

WEBVTT

00:00:05.255 --> 00:00:07.841 The fetus is a fascinating patient.

00:00:07.841 --> 00:00:11.636 They have many accessible and developing stem cell populations

00:00:11.636 --> 00:00:13.847 that are gone once the baby is born.

00:00:14.556 --> 00:00:19.561 Historically, if you do fetal surgery where you operate on a fetus,

00:00:19.561 --> 00:00:21.438 the wound heals with no scar.

00:00:21.855 --> 00:00:25.692 So it's a very different patient than even a baby.

00:00:26.443 --> 00:00:32.449 And so the idea that you could get organs to grow more normally while they're

00:00:32.449 --> 00:00:35.785 in the process of becoming the organs that they're going to be is compelling.

00:00:40.373 --> 00:00:42.667 Our lab is looking at ways to

00:00:42.667 --> 00:00:46.713 treat and cure genetic and structural diseases before birth.

00:00:47.130 --> 00:00:49.758 The clinical practice in pediatric surgery

00:00:49.758 --> 00:00:53.470 is babies who are born with a variety of needs.

00:00:53.470 --> 00:00:56.765 So babies whose abdominal walls don't form normally

00:00:56.765 --> 00:00:58.224 or diaphragms don't form normally

00:00:58.224 --> 00:01:01.227 or lungs, guts and airways that don't form normally,

00:01:01.227 --> 00:01:04.314 and some of these things are diagnosed before birth

00:01:04.314 --> 00:01:09.235 and that's a window to allow the baby to develop normally,

00:01:09.235 --> 00:01:10.570 if you can correct problem.

00:01:14.574 --> 00:01:17.911 So our work is a collaboration with biomedical engineering

00:01:17.911 --> 00:01:19.996 and molecular therapy at Yale,

00:01:19.996 --> 00:01:24.125 and we deliver therapeutic agents in very small particles

00:01:24.125 --> 00:01:27.545 to try to treat genetic or structural diseases before birth.

00:01:28.213 --> 00:01:31.633 The first part of it is synthesizing those particles

00:01:31.633 --> 00:01:35.595 using a variety of techniques to verify that they're good quality,

00:01:35.595 --> 00:01:39.474 and that they are loaded with the things that you think that they're loaded with.

00:01:40.266 --> 00:01:45.105 We're able to deliver those particles to fetuses in experimental models

00:01:45.271 --> 00:01:49.901 and then there's one round of analysis, which is where are the particles going?

00:01:50.026 --> 00:01:53.655 So that's typically microscopy or flow cytometry,

00:01:53.738 --> 00:01:57.158 and then if you're trying to rescue a disease model then

00:01:57.367 --> 00:02:00.245 the analysis depends on the model that you're looking.

00:02:00.245 --> 00:02:03.373 They're projects where we're looking at lung growth,

00:02:03.373 --> 00:02:06.126 techniques to to assess those are microscopy functional assays

00:02:06.126 --> 00:02:10.380 and we've actually started to get into more sophisticated molecular techniques

00:02:10.380 --> 00:02:13.633 like single cell RNA sequencing and spatialomics

00:02:13.633 --> 00:02:15.552 where you can really try to understand

00:02:15.552 --> 00:02:18.555 the interactions between the cells in normal fetal development,

00:02:18.972 --> 00:02:22.809 and then the interactions of those cells when there's abnormal fetal development.

00:02:26.729 --> 00:02:29.649 With the spectrum of things that we're working in the lab,

00:02:29.649 --> 00:02:32.235 you could provide a single shot

00:02:32.235 --> 00:02:35.196 that would cure a variety of genetic diseases.

00:02:35.196 --> 00:02:37.740 So lysosomal storage diseases,

00:02:37.740 --> 00:02:40.618 diseases of the brain, cystic fibrosis, blood diseases.

00:02:40.618 --> 00:02:43.413 You may be able to have a single shot

00:02:43.413 --> 00:02:47.292 and cure a genetic disease for the duration of that patient's lifetime.

00:02:47.959 --> 00:02:51.087 Other strategies that are a little bit newer for our lab,

00:02:51.087 --> 00:02:53.298 45% of neonatal death

00:02:53.756 --> 00:02:56.676 is due to these issues of prematurity

00:02:56.676 --> 00:03:01.890 and if you could improve the health and function of the tissues that support a healthy pregnancy,

00:03:01.890 --> 00:03:05.310 then you may be able to drastically move the needle

00:03:05.310 --> 00:03:08.438 on these sort of major public health problems.