:03:44.390 --> 00:03:47.143 therapeutics are going to influence these communities of cells

00:03:47.143 --> 00:03:50.647 so that we can, you know, steer disease tissues back to homeostasis.