

WEBVTT

00:00:00.000 --> 00:00:03.675 Funding for Yale Cancer Answers is provided

NOTE Confidence: 0.95843685

00:00:03.675 --> 00:00:07.619 by Smilow Cancer Hospital and AstraZeneca.

NOTE Confidence: 0.95843685

00:00:07.620 --> 00:00:09.800 Welcome to Yale Cancer Answers with

NOTE Confidence: 0.95843685

00:00:09.800 --> 00:00:12.379 your host doctor Anees Chagpar.

NOTE Confidence: 0.95843685

00:00:12.380 --> 00:00:14.335 Yale Cancer Answers features the

NOTE Confidence: 0.95843685

00:00:14.335 --> 00:00:16.735 latest information on cancer care by

NOTE Confidence: 0.95843685

00:00:16.735 --> 00:00:18.275 welcoming oncologists and specialists

NOTE Confidence: 0.95843685

00:00:18.275 --> 00:00:20.852 who are on the forefront of the

NOTE Confidence: 0.95843685

00:00:20.852 --> 00:00:22.628 battle to fight cancer. This week,

NOTE Confidence: 0.95843685

00:00:22.630 --> 00:00:25.143 it's a conversation about the use of

NOTE Confidence: 0.95843685

00:00:25.143 --> 00:00:27.388 nanoparticles to treat skin cancer with

NOTE Confidence: 0.95843685

00:00:27.388 --> 00:00:29.950 doctors Michael Girardi and W. Mark Salzman.

NOTE Confidence: 0.95843685

00:00:29.950 --> 00:00:32.068 Doctor Girardi is a professor of

NOTE Confidence: 0.95843685

00:00:32.068 --> 00:00:34.291 dermatology and Doctor Saltzman is a

NOTE Confidence: 0.95843685

00:00:34.291 --> 00:00:35.799 professor of biomedical engineering,

NOTE Confidence: 0.95843685

00:00:35.800 --> 00:00:37.308 Cellular and Molecular Physiology
NOTE Confidence: 0.95843685

00:00:37.308 --> 00:00:39.193 and of Chemical Engineering at
NOTE Confidence: 0.95843685

00:00:39.193 --> 00:00:40.940 the Yale School of Medicine,
NOTE Confidence: 0.95843685

00:00:40.940 --> 00:00:42.938 where Doctor Chagpar is a
NOTE Confidence: 0.95843685

00:00:42.938 --> 00:00:44.270 professor of surgical oncology.
NOTE Confidence: 0.9887273

00:00:45.150 --> 00:00:47.467 So maybe we'll start off by having
NOTE Confidence: 0.9887273

00:00:47.467 --> 00:00:50.776 both of you tell us a little bit about
NOTE Confidence: 0.9887273

00:00:50.776 --> 00:00:52.850 yourselves and what you do.
NOTE Confidence: 0.9887273

00:00:52.850 --> 00:00:55.650 Mike, maybe I'll start with you.
NOTE Confidence: 0.9887273

00:00:55.650 --> 00:00:57.534 Sure, I run a research laboratory
NOTE Confidence: 0.9887273

00:00:57.534 --> 00:00:59.973 with a big focus on skin cancer
NOTE Confidence: 0.9887273

00:00:59.973 --> 00:01:02.199 development and strategies to try to
NOTE Confidence: 0.9887273

00:01:02.199 --> 00:01:04.397 prevent skin cancer formation and to treat it.
NOTE Confidence: 0.9887273

00:01:04.400 --> 00:01:06.850 And how about you, Mark?
NOTE Confidence: 0.9887273

00:01:06.850 --> 00:01:09.058 I'm a professor in the
NOTE Confidence: 0.9887273

00:01:09.058 --> 00:01:10.700 Department of Biomedical Engineering.

NOTE Confidence: 0.9887273

00:01:10.700 --> 00:01:12.826 My training is in chemical engineering,

NOTE Confidence: 0.9887273

00:01:12.826 --> 00:01:15.367 but for my research career and my

NOTE Confidence: 0.9887273

00:01:15.370 --> 00:01:16.902 teaching career I've mainly

NOTE Confidence: 0.9887273

00:01:16.902 --> 00:01:19.200 focused on how to apply principles

NOTE Confidence: 0.9887273

00:01:19.263 --> 00:01:20.907 from chemical engineering to

NOTE Confidence: 0.9887273

00:01:20.907 --> 00:01:22.962 make new products for medicine.

NOTE Confidence: 0.9891947

00:01:22.970 --> 00:01:25.525 This is such an

NOTE Confidence: 0.9891947

00:01:25.525 --> 00:01:27.069 unusual marriage and something

NOTE Confidence: 0.9891947

00:01:27.069 --> 00:01:29.673 that I love about academia is that

NOTE Confidence: 0.9891947

00:01:29.673 --> 00:01:32.286 we can take disciplines that are

NOTE Confidence: 0.9891947

00:01:32.286 --> 00:01:34.521 truly disperate on the surface

NOTE Confidence: 0.9891947

00:01:34.521 --> 00:01:36.970 and make them collide and have

NOTE Confidence: 0.9891947

00:01:36.970 --> 00:01:38.570 really fascinating things happen.

00:01:40.570 --> 00:01:43.506 Mike, tell me a little bit more about

NOTE Confidence: 0.9891947

00:01:43.506 --> 00:01:46.639 how your research evolved and

NOTE Confidence: 0.9891947

00:01:46.640 --> 00:01:48.650 how you got to meet Mark?

NOTE Confidence: 0.98948395

00:01:48.650 --> 00:01:51.998 You know we have a really rich

NOTE Confidence: 0.98948395

00:01:51.998 --> 00:01:54.717 environment for exchange of ideas and just

NOTE Confidence: 0.98948395

00:01:54.717 --> 00:01:57.638 a tremendous breadth of faculty that is

NOTE Confidence: 0.98948395

00:01:57.638 --> 00:02:00.302 very welcoming to folks getting together.

NOTE Confidence: 0.98948395

00:02:00.310 --> 00:02:01.842 Discussing how different perspectives

NOTE Confidence: 0.98948395

00:02:01.842 --> 00:02:04.730 and takes on research can be combined.

NOTE Confidence: 0.98948395

00:02:04.730 --> 00:02:07.250 Mark and I have had a

NOTE Confidence: 0.98948395

00:02:07.250 --> 00:02:10.465 chance to see each other at various

NOTE Confidence: 0.98948395

00:02:10.465 --> 00:02:11.965 meetings and conferences here

NOTE Confidence: 0.98948395

00:02:11.970 --> 00:02:14.875 on campus and to

NOTE Confidence: 0.98948395

00:02:14.875 --> 00:02:16.839 have discussions time to time

NOTE Confidence: 0.98948395

00:02:16.840 --> 00:02:18.484 over the years after these meetings

00:02:19.720 --> 00:02:22.924 and then we really hit it off on Mark's

NOTE Confidence: 0.98948395

00:02:22.924 --> 00:02:24.773 technology of using nanoparticles

NOTE Confidence: 0.98948395

00:02:24.773 --> 00:02:27.133 to deliver anti tumor agents.

00:02:28.187 --> 00:02:30.630 And a thought bomb went off in my

NOTE Confidence: 0.98948395

00:02:30.718 --> 00:02:33.278 head regarding all the potential
NOTE Confidence: 0.98948395

00:02:33.278 --> 00:02:36.279 applications in the skin which is
NOTE Confidence: 0.98948395

00:02:36.279 --> 00:02:38.778 so accessible and such a burden on
NOTE Confidence: 0.98948395

00:02:38.778 --> 00:02:41.798 our society in terms of the
NOTE Confidence: 0.98948395

00:02:41.798 --> 00:02:45.184 number of skin cancers and the
NOTE Confidence: 0.98948395

00:02:45.184 --> 00:02:47.399 challenges in controlling these and treating them.
00:02:48.606 --> 00:02:52.345 And so I reached out to Mark after one
NOTE Confidence: 0.98948395

00:02:52.345 --> 00:02:55.697 of his talks and he was very receptive.
NOTE Confidence: 0.98948395

00:02:55.700 --> 00:02:58.584 We had a wonderful meeting and
NOTE Confidence: 0.98948395

00:02:58.584 --> 00:03:00.634 brainstorming session and that was
NOTE Confidence: 0.98948395

00:03:00.634 --> 00:03:02.860 several years ago and we've really
NOTE Confidence: 0.98948395

00:03:02.860 --> 00:03:05.079 grown with our possibilities and directions
00:03:06.490 --> 00:03:08.565 research-wise in putting
NOTE Confidence: 0.98948395

00:03:08.565 --> 00:03:09.810 our heads together.
NOTE Confidence: 0.988194

00:03:09.810 --> 00:03:12.960 Mark tell us a little bit more
NOTE Confidence: 0.988194

00:03:12.960 --> 00:03:16.348 about your research and this drug
NOTE Confidence: 0.988194

00:03:16.348 --> 00:03:19.149 delivery mechanism that you have and

NOTE Confidence: 0.988194

00:03:19.150 --> 00:03:22.069 the talk that spurred everything on?

00:03:23.318 --> 00:03:25.814 I'll start back almost 30 years ago when I first

00:03:28.648 --> 00:03:30.829 got interested in this field,

NOTE Confidence: 0.9861952

00:03:30.830 --> 00:03:32.910 we had discovered that

NOTE Confidence: 0.9861952

00:03:32.910 --> 00:03:34.574 there were some polymers,

NOTE Confidence: 0.9861952

00:03:34.580 --> 00:03:35.828 some polymer materials,

NOTE Confidence: 0.9861952

00:03:35.830 --> 00:03:38.560 plastics that one could implant in the

NOTE Confidence: 0.9861952

00:03:38.560 --> 00:03:42.089 skin or put in contact with human tissues,

NOTE Confidence: 0.9861952

00:03:42.090 --> 00:03:44.170 and they're very inert.

NOTE Confidence: 0.9861952

00:03:44.170 --> 00:03:47.178 And the key discovery was that you could

NOTE Confidence: 0.9861952

00:03:47.178 --> 00:03:50.089 combine these materials with drug molecules.

NOTE Confidence: 0.9861952

00:03:50.090 --> 00:03:52.610 So that you could make such things

NOTE Confidence: 0.9861952

00:03:52.610 --> 00:03:54.411 like implants that you could

NOTE Confidence: 0.9861952

00:03:54.411 --> 00:03:56.577 place in contact with tissues or

NOTE Confidence: 0.9861952

00:03:56.577 --> 00:03:58.774 implant into tissues and they would

NOTE Confidence: 0.9861952

00:03:58.774 --> 00:04:00.519 slowly release the drug molecules

NOTE Confidence: 0.9861952

00:04:00.519 --> 00:04:02.689 that you had embedded into them,
NOTE Confidence: 0.9861952

00:04:02.690 --> 00:04:05.210 and so that really started me on a
NOTE Confidence: 0.9861952

00:04:05.210 --> 00:04:07.900 path to thinking about how you could
NOTE Confidence: 0.9861952

00:04:07.900 --> 00:04:10.250 both expand the range of materials
NOTE Confidence: 0.9861952

00:04:10.250 --> 00:04:12.770 that you could use in this fashion,
NOTE Confidence: 0.9861952

00:04:12.770 --> 00:04:13.850 and more importantly,
NOTE Confidence: 0.9861952

00:04:13.850 --> 00:04:16.010 how you could marry this technology
NOTE Confidence: 0.9861952

00:04:16.010 --> 00:04:17.450 to treat different diseases.
NOTE Confidence: 0.9861952

00:04:17.450 --> 00:04:20.450 And we really focused a lot on cancer
NOTE Confidence: 0.9861952

00:04:20.450 --> 00:04:22.988 because of the potential to create
NOTE Confidence: 0.9861952

00:04:22.988 --> 00:04:25.607 drug delivery systems that would be
NOTE Confidence: 0.9861952

00:04:25.607 --> 00:04:27.737 more effective at treating cancer.
NOTE Confidence: 0.9861952

00:04:27.740 --> 00:04:30.804 But at the same time would be safer
NOTE Confidence: 0.9861952

00:04:30.804 --> 00:04:34.347 and we could use the materials to sort
NOTE Confidence: 0.9861952

00:04:34.347 --> 00:04:38.237 of focus the drug action on the tumor
NOTE Confidence: 0.9861952

00:04:38.237 --> 00:04:41.249 cells rather than on normal tissue.

NOTE Confidence: 0.9861952

00:04:41.250 --> 00:04:44.099 And I think the possibilities for this

NOTE Confidence: 0.9861952

00:04:44.099 --> 00:04:46.278 really expanded about 15 years ago,

NOTE Confidence: 0.9861952

00:04:46.280 --> 00:04:48.210 when we discovered you could

NOTE Confidence: 0.9861952

00:04:48.210 --> 00:04:49.754 make not only implants,

NOTE Confidence: 0.9861952

00:04:49.760 --> 00:04:51.938 but you could make tiny tiny

NOTE Confidence: 0.9861952

00:04:51.938 --> 00:04:53.390 particles of these polymer

NOTE Confidence: 0.9861952

00:04:53.457 --> 00:04:55.567 materials and anti cancer drugs.

NOTE Confidence: 0.9861952

00:04:55.570 --> 00:04:57.868 So we call those nanoparticles because

NOTE Confidence: 0.9861952

00:04:57.868 --> 00:05:00.599 their size is measured in the nanometers.

NOTE Confidence: 0.9861952

00:05:00.600 --> 00:05:01.806 They're very small,

NOTE Confidence: 0.9861952

00:05:01.806 --> 00:05:05.423 so the particles that Mike and I have been

NOTE Confidence: 0.9861952

00:05:05.423 --> 00:05:08.722 using are about the same size as a virus.

NOTE Confidence: 0.9861952

00:05:08.722 --> 00:05:11.528 So because they're so small you can

NOTE Confidence: 0.9861952

00:05:11.530 --> 00:05:13.205 administer them easily in a

NOTE Confidence: 0.9861952

00:05:13.205 --> 00:05:14.545 variety of different settings.

NOTE Confidence: 0.9861952

00:05:14.550 --> 00:05:17.238 You can inject them easily through a needle,

NOTE Confidence: 0.9861952

00:05:17.240 --> 00:05:17.920 for example.

NOTE Confidence: 0.9861952

00:05:17.920 --> 00:05:20.300 Or you could suspend them in a

NOTE Confidence: 0.9861952

00:05:20.300 --> 00:05:22.374 solution and infuse them or apply

NOTE Confidence: 0.9861952

00:05:22.374 --> 00:05:24.753 them topically on the skin so that

NOTE Confidence: 0.9861952

00:05:24.753 --> 00:05:26.993 that gives you a lot of possibilities

NOTE Confidence: 0.9861952

00:05:26.993 --> 00:05:29.095 and thinking about how you're going

NOTE Confidence: 0.9861952

00:05:29.095 --> 00:05:31.572 to match this delivery system to the

NOTE Confidence: 0.9861952

00:05:31.572 --> 00:05:33.172 particular tumor that you're trying

NOTE Confidence: 0.9861952

00:05:33.172 --> 00:05:35.475 to treat and the other thing about

NOTE Confidence: 0.9861952

00:05:35.475 --> 00:05:37.395 being tiny tiny particles is that

NOTE Confidence: 0.9861952

00:05:37.400 --> 00:05:39.416 they're much smaller than tumor cells,

NOTE Confidence: 0.9861952

00:05:39.420 --> 00:05:41.856 and so they can actually enter into

NOTE Confidence: 0.9861952

00:05:41.860 --> 00:05:43.936 tumor cells and once

NOTE Confidence: 0.9861952

00:05:43.936 --> 00:05:45.740 they're in the tumor cell,

NOTE Confidence: 0.9861952

00:05:45.740 --> 00:05:47.858 they'll start releasing slowly their drug,

NOTE Confidence: 0.9861952

00:05:47.860 --> 00:05:49.912 and this allows the drug, the

NOTE Confidence: 0.9861952

00:05:49.912 --> 00:05:52.429 source of the drug, to be released

NOTE Confidence: 0.9861952

00:05:52.429 --> 00:05:54.565 very near its site of action,

NOTE Confidence: 0.9861952

00:05:54.570 --> 00:05:56.760 which for anti-cancer drugs is

NOTE Confidence: 0.9861952

00:05:56.760 --> 00:05:59.160 often in the nucleus of the cell,

NOTE Confidence: 0.9861952

00:05:59.160 --> 00:06:01.379 and so this gives you another level

NOTE Confidence: 0.9861952

00:06:01.379 --> 00:06:03.927 of control or design that you can

NOTE Confidence: 0.9861952

00:06:03.927 --> 00:06:06.219 introduce into the the delivery system

00:06:06.892 --> 00:06:09.244 in order to match them most

NOTE Confidence: 0.9861952

00:06:09.244 --> 00:06:10.738 effectively to treat the particular

NOTE Confidence: 0.9861952

00:06:10.738 --> 00:06:12.563 tumor that you're interested in.

NOTE Confidence: 0.9836517

00:06:12.930 --> 00:06:15.786 And so Mike, tell us more about

NOTE Confidence: 0.9836517

00:06:15.786 --> 00:06:18.199 the thought bomb that you had.

NOTE Confidence: 0.9836517

00:06:18.200 --> 00:06:20.090 You know, it certainly sounds

NOTE Confidence: 0.9836517

00:06:20.090 --> 00:06:21.980 like this technology that Mark

NOTE Confidence: 0.9836517

00:06:22.043 --> 00:06:23.867 has is incredibly innovative,

NOTE Confidence: 0.9836517

00:06:23.870 --> 00:06:26.300 but has so many possible applications.

NOTE Confidence: 0.9836517

00:06:26.300 --> 00:06:29.404 So how did you really think about its

NOTE Confidence: 0.9836517

00:06:29.404 --> 00:06:32.370 utility in terms of skin cancer?

NOTE Confidence: 0.9836517

00:06:32.370 --> 00:06:36.015 I took a broad approach at first.

NOTE Confidence: 0.9836517

00:06:36.020 --> 00:06:38.855 As to the potential applications in the

NOTE Confidence: 0.9836517

00:06:38.855 --> 00:06:41.252 skin topical application, for example,

NOTE Confidence: 0.9836517

00:06:41.252 --> 00:06:43.616 to improve sunscreen performance.

NOTE Confidence: 0.9836517

00:06:43.620 --> 00:06:46.062 Injection into tumors to improve delivery

NOTE Confidence: 0.9836517

00:06:46.062 --> 00:06:48.809 of anti tumor agents to skin cancers,

NOTE Confidence: 0.9836517

00:06:48.810 --> 00:06:51.442 but also about the potential to stimulate

NOTE Confidence: 0.9836517

00:06:51.442 --> 00:06:53.600 the immune system against cancer.

NOTE Confidence: 0.9836517

00:06:53.600 --> 00:06:55.192 How these could facilitate

NOTE Confidence: 0.9836517

00:06:55.192 --> 00:06:56.784 delivery of those agents.

NOTE Confidence: 0.9836517

00:06:56.790 --> 00:07:00.198 Mark and I also talked about the various

NOTE Confidence: 0.9836517

00:07:00.198 --> 00:07:02.332 inflammatory diseases of the skin and

NOTE Confidence: 0.9836517

00:07:02.332 --> 00:07:05.128 how we might use agents that are anti
NOTE Confidence: 0.9836517

00:07:05.128 --> 00:07:07.398 inflammatory and better deliver
NOTE Confidence: 0.9836517

00:07:07.398 --> 00:07:09.604 those agents and increase their performance,
NOTE Confidence: 0.9836517

00:07:09.604 --> 00:07:11.714 increase their safety so they're
NOTE Confidence: 0.9836517

00:07:11.714 --> 00:07:13.391 not necessarily impacting the
NOTE Confidence: 0.9836517

00:07:13.391 --> 00:07:14.459 overall immune system in a negative way.
00:07:16.260 --> 00:07:18.510 and throughout the entire body,
NOTE Confidence: 0.9836517

00:07:18.510 --> 00:07:20.760 so it's about local delivery.
NOTE Confidence: 0.9836517

00:07:20.760 --> 00:07:22.560 It's about increasing drug
NOTE Confidence: 0.9836517

00:07:22.560 --> 00:07:24.810 availability in terms of cancer.
NOTE Confidence: 0.9836517

00:07:24.810 --> 00:07:27.603 We have a huge burden
NOTE Confidence: 0.9836517

00:07:27.603 --> 00:07:29.760 with basal cell carcinoma.
NOTE Confidence: 0.9836517

00:07:29.760 --> 00:07:32.378 These are a huge number of cancers
NOTE Confidence: 0.9836517

00:07:32.378 --> 00:07:35.677 across the the world that outnumber all
NOTE Confidence: 0.9836517

00:07:35.677 --> 00:07:38.302 cancers combined in their occurrence,
NOTE Confidence: 0.9836517

00:07:38.310 --> 00:07:41.460 and often are treated by surgery or
NOTE Confidence: 0.9836517

00:07:41.460 --> 00:07:44.508 multiple surgeries on the same patient.

NOTE Confidence: 0.9836517

00:07:44.510 --> 00:07:46.315 An individual can develop many

NOTE Confidence: 0.9836517

00:07:46.315 --> 00:07:48.666 of these over a lifetime if

NOTE Confidence: 0.9836517

00:07:48.666 --> 00:07:50.558 they are fair skinned and

NOTE Confidence: 0.9836517

00:07:50.560 --> 00:07:52.570 have a lot of sun exposure.

NOTE Confidence: 0.9836517

00:07:52.570 --> 00:07:54.585 There is squamous cell carcinoma which

NOTE Confidence: 0.9836517

00:07:54.585 --> 00:07:56.600 presents another set of problems.

NOTE Confidence: 0.9836517

00:07:56.600 --> 00:07:59.018 They can be numerous as well,

NOTE Confidence: 0.9836517

00:07:59.020 --> 00:08:01.972 but they can also have a small chance

NOTE Confidence: 0.9836517

00:08:01.972 --> 00:08:04.260 of traveling throughout the body.

NOTE Confidence: 0.9836517

00:08:04.260 --> 00:08:07.081 They tend to be deeper as well.

00:08:10.696 --> 00:08:13.270 Melanoma not as common as basal

NOTE Confidence: 0.9836517

00:08:13.270 --> 00:08:15.500 cell and squamous cell carcinoma.

NOTE Confidence: 0.9836517

00:08:15.500 --> 00:08:18.314 But a whole other set of problems si that

NOTE Confidence: 0.9836517

00:08:18.320 --> 00:08:21.947 this is a real killer of young people.

NOTE Confidence: 0.9836517

00:08:21.950 --> 00:08:22.369 Melanoma is

NOTE Confidence: 0.9836517

00:08:22.369 --> 00:08:25.302 something that has a very high risk

NOTE Confidence: 0.9836517

00:08:25.302 --> 00:08:27.334 of metastasis after it obtains

NOTE Confidence: 0.9836517

00:08:27.334 --> 00:08:29.199 a certain level of depth.

NOTE Confidence: 0.9836517

00:08:29.200 --> 00:08:30.190 There are clear,

NOTE Confidence: 0.9836517

00:08:30.190 --> 00:08:32.170 unmet needs in some patients who

NOTE Confidence: 0.9836517

00:08:32.170 --> 00:08:33.964 have intermediate depth Melanoma

NOTE Confidence: 0.9836517

00:08:33.964 --> 00:08:35.832 that has already metastasized

NOTE Confidence: 0.9836517

00:08:35.832 --> 00:08:37.670 to regional lymph nodes.

NOTE Confidence: 0.9836517

00:08:37.670 --> 00:08:40.286 And there are challenges in treating

NOTE Confidence: 0.9836517

00:08:40.286 --> 00:08:42.030 these patients without necessarily

NOTE Confidence: 0.9836517

00:08:42.094 --> 00:08:44.560 giving them something aggressive

NOTE Confidence: 0.9836517

00:08:44.560 --> 00:08:46.204 and systemically delivered.

NOTE Confidence: 0.9836517

00:08:46.210 --> 00:08:48.590 Chemotherapy to the entire body.

NOTE Confidence: 0.9836517

00:08:48.590 --> 00:08:51.872 So all of these potential challenges

NOTE Confidence: 0.9836517

00:08:51.872 --> 00:08:55.285 in the world of skin cancer

NOTE Confidence: 0.9836517

00:08:55.285 --> 00:08:58.065 have areas that could be

NOTE Confidence: 0.9836517

00:08:58.070 --> 00:08:59.698 potentially leveraged with this technology.

NOTE Confidence: 0.9836517

00:08:59.698 --> 00:09:02.140 Mark and I have

NOTE Confidence: 0.9836517

00:09:02.213 --> 00:09:04.698 been really trying to look at all

NOTE Confidence: 0.9836517

00:09:04.698 --> 00:09:06.671 of the possibilities and begin

NOTE Confidence: 0.9836517

00:09:06.671 --> 00:09:08.351 to develop research programs

NOTE Confidence: 0.9836517

00:09:08.351 --> 00:09:10.440 and strategies to address them.

NOTE Confidence: 0.98096687

00:09:10.440 --> 00:09:13.200 Mark, a couple

NOTE Confidence: 0.98096687

00:09:13.200 --> 00:09:15.773 of things that struck me when

NOTE Confidence: 0.98096687

00:09:15.773 --> 00:09:18.018 you were talking about this

NOTE Confidence: 0.98096687

00:09:18.020 --> 00:09:20.678 technology, one is that these

NOTE Confidence: 0.98096687

00:09:20.678 --> 00:09:23.663 nanoparticles are so small that they can

NOTE Confidence: 0.98096687

00:09:23.663 --> 00:09:26.302 actually be engulfed by the tumor

NOTE Confidence: 0.98096687

00:09:26.377 --> 00:09:29.037 cell and have a mechanism of action

NOTE Confidence: 0.98096687

00:09:29.040 --> 00:09:30.512 at their nucleus, essentially,

NOTE Confidence: 0.98096687

00:09:30.512 --> 00:09:31.616 really targeted therapy,

NOTE Confidence: 0.98096687

00:09:31.620 --> 00:09:34.580 delivered to the source of the tumor.
NOTE Confidence: 0.98096687

00:09:34.580 --> 00:09:36.420 But my question there is,
NOTE Confidence: 0.98096687

00:09:36.420 --> 00:09:38.270 how targeted can it be?
NOTE Confidence: 0.98096687

00:09:38.270 --> 00:09:40.825 I mean can you make these
NOTE Confidence: 0.98096687

00:09:40.825 --> 00:09:43.089 nanoparticles such that the tumor cells
NOTE Confidence: 0.98096687

00:09:43.089 --> 00:09:45.644 and only the tumor cells engulf them?
NOTE Confidence: 0.98096687

00:09:45.650 --> 00:09:47.122 How does that work?
NOTE Confidence: 0.98096687

00:09:47.122 --> 00:09:48.594 That's a great question and I think
00:09:51.545 --> 00:09:53.390 there's several different aspects to that.
NOTE Confidence: 0.9840316

00:09:53.390 --> 00:09:56.141 The one that we've been talking about
NOTE Confidence: 0.9840316

00:09:56.141 --> 00:09:59.049 so far and a major
NOTE Confidence: 0.9840316

00:09:59.050 --> 00:10:01.255 one that Mike and I have been
NOTE Confidence: 0.9840316

00:10:01.255 --> 00:10:02.790 exploring is to
NOTE Confidence: 0.9840316

00:10:02.790 --> 00:10:04.560 put the particles as close to
NOTE Confidence: 0.9840316

00:10:04.560 --> 00:10:06.298 the tumor cells as possible.
NOTE Confidence: 0.9840316

00:10:06.300 --> 00:10:08.498 To physically target them,
NOTE Confidence: 0.9840316

00:10:08.500 --> 00:10:10.390 inject them into a tumor,
NOTE Confidence: 0.9840316

00:10:10.390 --> 00:10:11.024 for example.
NOTE Confidence: 0.9840316

00:10:12.926 --> 00:10:14.846 And that's possible with the skin cancers
NOTE Confidence: 0.9840316

00:10:14.846 --> 00:10:16.682 that Mike is mentioning,
NOTE Confidence: 0.9840316

00:10:16.690 --> 00:10:18.380 because they're so accessible,
NOTE Confidence: 0.9840316

00:10:18.380 --> 00:10:20.788 they're on the surface of the skin,
NOTE Confidence: 0.9840316

00:10:20.790 --> 00:10:23.286 at least some of them are
NOTE Confidence: 0.9840316

00:10:23.286 --> 00:10:25.509 exclusively on the surface of the skin,
00:10:26.692 --> 00:10:29.056 and dermatologists are very comfortable with
NOTE Confidence: 0.9840316

00:10:29.060 --> 00:10:30.880 using needles to inject locally
NOTE Confidence: 0.9840316

00:10:30.880 --> 00:10:33.103 in the skin and they're very
NOTE Confidence: 0.9840316

00:10:33.103 --> 00:10:34.758 talented as well,
NOTE Confidence: 0.9840316

00:10:34.760 --> 00:10:36.896 and so that makes a
NOTE Confidence: 0.9840316

00:10:36.896 --> 00:10:38.320 reasonable form of targeting.
NOTE Confidence: 0.9840316

00:10:38.320 --> 00:10:40.808 But you could also make it more
NOTE Confidence: 0.9840316

00:10:40.810 --> 00:10:42.790 targeted and one possible way to
NOTE Confidence: 0.9840316

00:10:42.790 --> 00:10:45.347 make it more targeted is to take
NOTE Confidence: 0.9840316

00:10:45.347 --> 00:10:46.911 the nanoparticles and engineer
NOTE Confidence: 0.9840316

00:10:46.911 --> 00:10:48.639 the surface properties of them.
NOTE Confidence: 0.9840316

00:10:48.640 --> 00:10:51.202 And one of the aspects of the
NOTE Confidence: 0.9840316

00:10:51.202 --> 00:10:52.742 technology that we've exploited
NOTE Confidence: 0.9840316

00:10:52.742 --> 00:10:55.304 in many of the projects that we
NOTE Confidence: 0.9840316

00:10:55.304 --> 00:10:57.540 worked on is to make the particles
NOTE Confidence: 0.9840316

00:10:57.540 --> 00:10:59.450 themselves very sticky to proteins.
NOTE Confidence: 0.9840316

00:10:59.450 --> 00:11:01.676 Or tumor cells that have a lot
NOTE Confidence: 0.9840316

00:11:01.676 --> 00:11:03.689 of proteins on their surface.
NOTE Confidence: 0.9840316

00:11:03.690 --> 00:11:05.940 And so when you inject these
NOTE Confidence: 0.9840316

00:11:05.940 --> 00:11:07.830 sticky particles they will
NOTE Confidence: 0.9840316

00:11:07.830 --> 00:11:10.028 tend to be taken up by whatever
NOTE Confidence: 0.9840316

00:11:10.028 --> 00:11:12.502 cells are near the site where
NOTE Confidence: 0.9840316

00:11:12.502 --> 00:11:14.661 you've placed them and this
NOTE Confidence: 0.9840316

00:11:14.661 --> 00:11:17.328 allows the vast majority of the

NOTE Confidence: 0.9840316

00:11:17.328 --> 00:11:20.038 particles to stay in a tumor if you

NOTE Confidence: 0.9840316

00:11:20.038 --> 00:11:22.400 inject them right into the skin tumor,

NOTE Confidence: 0.9840316

00:11:22.400 --> 00:11:23.052 for example.

NOTE Confidence: 0.9840316

00:11:23.052 --> 00:11:25.334 And so that's one one way to

NOTE Confidence: 0.9840316

00:11:25.334 --> 00:11:27.623 augment the targeting that local

NOTE Confidence: 0.9840316

00:11:27.623 --> 00:11:29.519 delivery naturally provides you.

NOTE Confidence: 0.9840316

00:11:29.520 --> 00:11:31.800 A second way would be to not just

NOTE Confidence: 0.9840316

00:11:31.800 --> 00:11:33.261 use physical properties like

NOTE Confidence: 0.9840316

00:11:33.261 --> 00:11:35.311 stickiness of particles to make

NOTE Confidence: 0.9840316

00:11:35.311 --> 00:11:37.350 them attractive to tumor cells,

NOTE Confidence: 0.9840316

00:11:37.350 --> 00:11:39.130 but to make them specifically

NOTE Confidence: 0.9840316

00:11:39.130 --> 00:11:40.554 adhesive to tumor cells.

NOTE Confidence: 0.9840316

00:11:40.560 --> 00:11:41.684 So in that case,

NOTE Confidence: 0.9840316

00:11:41.684 --> 00:11:44.526 if you knew that there was

NOTE Confidence: 0.9840316

00:11:44.526 --> 00:11:47.046 a protein on the tumor cell surface

NOTE Confidence: 0.9840316

00:11:47.127 --> 00:11:49.593 that was expressed very abundantly in
NOTE Confidence: 0.9840316

00:11:49.593 --> 00:11:52.624 the tumor cells and not in normal cells,
NOTE Confidence: 0.9840316

00:11:52.624 --> 00:11:54.354 you could put some chemicals
NOTE Confidence: 0.9840316

00:11:54.354 --> 00:11:56.922 that bind to that protein on the
NOTE Confidence: 0.9840316

00:11:56.922 --> 00:11:58.358 surface of the nanoparticle.
NOTE Confidence: 0.9840316

00:11:58.360 --> 00:12:00.556 So this might be an antibody.
NOTE Confidence: 0.9840316

00:12:00.560 --> 00:12:03.395 Or an antibody fragment that
NOTE Confidence: 0.9840316

00:12:03.395 --> 00:12:06.043 is specific for that protein that's
NOTE Confidence: 0.9840316

00:12:06.043 --> 00:12:08.743 highly enriched on the tumor cell.
NOTE Confidence: 0.9840316

00:12:08.750 --> 00:12:11.336 Then that gives you an additional
NOTE Confidence: 0.9840316

00:12:11.336 --> 00:12:12.630 level of targeting.
NOTE Confidence: 0.9840316

00:12:12.630 --> 00:12:17.928 And it's even possible to think about
NOTE Confidence: 0.9840316

00:12:17.930 --> 00:12:20.114 administering those highly
NOTE Confidence: 0.9840316

00:12:20.114 --> 00:12:22.298 targeted particles systemically and
NOTE Confidence: 0.9840316

00:12:22.298 --> 00:12:25.019 and asking them to find the tumor
NOTE Confidence: 0.9840316

00:12:25.019 --> 00:12:27.406 for you instead of you using the

NOTE Confidence: 0.9840316

00:12:27.406 --> 00:12:29.686 needle to find the tumor yourself.

NOTE Confidence: 0.9840316

00:12:29.690 --> 00:12:33.362 And that's been a very active area of

NOTE Confidence: 0.9840316

00:12:33.362 --> 00:12:37.243 study over the past 10 to 15 years or so,

NOTE Confidence: 0.9840316

00:12:37.250 --> 00:12:40.869 and it turns out to be

NOTE Confidence: 0.9840316

00:12:40.870 --> 00:12:42.575 hard to achieve practically for

NOTE Confidence: 0.9840316

00:12:42.575 --> 00:12:44.280 reasons that we could discuss.

NOTE Confidence: 0.9840316

00:12:44.280 --> 00:12:46.667 But it's also a method of targeting.

NOTE Confidence: 0.9874533399999999

00:12:46.670 --> 00:12:48.542 I would like

NOTE Confidence: 0.9874533399999999

00:12:48.542 --> 00:12:50.967 to get into how exactly we target

NOTE Confidence: 0.9874533399999999

00:12:50.967 --> 00:12:53.187 things and what are the challenges

NOTE Confidence: 0.9874533399999999

00:12:53.187 --> 00:12:55.189 that are being faced in this

NOTE Confidence: 0.9874533399999999

00:12:55.190 --> 00:12:56.900 really exciting area, but first

NOTE Confidence: 0.9874533399999999

00:12:56.900 --> 00:12:59.393 we need to take a short break

NOTE Confidence: 0.9874533399999999

00:12:59.393 --> 00:13:01.749 for a medical minute, so please stay

NOTE Confidence: 0.9874533399999999

00:13:01.749 --> 00:13:03.981 tuned to learn more about nanoparticles

NOTE Confidence: 0.9874533399999999

00:13:03.981 --> 00:13:06.447 and skin tumors with my guests

NOTE Confidence: 0.987453339999999

00:13:06.450 --> 00:13:07.130 Doctor Michael Girardi and

00:13:08.490 --> 00:13:09.170 Doctor Mark Saltzman.

NOTE Confidence: 0.88316566

00:13:09.850 --> 00:13:12.445 Funding for Yale Cancer Answers

NOTE Confidence: 0.88316566

00:13:12.445 --> 00:13:15.536 comes from AstraZeneca, working to

NOTE Confidence: 0.88316566

00:13:15.536 --> 00:13:18.420 eliminate cancer as a cause of death.

NOTE Confidence: 0.88316566

00:13:18.420 --> 00:13:22.188 Learn more at astrazeneca-us.com.

NOTE Confidence: 0.88316566

00:13:22.190 --> 00:13:24.340 Over 230,000 Americans will be

NOTE Confidence: 0.88316566

00:13:24.340 --> 00:13:26.490 diagnosed with lung cancer this

NOTE Confidence: 0.88316566

00:13:26.565 --> 00:13:28.405 year and in Connecticut alone

NOTE Confidence: 0.88316566

00:13:28.405 --> 00:13:31.010 there will be over 2700 new cases.

NOTE Confidence: 0.88316566

00:13:31.010 --> 00:13:33.170 More than 85% of lung cancer

NOTE Confidence: 0.88316566

00:13:33.170 --> 00:13:35.553 diagnosis are related to smoking and

NOTE Confidence: 0.88316566

00:13:35.553 --> 00:13:38.163 quitting even after decades of use

NOTE Confidence: 0.88316566

00:13:38.163 --> 00:13:40.282 can significantly reduce your risk

NOTE Confidence: 0.88316566

00:13:40.282 --> 00:13:42.640 of developing lung cancer. Each day,

NOTE Confidence: 0.88316566

00:13:42.640 --> 00:13:44.950 patients with lung cancer are surviving
NOTE Confidence: 0.88316566

00:13:44.950 --> 00:13:47.386 thanks to increased access to advanced
NOTE Confidence: 0.88316566

00:13:47.386 --> 00:13:49.058 therapies and specialized care,
NOTE Confidence: 0.88316566

00:13:49.060 --> 00:13:51.005 new treatment options and surgical
NOTE Confidence: 0.88316566

00:13:51.005 --> 00:13:53.590 techniques are giving lung cancer survivors
NOTE Confidence: 0.88316566

00:13:53.590 --> 00:13:56.766 more hope than they have ever had before.
NOTE Confidence: 0.88316566

00:13:56.770 --> 00:13:58.350 Clinical trials are currently
NOTE Confidence: 0.88316566

00:13:58.350 --> 00:13:59.930 underway at federally designated
NOTE Confidence: 0.88316566

00:13:59.930 --> 00:14:01.150 Comprehensive cancer centers,
NOTE Confidence: 0.88316566

00:14:01.150 --> 00:14:03.740 such as the BATTLE II trial at
NOTE Confidence: 0.88316566

00:14:03.740 --> 00:14:05.644 Yale Cancer Center and Smilow
NOTE Confidence: 0.88316566

00:14:05.644 --> 00:14:08.136 Cancer Hospital to learn if a drug
NOTE Confidence: 0.88316566

00:14:08.136 --> 00:14:10.826 or combination of drugs based on
NOTE Confidence: 0.88316566

00:14:10.826 --> 00:14:13.086 personal biomarkers can help to
NOTE Confidence: 0.88316566

00:14:13.090 --> 00:14:15.478 control non small cell lung cancer.
NOTE Confidence: 0.88316566

00:14:15.480 --> 00:14:17.530 More information is available at

NOTE Confidence: 0.88316566

00:14:17.530 --> 00:14:18.760 yalecancercenter.org. You're listening

NOTE Confidence: 0.88316566

00:14:18.760 --> 00:14:20.260 to Connecticut Public Radio.

NOTE Confidence: 0.9704669

00:14:21.320 --> 00:14:23.816 Welcome back to Yale Cancer Answers.

NOTE Confidence: 0.9704669

00:14:23.820 --> 00:14:26.664 This is Doctor Anees Chagpar

NOTE Confidence: 0.9704669

00:14:26.664 --> 00:14:29.338 and I'm joined tonight by my guest doctor

NOTE Confidence: 0.9704669

00:14:29.338 --> 00:14:32.140 Michael Girardi and Doctor Mark Saltzman.

NOTE Confidence: 0.9704669

00:14:32.140 --> 00:14:34.580 We're talking about research looking

NOTE Confidence: 0.9704669

00:14:34.580 --> 00:14:37.020 into using nanoparticles to treat

NOTE Confidence: 0.9704669

00:14:37.090 --> 00:14:39.346 skin tumors and right before the

NOTE Confidence: 0.9704669

00:14:39.346 --> 00:14:42.032 break we were talking about how these

NOTE Confidence: 0.9704669

00:14:42.032 --> 00:14:44.615 nanoparticles are so small and how we

NOTE Confidence: 0.9704669

00:14:44.620 --> 00:14:47.399 can try to make them really attack

NOTE Confidence: 0.9704669

00:14:47.399 --> 00:14:50.020 tumor cells rather than normal cells.

NOTE Confidence: 0.9704669

00:14:50.020 --> 00:14:52.720 So Mike, Mark was

NOTE Confidence: 0.9704669

00:14:52.720 --> 00:14:55.170 talking about how

NOTE Confidence: 0.9704669

00:14:55.170 --> 00:14:57.860 we can make nanoparticles sticky.
NOTE Confidence: 0.9704669

00:14:57.860 --> 00:15:00.748 We can try to get them in an
NOTE Confidence: 0.9704669

00:15:00.748 --> 00:15:03.418 area where these cancers exist.
NOTE Confidence: 0.9704669

00:15:03.420 --> 00:15:07.263 What have you explored in terms of
NOTE Confidence: 0.9704669

00:15:07.270 --> 00:15:10.694 trying to treat these skin cancers?
00:15:11.139 --> 00:15:13.773 What are the exciting
NOTE Confidence: 0.9704669

00:15:13.773 --> 00:15:15.400 developments and where are
NOTE Confidence: 0.9880927

00:15:15.400 --> 00:15:17.112 we with this research?
NOTE Confidence: 0.9880927

00:15:17.112 --> 00:15:20.111 So I think there's several features that
NOTE Confidence: 0.9880927

00:15:20.111 --> 00:15:22.657 we're really leveraging about the sticky
NOTE Confidence: 0.9880927

00:15:22.657 --> 00:15:25.590 type particles and these will bind to proteins.
NOTE Confidence: 0.9880927

00:15:25.590 --> 00:15:28.008 Any proteins they come in contact
NOTE Confidence: 0.9880927

00:15:28.008 --> 00:15:30.429 with but what's really special about the
NOTE Confidence: 0.9880927

00:15:30.430 --> 00:15:32.550 tumor microenvironment is that it's
NOTE Confidence: 0.9880927

00:15:32.550 --> 00:15:35.099 very protein rich tumor cells secrete
NOTE Confidence: 0.9880927

00:15:35.099 --> 00:15:37.277 a lot of proteins.
NOTE Confidence: 0.9880927

00:15:37.280 --> 00:15:39.290 They create their own matrix.
NOTE Confidence: 0.9880927

00:15:39.290 --> 00:15:41.310 This is helpful for them.
NOTE Confidence: 0.9880927

00:15:41.310 --> 00:15:44.874 We think they perceive it as such so they
NOTE Confidence: 0.9880927

00:15:44.874 --> 00:15:48.969 can grow so they can begin to want to travel
NOTE Confidence: 0.9880927

00:15:48.970 --> 00:15:52.186 if we personify the tumor cells that way,
NOTE Confidence: 0.9880927

00:15:52.190 --> 00:15:54.062 and so these particles
NOTE Confidence: 0.9880927

00:15:54.062 --> 00:15:57.803 will bind to both tumor matrix proteins and
NOTE Confidence: 0.9880927

00:15:57.803 --> 00:16:01.230 bind to the surface of the tumor cells,
NOTE Confidence: 0.9880927

00:16:01.230 --> 00:16:03.738 so this really not only gets
NOTE Confidence: 0.9880927

00:16:03.738 --> 00:16:06.570 the drugs into the tumor cells,
NOTE Confidence: 0.9880927

00:16:06.570 --> 00:16:09.174 but creates anti-tumor
NOTE Confidence: 0.9880927

00:16:09.174 --> 00:16:11.470 agents all around the tumor.
NOTE Confidence: 0.9880927

00:16:11.470 --> 00:16:14.445 We think this is really important for
NOTE Confidence: 0.9880927

00:16:14.445 --> 00:16:17.699 trying to target and eliminate the tumor.
NOTE Confidence: 0.9880927

00:16:17.700 --> 00:16:20.202 We also have worked on strategies
NOTE Confidence: 0.9880927

00:16:20.202 --> 00:16:22.994 and how we deliver these tiny

NOTE Confidence: 0.9880927
00:16:22.994 --> 00:16:25.078 particles beyond the simple
NOTE Confidence: 0.9880927
00:16:25.080 --> 00:16:26.728 syringe and needle strategy,
NOTE Confidence: 0.9880927
00:16:26.728 --> 00:16:28.376 which is actually quite
NOTE Confidence: 0.9880927
00:16:28.376 --> 00:16:30.159 effective in and of itself.
NOTE Confidence: 0.9880927
00:16:30.160 --> 00:16:32.506 But for certain tumors,
NOTE Confidence: 0.9880927
00:16:32.510 --> 00:16:33.254 for example,
NOTE Confidence: 0.9880927
00:16:33.254 --> 00:16:35.114 ones that are more broad
NOTE Confidence: 0.9880927
00:16:35.114 --> 00:16:37.199 but thin and shallow,
NOTE Confidence: 0.9880927
00:16:37.200 --> 00:16:39.155 they can create surgical challenges
NOTE Confidence: 0.9880927
00:16:39.155 --> 00:16:42.714 to cut out a large piece of skin when
NOTE Confidence: 0.9880927
00:16:42.714 --> 00:16:45.012 something is really not that deep.
NOTE Confidence: 0.9880927
00:16:45.020 --> 00:16:47.533 That lets us wonder if there is a
NOTE Confidence: 0.9880927
00:16:47.533 --> 00:16:49.710 way to deliver these agents,
NOTE Confidence: 0.9880927
00:16:49.710 --> 00:16:52.056 for example over a larger area,
NOTE Confidence: 0.9880927
00:16:52.060 --> 00:16:56.300 but not as deep and so Mark and I have
NOTE Confidence: 0.9880927

00:16:56.300 --> 00:16:58.260 explored strategies using what's called

NOTE Confidence: 0.9880927

00:16:58.260 --> 00:17:00.560 micro needling or micro needle pads,

NOTE Confidence: 0.9880927

00:17:00.560 --> 00:17:02.495 and so the particles might

NOTE Confidence: 0.9880927

00:17:02.495 --> 00:17:04.430 be loaded into these hollow

NOTE Confidence: 0.9880927

00:17:04.430 --> 00:17:07.118 very tiny needles and in

NOTE Confidence: 0.9880927

00:17:07.118 --> 00:17:10.116 many cases they can be made to be

NOTE Confidence: 0.9880927

00:17:10.116 --> 00:17:12.372 painless because they just don't

NOTE Confidence: 0.9880927

00:17:12.372 --> 00:17:15.221 get to the depth where they're going

NOTE Confidence: 0.9880927

00:17:15.221 --> 00:17:17.500 to trigger the nerve endings and

NOTE Confidence: 0.9880927

00:17:17.500 --> 00:17:20.165 these pads could be applied and the

NOTE Confidence: 0.9880927

00:17:20.165 --> 00:17:22.993 particles can be delivered in that fashion.

NOTE Confidence: 0.9880927

00:17:23.000 --> 00:17:25.280 We've also looked at strategies where

NOTE Confidence: 0.9880927

00:17:25.280 --> 00:17:27.380 we've accelerated fluid that contains

NOTE Confidence: 0.9880927

00:17:27.380 --> 00:17:28.248 the nanoparticles

NOTE Confidence: 0.9880927

00:17:28.248 --> 00:17:31.720 in a way that can push them with

NOTE Confidence: 0.9880927

00:17:31.805 --> 00:17:34.559 a high pressure system through the

NOTE Confidence: 0.9880927

00:17:34.559 --> 00:17:37.872 surface of the skin into a tumor

NOTE Confidence: 0.9880927

00:17:37.872 --> 00:17:39.720 and the surrounding area.

NOTE Confidence: 0.9880927

00:17:39.720 --> 00:17:43.376 Kind of like a high pressure micro waterjet,

NOTE Confidence: 0.9880927

00:17:43.380 --> 00:17:46.355 so we're really looking at ways that

NOTE Confidence: 0.9880927

00:17:46.355 --> 00:17:49.089 we can empower health care providers

NOTE Confidence: 0.9880927

00:17:49.089 --> 00:17:52.295 to be able to use this technology

NOTE Confidence: 0.9880927

00:17:52.383 --> 00:17:54.798 to best serve their patients.

NOTE Confidence: 0.9880927

00:17:54.800 --> 00:17:57.968 But in a number of different

NOTE Confidence: 0.9880927

00:17:57.970 --> 00:18:00.170 tumor settings, different tumor types,

NOTE Confidence: 0.9880927

00:18:00.170 --> 00:18:01.484 different tumor sizes,

NOTE Confidence: 0.9880927

00:18:01.484 --> 00:18:03.236 and different tumor depths.

NOTE Confidence: 0.9880927

00:18:03.240 --> 00:18:03.680 That's

NOTE Confidence: 0.9852848

00:18:03.680 --> 00:18:06.572 really interesting, and I guess the

NOTE Confidence: 0.9852848

00:18:06.572 --> 00:18:09.820 other way to do this is,

NOTE Confidence: 0.9852848

00:18:09.820 --> 00:18:12.900 as you both were talking about earlier,

NOTE Confidence: 0.9852848

00:18:12.900 --> 00:18:14.696 was injecting this systemically.
NOTE Confidence: 0.9852848

00:18:14.696 --> 00:18:18.297 So I would think intravenously to try and
NOTE Confidence: 0.9852848

00:18:18.297 --> 00:18:20.799 hone these nanoparticles to their target
NOTE Confidence: 0.9852848

00:18:20.800 --> 00:18:23.428 whether it's an
NOTE Confidence: 0.9852848

00:18:23.428 --> 00:18:26.241 antibody or other mechanism to
NOTE Confidence: 0.9852848

00:18:26.241 --> 00:18:29.133 try to find these cancer cells
NOTE Confidence: 0.9852848

00:18:29.140 --> 00:18:31.170 and target them that way.
NOTE Confidence: 0.9852848

00:18:31.170 --> 00:18:33.190 Mark, you know another concept
NOTE Confidence: 0.9852848

00:18:33.190 --> 00:18:34.806 that you had mentioned,
NOTE Confidence: 0.9852848

00:18:34.810 --> 00:18:37.770 or I think Mike had mentioned before the
NOTE Confidence: 0.9852848

00:18:37.770 --> 00:18:40.268 break was using nanoparticles to kind
NOTE Confidence: 0.9852848

00:18:40.268 --> 00:18:43.320 of prime the immune system.
NOTE Confidence: 0.9852848

00:18:43.320 --> 00:18:46.020 Often on this show we're talking about
NOTE Confidence: 0.9852848

00:18:46.020 --> 00:18:48.759 immunotherapy and the fact that these
NOTE Confidence: 0.9852848

00:18:48.759 --> 00:18:51.748 cancers kind of evade the immune system
NOTE Confidence: 0.9852848

00:18:51.748 --> 00:18:54.821 whose job it is really to get rid of

NOTE Confidence: 0.9852848

00:18:54.821 --> 00:18:57.900 things that we don't want in our body,

NOTE Confidence: 0.9852848

00:18:57.900 --> 00:18:59.229 whether it's infections,

NOTE Confidence: 0.9852848

00:18:59.229 --> 00:19:01.887 or whether it's tumor cells.

NOTE Confidence: 0.9852848

00:19:01.887 --> 00:19:04.489 Tell us a little bit more about

NOTE Confidence: 0.9852848

00:19:04.489 --> 00:19:06.482 how you can engineer nanoparticles

NOTE Confidence: 0.9852848

00:19:06.482 --> 00:19:09.127 to trigger the immune system,

NOTE Confidence: 0.9852848

00:19:09.130 --> 00:19:12.147 and how that's working in treating cancer?

NOTE Confidence: 0.93299675

00:19:13.890 --> 00:19:15.606 I'd be happy

NOTE Confidence: 0.93299675

00:19:15.606 --> 00:19:16.750 to start addressing that,

NOTE Confidence: 0.93299675

00:19:16.750 --> 00:19:19.315 but Mike is really the expert on that part,

NOTE Confidence: 0.93299675

00:19:19.320 --> 00:19:21.552 but so I'll talk about the parts that

NOTE Confidence: 0.93299675

00:19:21.552 --> 00:19:23.899 I know and maybe he can follow up.

00:19:26.190 --> 00:19:27.936 One of the interesting things about some

NOTE Confidence: 0.93299675

00:19:27.936 --> 00:19:30.532 of the cells of the immune system is

NOTE Confidence: 0.93299675

00:19:30.532 --> 00:19:32.242 that their naturally phagocytic

NOTE Confidence: 0.93299675

00:19:32.250 --> 00:19:35.028 and part of their job is to take up

NOTE Confidence: 0.93299675
00:19:38.070 --> 00:19:39.478 particles from the environment
NOTE Confidence: 0.93299675
00:19:39.478 --> 00:19:41.985 and to sample them to look for
NOTE Confidence: 0.93299675
00:19:41.985 --> 00:19:43.317 danger signals,
NOTE Confidence: 0.93299675
00:19:43.320 --> 00:19:44.528 and so you can
NOTE Confidence: 0.93299675
00:19:44.528 --> 00:19:46.340 exploit those cells by
NOTE Confidence: 0.93299675
00:19:46.411 --> 00:19:48.351 creating nanoparticles that look
NOTE Confidence: 0.93299675
00:19:48.351 --> 00:19:50.703 like the natural kinds of things
NOTE Confidence: 0.93299675
00:19:50.703 --> 00:19:53.118 that they would take up and ingest.
NOTE Confidence: 0.93299675
00:19:53.120 --> 00:19:55.129 And you can do that by controlling
NOTE Confidence: 0.93299675
00:19:55.129 --> 00:19:57.406 the size of the particle and by
NOTE Confidence: 0.93299675
00:19:57.406 --> 00:19:59.428 controlling its surface to make it
NOTE Confidence: 0.93299675
00:19:59.495 --> 00:20:01.967 most attractive to those
NOTE Confidence: 0.93299675
00:20:01.967 --> 00:20:04.012 macrophages or antigen presenting cells.
NOTE Confidence: 0.93299675
00:20:04.012 --> 00:20:05.188 But in addition,
NOTE Confidence: 0.93299675
00:20:05.188 --> 00:20:07.148 you could further
NOTE Confidence: 0.93299675

00:20:07.148 --> 00:20:09.068 augment the activity of those
NOTE Confidence: 0.93299675

00:20:09.070 --> 00:20:11.744 particles by putting in the kind
NOTE Confidence: 0.93299675

00:20:11.744 --> 00:20:14.160 of danger signals that they might
NOTE Confidence: 0.93299675

00:20:14.160 --> 00:20:16.542 find from a microorganism and that
NOTE Confidence: 0.93299675

00:20:16.542 --> 00:20:19.247 revs up their their immune activity.
NOTE Confidence: 0.93299675

00:20:19.250 --> 00:20:21.686 And so we've been exploring that
NOTE Confidence: 0.93299675

00:20:21.686 --> 00:20:24.001 and also exploring the idea
NOTE Confidence: 0.93299675

00:20:24.001 --> 00:20:27.406 that you could present these
NOTE Confidence: 0.93299675

00:20:27.410 --> 00:20:29.290 signals to immune cells
NOTE Confidence: 0.93299675

00:20:29.290 --> 00:20:31.590 in a variety of different ways,
NOTE Confidence: 0.93299675

00:20:31.590 --> 00:20:33.490 either by slowly releasing them,
NOTE Confidence: 0.93299675

00:20:33.490 --> 00:20:35.836 the concept we talked about before,
NOTE Confidence: 0.93299675

00:20:35.836 --> 00:20:38.245 or by presenting them in different
NOTE Confidence: 0.93299675

00:20:38.245 --> 00:20:40.549 fashions on the surface or the
NOTE Confidence: 0.93299675

00:20:40.549 --> 00:20:42.789 interior of the particle and looking
NOTE Confidence: 0.93299675

00:20:42.789 --> 00:20:45.628 to see if by changing the way that

NOTE Confidence: 0.93299675

00:20:45.628 --> 00:20:47.842 the particle is engineered with these

NOTE Confidence: 0.93299675

00:20:47.842 --> 00:20:50.587 signals for the immune system,

NOTE Confidence: 0.93299675

00:20:50.590 --> 00:20:51.682 if that changes

NOTE Confidence: 0.93299675

00:20:51.682 --> 00:20:54.230 the speed or the aggressiveness

NOTE Confidence: 0.93299675

00:20:54.303 --> 00:20:56.253 that you can introduce into

NOTE Confidence: 0.93299675

00:20:56.253 --> 00:20:57.423 the immune response.

NOTE Confidence: 0.97866803

00:20:58.690 --> 00:21:01.000 So Mike, do you want to

NOTE Confidence: 0.97866803

00:21:01.000 --> 00:21:03.430 kind of pick up on that?

NOTE Confidence: 0.97866803

00:21:03.430 --> 00:21:05.692 I mean, oftentimes when we're thinking

NOTE Confidence: 0.97866803

00:21:05.692 --> 00:21:07.780 about generating an immune response,

NOTE Confidence: 0.97866803

00:21:07.780 --> 00:21:10.150 we kind of talked about

NOTE Confidence: 0.97866803

00:21:10.150 --> 00:21:11.730 two kinds of systems.

00:21:13.206 --> 00:21:16.070 One that's a more generalized immune response,

NOTE Confidence: 0.97866803

00:21:16.070 --> 00:21:17.745 and one that's more targeted.

NOTE Confidence: 0.97866803

00:21:17.745 --> 00:21:20.274 Talk a little bit about how you

NOTE Confidence: 0.97866803

00:21:20.274 --> 00:21:21.453 envision nanoparticles really

NOTE Confidence: 0.97866803

00:21:21.453 --> 00:21:24.002 working in terms of the immune

NOTE Confidence: 0.97866803

00:21:24.002 --> 00:21:25.550 response against cancers.

NOTE Confidence: 0.98842096

00:21:26.510 --> 00:21:29.604 Yeah, I think it's a critical question.

NOTE Confidence: 0.98842096

00:21:29.610 --> 00:21:32.592 I think that cancer therapy today is

NOTE Confidence: 0.98842096

00:21:32.592 --> 00:21:35.016 about targeting the tumor and

NOTE Confidence: 0.98842096

00:21:35.016 --> 00:21:37.287 it's about manipulating the immune

NOTE Confidence: 0.98842096

00:21:37.287 --> 00:21:39.969 system to to maximize the effects

NOTE Confidence: 0.98842096

00:21:40.045 --> 00:21:42.460 of the tumor targeting strategies.

NOTE Confidence: 0.98842096

00:21:42.460 --> 00:21:45.112 No cancer therapy can ignore today

NOTE Confidence: 0.98842096

00:21:45.112 --> 00:21:48.048 what's going on with the immune system.

NOTE Confidence: 0.98842096

00:21:48.048 --> 00:21:50.364 It's too powerful an ally in

NOTE Confidence: 0.98842096

00:21:50.364 --> 00:21:53.320 the fight against the cancer and

NOTE Confidence: 0.98842096

00:21:53.320 --> 00:21:55.308 there's obstacles to overcome,

NOTE Confidence: 0.98842096

00:21:55.310 --> 00:21:57.822 so let me explain.

NOTE Confidence: 0.98842096

00:21:57.822 --> 00:22:01.590 That first dichotomy is

NOTE Confidence: 0.98842096

00:22:01.590 --> 00:22:04.602 that we have evolved to recognize
NOTE Confidence: 0.98842096

00:22:04.602 --> 00:22:05.606 foreign substances,
NOTE Confidence: 0.98842096

00:22:05.610 --> 00:22:08.646 including antigens on tumor cells
NOTE Confidence: 0.98842096

00:22:08.646 --> 00:22:12.226 and we can stimulate the heck out
NOTE Confidence: 0.98842096

00:22:12.226 --> 00:22:14.666 of that process through agents,
NOTE Confidence: 0.98842096

00:22:14.670 --> 00:22:17.730 as Mark has described, that might
NOTE Confidence: 0.98842096

00:22:17.730 --> 00:22:19.770 be considered dangerous signals,
NOTE Confidence: 0.98842096

00:22:19.851 --> 00:22:22.719 molecules that might be for example,
NOTE Confidence: 0.98842096

00:22:22.720 --> 00:22:25.230 normally found on infectious agents,
NOTE Confidence: 0.98842096

00:22:25.230 --> 00:22:28.236 molecules that might be produced by
NOTE Confidence: 0.98842096

00:22:28.236 --> 00:22:31.918 our own cells when they have sensed
NOTE Confidence: 0.98842096

00:22:31.920 --> 00:22:34.140 that they are infected, for example.
NOTE Confidence: 0.98842096

00:22:34.140 --> 00:22:36.868 We can begin to try to trick
NOTE Confidence: 0.98842096

00:22:36.868 --> 00:22:38.210 the immune system
NOTE Confidence: 0.98842096

00:22:38.210 --> 00:22:40.380 in looking at the cancer cells in
NOTE Confidence: 0.98842096

00:22:40.380 --> 00:22:43.491 a way that makes them appear as if

NOTE Confidence: 0.98842096

00:22:43.491 --> 00:22:45.601 they're a foreign infection,

NOTE Confidence: 0.98842096

00:22:45.610 --> 00:22:47.460 whether that be viral resemblance

NOTE Confidence: 0.98842096

00:22:47.460 --> 00:22:49.310 or bacterial resemblance or others.

NOTE Confidence: 0.98842096

00:22:49.310 --> 00:22:52.640 And we can do that in a general way,

NOTE Confidence: 0.98842096

00:22:52.640 --> 00:22:55.405 and so those are common molecules that

NOTE Confidence: 0.98842096

00:22:55.405 --> 00:22:57.820 are found on a bunch of microorganisms,

NOTE Confidence: 0.98842096

00:22:57.820 --> 00:23:00.450 so we can just introduce those types

NOTE Confidence: 0.98842096

00:23:00.450 --> 00:23:02.350 of compounds into the nanoparticles.

NOTE Confidence: 0.98842096

00:23:02.350 --> 00:23:04.690 Then we can try to facilitate

NOTE Confidence: 0.98842096

00:23:04.690 --> 00:23:07.175 how they're seen by the immune

NOTE Confidence: 0.98842096

00:23:07.175 --> 00:23:09.683 system in a more optimized way.

NOTE Confidence: 0.98842096

00:23:09.690 --> 00:23:11.730 In a more specific way,

NOTE Confidence: 0.98842096

00:23:11.730 --> 00:23:14.178 we might try to load what

NOTE Confidence: 0.98842096

00:23:14.178 --> 00:23:15.810 are called tumor antigens,

NOTE Confidence: 0.98842096

00:23:15.810 --> 00:23:18.228 so these might be real signatures

NOTE Confidence: 0.98842096

00:23:18.228 --> 00:23:20.709 on very specific types of cancers,
NOTE Confidence: 0.98842096

00:23:20.710 --> 00:23:23.152 and they may be even specific
NOTE Confidence: 0.98842096

00:23:23.152 --> 00:23:24.373 to each patient.
NOTE Confidence: 0.98842096

00:23:24.380 --> 00:23:25.565 In this way,
NOTE Confidence: 0.98842096

00:23:25.565 --> 00:23:27.935 we're trying to stimulate a very
NOTE Confidence: 0.98842096

00:23:27.935 --> 00:23:30.090 directed killer T cell response.
NOTE Confidence: 0.98842096

00:23:30.090 --> 00:23:33.036 That's akin to a vaccine, for example.
NOTE Confidence: 0.98842096

00:23:33.036 --> 00:23:36.207 That you know is being discussed
NOTE Confidence: 0.98842096

00:23:36.207 --> 00:23:39.595 these days for a bunch of other reasons,
NOTE Confidence: 0.98842096

00:23:39.600 --> 00:23:42.680 and so we can use nanoparticles to
NOTE Confidence: 0.98842096

00:23:42.680 --> 00:23:45.321 develop anti tumor vaccines that
NOTE Confidence: 0.98842096

00:23:45.321 --> 00:23:47.793 could more specifically stimulate
NOTE Confidence: 0.98842096

00:23:47.793 --> 00:23:49.647 the immune system
00:23:53.000 --> 00:23:54.908 to attack the cancer.
NOTE Confidence: 0.98772454

00:23:57.240 --> 00:23:59.210 And on another consideration though,
NOTE Confidence: 0.98772454

00:23:59.210 --> 00:24:02.138 we have to realize that tumors evolve and
NOTE Confidence: 0.98772454

00:24:02.138 --> 00:24:05.486 grow to try to suppress the immune system.

NOTE Confidence: 0.98772454

00:24:05.490 --> 00:24:07.848 And this is a major major

NOTE Confidence: 0.98772454

00:24:07.848 --> 00:24:09.420 consideration in treating cancer,

NOTE Confidence: 0.98772454

00:24:09.420 --> 00:24:11.390 immune checkpoint inhibitors or something,

NOTE Confidence: 0.98772454

00:24:11.390 --> 00:24:13.435 for example, that are delivered

NOTE Confidence: 0.98772454

00:24:13.435 --> 00:24:16.320 throughout the body to try to alleviate

NOTE Confidence: 0.98772454

00:24:16.320 --> 00:24:18.606 some of these controls that the

NOTE Confidence: 0.98772454

00:24:18.606 --> 00:24:21.209 tumor has put on the immune system.

NOTE Confidence: 0.98772454

00:24:21.210 --> 00:24:24.052 But we can also try to target

NOTE Confidence: 0.98772454

00:24:24.052 --> 00:24:25.970 that with nanoparticles locally.

NOTE Confidence: 0.98772454

00:24:25.970 --> 00:24:28.802 So for example, there are immune cells that

NOTE Confidence: 0.98772454

00:24:28.802 --> 00:24:31.790 try to suppress the antitumor effects,

NOTE Confidence: 0.98772454

00:24:31.790 --> 00:24:35.820 and these need to be

NOTE Confidence: 0.98772454

00:24:35.820 --> 00:24:37.850 dealt with in a way,

NOTE Confidence: 0.98772454

00:24:37.850 --> 00:24:39.880 especially at the tumor site,

NOTE Confidence: 0.98772454

00:24:39.880 --> 00:24:42.292 so that the tumor can become

NOTE Confidence: 0.98772454

00:24:42.292 --> 00:24:45.158 what we call hot and not cold.

NOTE Confidence: 0.98772454

00:24:45.160 --> 00:24:48.240 Hot, meaning it can be recognized by the

NOTE Confidence: 0.98772454

00:24:48.240 --> 00:24:50.439 antitumor immune system more readily.

NOTE Confidence: 0.9774533

00:24:51.830 --> 00:24:54.398 And it sounds like

NOTE Confidence: 0.9774533

00:24:54.398 --> 00:24:56.307 you have so many possibilities

NOTE Confidence: 0.9774533

00:24:56.307 --> 00:24:59.079 in terms of how you can fashion

NOTE Confidence: 0.9774533

00:24:59.155 --> 00:25:01.637 these nanoparticles, so you can

NOTE Confidence: 0.9774533

00:25:01.637 --> 00:25:03.940 target the tumor on one

NOTE Confidence: 0.9774533

00:25:04.021 --> 00:25:06.281 side and potentially attract the

NOTE Confidence: 0.9774533

00:25:06.281 --> 00:25:09.025 immune system on the other side

NOTE Confidence: 0.9774533

00:25:09.025 --> 00:25:11.867 and get these two systems in

NOTE Confidence: 0.9774533

00:25:11.867 --> 00:25:14.284 close proximity to each other in

NOTE Confidence: 0.9774533

00:25:14.284 --> 00:25:16.289 addition to delivering drugs.

NOTE Confidence: 0.9774533

00:25:16.290 --> 00:25:19.013 Now the other thing that you mentioned

NOTE Confidence: 0.9774533

00:25:19.013 --> 00:25:21.950 before the break was using nanoparticles

NOTE Confidence: 0.9774533

00:25:21.950 --> 00:25:24.908 relating to skin cancers,
NOTE Confidence: 0.9774533

00:25:24.910 --> 00:25:27.868 but more on the prevention side.
NOTE Confidence: 0.9774533

00:25:27.870 --> 00:25:30.936 So Mark talk a little bit about
NOTE Confidence: 0.9774533

00:25:30.936 --> 00:25:32.920 using nanoparticles to make
NOTE Confidence: 0.9774533

00:25:32.920 --> 00:25:35.256 sunscreens more effective.
NOTE Confidence: 0.9900481

00:25:36.340 --> 00:25:39.080 Yeah, I'd be happy to do that and that was one
of
NOTE Confidence: 0.9900481

00:25:39.150 --> 00:25:42.110 the first big projects that Mike and I
NOTE Confidence: 0.9900481

00:25:42.110 --> 00:25:44.836 worked together on and it was quite successful.
NOTE Confidence: 0.9900481

00:25:44.840 --> 00:25:48.240 So the idea was that we NOTE Confidence:
0.9900481

00:25:48.240 --> 00:25:50.739 knew that we could make these
NOTE Confidence: 0.9900481

00:25:50.739 --> 00:25:52.737 nanoparticles that would adhere to tissues
NOTE Confidence: 0.9900481

00:25:52.737 --> 00:25:55.552 and we tested them to see if you just
NOTE Confidence: 0.9900481

00:25:55.552 --> 00:25:57.760 suspended these particles,
NOTE Confidence: 0.9900481

00:25:57.760 --> 00:26:00.273 these sticky particles and NOTE Confidence:
0.9900481

00:26:00.273 --> 00:26:03.581 you put that water on the skin would
NOTE Confidence: 0.9900481

00:26:03.581 --> 00:26:06.270 the particles adhere and in fact they did.

NOTE Confidence: 0.9900481
00:26:06.270 --> 00:26:08.998 And they adhered very strongly to the skin.
00:26:09.909 --> 00:26:12.030 You could put some particles on the
NOTE Confidence: 0.9900481
00:26:12.100 --> 00:26:14.396 skin and then you could wash the
NOTE Confidence: 0.9900481
00:26:14.396 --> 00:26:16.204 skin extensively and the particles
NOTE Confidence: 0.9900481
00:26:16.204 --> 00:26:18.472 would just stay there and resist
NOTE Confidence: 0.9900481
00:26:18.472 --> 00:26:19.910 removal with washing.
NOTE Confidence: 0.9900481
00:26:19.910 --> 00:26:22.635 And so we knew that there was something
NOTE Confidence: 0.9900481
00:26:22.635 --> 00:26:23.999 special about that technology,
NOTE Confidence: 0.9900481
00:26:24.000 --> 00:26:26.238 because if you can apply something
NOTE Confidence: 0.9900481
00:26:26.238 --> 00:26:28.388 topically to the skin and it
NOTE Confidence: 0.9900481
00:26:28.388 --> 00:26:30.140 stays there for a long time,
NOTE Confidence: 0.9900481
00:26:30.140 --> 00:26:31.850 that might have some value.
NOTE Confidence: 0.9900481
00:26:31.850 --> 00:26:34.730 And so in the second phase we learned that
NOTE Confidence: 0.9900481
00:26:34.799 --> 00:26:37.619 one could take common sunscreen ingredients
NOTE Confidence: 0.9900481
00:26:37.620 --> 00:26:40.357 and load them at very high levels
NOTE Confidence: 0.9900481
00:26:40.357 --> 00:26:41.530 inside these nanoparticles,

NOTE Confidence: 0.9900481

00:26:41.530 --> 00:26:43.485 so that the nanoparticle itself

NOTE Confidence: 0.9900481

00:26:43.485 --> 00:26:45.050 was 50 percent, 60%,

NOTE Confidence: 0.9900481

00:26:45.050 --> 00:26:47.000 sometimes even 70% sunscreen agent.

NOTE Confidence: 0.9900481

00:26:47.000 --> 00:26:50.072 And then if you apply those to the

NOTE Confidence: 0.9900481

00:26:50.072 --> 00:26:52.480 surface of the skin, they stuck.

NOTE Confidence: 0.9900481

00:26:52.480 --> 00:26:54.820 They don't penetrate into the skin.

NOTE Confidence: 0.9900481

00:26:54.820 --> 00:26:57.170 They don't wash off very easily,

NOTE Confidence: 0.9900481

00:26:57.170 --> 00:27:00.296 but they're sitting on the skin now in

NOTE Confidence: 0.9900481

00:27:00.296 --> 00:27:03.422 a position to be between the skin and

NOTE Confidence: 0.9900481

00:27:03.422 --> 00:27:06.550 any ultraviolet light that falls on the skin,

NOTE Confidence: 0.9900481

00:27:06.550 --> 00:27:08.580 and so they could be

NOTE Confidence: 0.9900481

00:27:08.580 --> 00:27:11.165 very effective at screening that

NOTE Confidence: 0.9900481

00:27:11.165 --> 00:27:13.750 ultraviolet light and and absorbing

NOTE Confidence: 0.9900481

00:27:13.833 --> 00:27:16.527 it and blocking it without anything

NOTE Confidence: 0.9900481

00:27:16.527 --> 00:27:19.059 ever entering your body and they

NOTE Confidence: 0.9900481

00:27:19.059 --> 00:27:21.362 stay on there for a long time.
NOTE Confidence: 0.9900481

00:27:21.370 --> 00:27:24.628 And so we did a number of studies
NOTE Confidence: 0.9900481

00:27:24.628 --> 00:27:27.754 trying to understand how this works and
NOTE Confidence: 0.9900481

00:27:27.754 --> 00:27:30.622 trying to perfect it using combinations
NOTE Confidence: 0.9900481

00:27:30.622 --> 00:27:34.101 of sunscreens so that we could block
NOTE Confidence: 0.9900481

00:27:34.101 --> 00:27:35.923 all wavelengths of ultraviolet
NOTE Confidence: 0.9900481

00:27:35.923 --> 00:27:38.826 light and ultimately did a
NOTE Confidence: 0.9900481

00:27:38.826 --> 00:27:41.098 small pilot clinical trial
NOTE Confidence: 0.9900481

00:27:41.100 --> 00:27:43.767 here at Yale showing that
NOTE Confidence: 0.9900481

00:27:43.767 --> 00:27:46.453 indeed you could put these on the
NOTE Confidence: 0.9900481

00:27:46.453 --> 00:27:48.649 surface of the skin of volunteers
NOTE Confidence: 0.9900481

00:27:48.731 --> 00:27:51.447 that they were completely safe and
NOTE Confidence: 0.9900481

00:27:51.447 --> 00:27:54.208 Mike can talk about the details of
NOTE Confidence: 0.9900481

00:27:54.208 --> 00:27:57.030 that and that they would perform just
NOTE Confidence: 0.9900481

00:27:57.030 --> 00:27:59.550 as well as the kinds of sunscreens
NOTE Confidence: 0.9900481

00:27:59.550 --> 00:28:02.220 that you can buy at the drugstore.

NOTE Confidence: 0.9900481

00:28:02.220 --> 00:28:04.518 So we're very excited about that

NOTE Confidence: 0.9900481

00:28:05.670 --> 00:28:08.575 and new ways

NOTE Confidence: 0.9900481

00:28:08.575 --> 00:28:09.820 to use technology

NOTE Confidence: 0.9900481

00:28:09.820 --> 00:28:11.308 to prevent skin cancer.

00:28:16.992 --> 00:28:19.375 And my grandparents all worked on

NOTE Confidence: 0.9900481

00:28:19.375 --> 00:28:21.748 farms and so are very familiar with the

NOTE Confidence: 0.9900481

00:28:21.748 --> 00:28:24.000 devastating effects

NOTE Confidence: 0.9574797

00:28:24.000 --> 00:28:26.370 of skin cancer.

NOTE Confidence: 0.9574797

00:28:26.370 --> 00:28:28.335 Doctor W. Mark Saltzman is a professor

NOTE Confidence: 0.9574797

00:28:28.335 --> 00:28:29.514 of biomedical engineering,

NOTE Confidence: 0.9574797

00:28:29.520 --> 00:28:31.256 cellular and molecular Physiology

NOTE Confidence: 0.9574797

00:28:31.256 --> 00:28:32.992 and of chemical engineering

NOTE Confidence: 0.9574797

00:28:32.992 --> 00:28:34.961 and Doctor Michael Girardi is

NOTE Confidence: 0.9574797

00:28:34.961 --> 00:28:36.681 a professor of dermatology at

NOTE Confidence: 0.9574797

00:28:36.681 --> 00:28:38.578 the Yale School of Medicine.

NOTE Confidence: 0.9574797

00:28:38.580 --> 00:28:41.130 If you have questions the address

NOTE Confidence: 0.9574797

00:28:41.130 --> 00:28:41.980 is canceranswers@yale.edu.

NOTE Confidence: 0.9574797

00:28:41.980 --> 00:28:43.750 And past editions of the program

NOTE Confidence: 0.9574797

00:28:43.750 --> 00:28:45.868 are available in audio and written

NOTE Confidence: 0.9574797

00:28:45.868 --> 00:28:47.188 form at yalecancercenter.org.

NOTE Confidence: 0.9574797

00:28:47.190 --> 00:28:49.430 We hope you'll join us next week to

NOTE Confidence: 0.9574797

00:28:49.430 --> 00:28:51.583 learn more about the fight against

NOTE Confidence: 0.9574797

00:28:51.583 --> 00:28:53.498 cancer here on Connecticut Public

NOTE Confidence: 0.9574797

00:28:53.498 --> 00:28:55.407 radio funding for Yale Cancer

NOTE Confidence: 0.9574797

00:28:55.407 --> 00:28:57.232 Answers is provided by Smilow

NOTE Confidence: 0.9574797

00:28:57.232 --> 00:29:00.072 Cancer Hospital and AstraZeneca.