



BENCHSIDE DISPATCHES

GETTING TO THE HEART OF NANOTECHNOLOGY RESEARCH

AN INTERVIEW WITH ADAM J. FRIEDMAN, MD

Welcome to the next installment of Benchside Dispatches, a series of interviews with top researchers in the field of dermatology intended to highlight important advances in the care of medical skin disorders. Over the course of this series, prominent thought leaders have explored the latest research in specific dermatologic disease states.

In this installment, Adam Friedman, MD, discusses nanotechnology and its potential applications. Dr. Friedman is an Associate Professor of Dermatology and serves as Residency Program Director and Director of Translational Research in the Department of Dermatology at The George Washington University School of Medicine & Health Sciences.

The following is excerpted from a video interview with Dr. Friedman. You can watch the full interview at DermTube.com.

In terms of nano-delivery, what is the state of the science?

Adam J. Friedman, MD: To talk about nano-delivery, we first have to start with definitions. You realize we don't have one set standardized definition, even according to the FDA. The one that I ascribe to is this: that nanotechnology is the study, the investigation, the manipulation, the development of materials that at least one dimension is between 1 and 100 nanometers. We're talking really quite small nanometer, about a billionth of a meter.

The kicker is it's where unique phenomena emerge. What I mean by this is that the properties of matter, physical, optical, they're all augmented when you shrink something down.

Why is this? If you think about it, when you shrink something very, very, very, very small, the surface area relative to the volume of that material grows exponentially. Meaning, you have more surface reactivity; meaning, its ability to interact with the environment is much greater.

If you think about biology, most biological processes occur at the nanoscale. Are you more likely to hit your biological target, let's say it's very small, with a giant dart, or if you take a tiny dart and have a giant bullseye, so to speak? That's really where nano comes in.

Now the other element is purposeful drug design. Because you can augment all these properties, you can make something that at the bulk scale is really gross and not cosmetically appealing. Invisible, you can make something that would not suspend very well in a very thin and elegant vehicle. Suspend an elegant vehicle at the nanoscale, you can design whatever you want for your intended purpose... You can deliver something that's hard to deliver. You can design a nanopatform to release a product over

time to diminish side effects and adverse events associated with it. Sky's the limit because of these unique properties that you can really make whatever you want for its intent and purpose...

If you have something very small, one, its ability to get through the epidermal barrier, the stratum corneum's much greater. Two, the likelihood that it will stay on the skin longer, that resident transit time is also much greater, and I think that's really where a lot of the benefits of nano come in...

While I think it's a very exciting area, we have a lot of work to do to really make it a part of mainstream, both over-the-counter therapeutics but even prescription and diagnostics. A lot of opportunity. If this is something that interests you, jump on it. I think we need more funding and we need more investigators interested in this area. I think it's going to explode momentarily, I think we're going to see a flurry of excitement in the nano realm.

How did you get involved in nanotechnology research?

Dr. Friedman: I got interested in nano research by accident. At the time, I was a medical student working with a hydrogel-based platform, actually studying protein dynamics, nothing to do with this whatsoever. This platform really allowed for you to change the structure of these proteins because things could get in, gaseous molecules, carbon monoxide. If things could get in, my thought was, well, maybe things can come out.

So I started making these gels...for topical application. Then one day I just desiccated it, I dried it out, I lyophilized it, and I got this very fine powder. I wanted to know what I was dealing with, took it to our analytical imaging facility, and they measured it with electro-microscopy and it turned out, there were nanoparticles. I said to myself, well, I guess I'm doing nano now.

My philosophy, and this is something I impart to all my fellows is, if you're going to do something, you better be the master of your domain. From that moment on, which was like maybe 2005, I tried to get my hands on every bit of literature in the area so that it really became my thing. It was, very often like science, very much by accident. ■

Get more. Watch the full interview with Dr. Friedman online at DermTube.com/series/benchside-dispatches.



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