Adventures in Clinical Chemistry and Proteomics: A Personal Account

Host: This is the podcast from *Clinical Chemistry*. I am Bob Barrett. The February issue of *Clinical Chemistry* contains a reflection by Dr. Norman G. Anderson on the transformation and the understanding of disease in terms of molecules, largely through the application of new instruments and technologies, which he and others have developed over the past decades.

Throughout his long career, Dr. Anderson has shown both an interest in inventing or improving analytical instruments, and in learning how successful research gets done, and also how to determine when a solitary inventor is needed and when it takes an array of contributors. Long-time readers of this journal will be familiar with his publications in *Clinical Chemistry* on the development of the centrifugal fast analyzer and two-dimensional electrophoresis, the latter some consider proteomics some 25 years before the term was coined.

Dr. Anderson holds numerous patents, and he has published more than 300 scientific articles. He is currently Senior Scientific Advisor to the Plasma Proteome Institute in Washington, D.C. And we're fortunate to have him as our guest in this podcast.

So tell us, Dr. Anderson, with all your experience in the field, what are some of the interfaces and science today that deserve attention?

Dr. Norman G. Anderson: Well, I think there are many, and they are in all directions. We need a lot better mass spectrometers, we need better ways of determining structures of proteins.

One of the things that we don't have worked out yet is how do we take a tremendous amount of information on protein structure and decide which proteins will fit together, which are part of the so-called “interactome,” and then how does all this get into the actual clinical laboratory.

Clinical laboratory medicine involves big machines, and so when you develop something new, it’s got to get into one of those machines somehow, and crossing that barrier is a very interesting one.

Then the interface with pathology and with toxicology, a lot of the interest ought to be, I think, in how different drugs affect gene expression and the amount of different protein. That can be done, but if I were to ask, “what is one of the most urgent things to do,” that would possibly be it.

Host: Well, what would you most like to do now?

Dr. Norman G. Anderson: What would I like to do?

Host: Huh-uh.

Dr. Norman G. Anderson: What I'd like to do is ask this question. “Why is it that if we have a new outbreak of a viral illness, say, a pandemic, there are no real plans for aborting it before it's over,” in other words, for making a vaccine in that short period of time? It can't be done now, but if it's ever going to be done, we've got to think about it very hard, and we've got to go through and say, “do we have the technology for rapid virus identification, rapid virus isolation.”

What are the barriers in making vaccines? Maybe all the hold-up is at some technological level, but it's also possible if it's all the FDA's problem, in other words, regulational that if we have to run all the tests that are done, we simply will never get there. That's what I'd like to do, and that's actually what I am doing.

Host: In your opinion, how was the big-science, little-science debate actually played out?

Dr. Norman G. Anderson: Well, it's an interesting argument, but I think the answer is there are extremes to this, but you need a continuum from one end to the other. And one of the problems is how do they talk to each other.

In other words, the people run the big-science laboratories have problems getting big problems, and they always come up from little problems. So, how do you start one end of this? One man in laboratory starts out. He does some interesting work, and then it’s seen that that can become larger.

How does it gradually segue into whatever it takes? Now one of the problems with the whole big-science business is that big-science looks for big problems. They are usually the product of some growth somewhere, and how that's managed is a very interesting one, and I don't really know it.

Host: So, what's happened to the collegiality of the former days, especially after the Bayh-Dole Act of 1980?

Dr. Norman G. Anderson: Well, it used to be that you could come into somebody's office and sit down and tell him all the things you are doing, and he would tell you

everything he knows about how these problems could be solved, and it was a nice arrangement. Nobody was even thinking of making any money out of this, and then it was found that a lot of money could be made out of some of the patents that arose from, say, molecular biology.

So, it's not unusual to run into somebody's decision. I can't really talk to you about this because I am working with some small companies somewhere. The NIH in their recent investigation found out that they had another staff; people are getting really large funding without anybody knowing about it.

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So, I think they've taken care of that problem adequately, but so far as somebody telling you that that giving you the best advice on something and when it was perfectly well, what you're going to do with it and that he could beat you to it. That's disappearing or gone and that was one of the marvels of the big national laboratories.

You could find somebody in any field almost, who knew all about it, and if you knew how to state your problem and could find him, you could find out, was there an answer. Is that known that there can't be an answer, or you're trying to repeal gravity, or go faster than the speed of light? There's some good reason why you can't do that, or you could say, you know that's an interesting problem and here is how I might approach it. And that's the collegiality and that's half of the fun of it.

I would like to know what other people are doing and they would like to tell me, but can they do it without being true they haven't filed a patent.

Host: Do you want to say anything about research and aging?

Dr. Norman G. Anderson: Well, it's obvious why I am interested in that problem. You know I am 90, and I am working very hard and having a lot of fun. But unlike the Patent Office, who has an arrangement for this, they say, if you're above a certain age, then they run a little faster, because in many cases I get their mail back saying, this person is no longer at that address.

So, there really isn't any thought, and I don't know very many people who get even minimal funding unless it's all arranged in advance. And actually, if

you do the cold-blooded thing of calculating your life expectancy, in many cases, it's less than getting the grant going. So, that shows you right there.

Host: Okay. Lastly, do you have any advice for people considering joining the field of laboratory medicine or proteomics?

Dr. Norman G. Anderson: Well, there is an interesting general question here which is how in high school, let's say, or even in college, do you find out about all the different exciting fields that exist. Most people even going into medicine don't know about what can be done in the field of pathology and remains to be done, and how much support there would be if they ever got there.

So how do you hook these up? There are lots of smart kids that could learn a lot and could learn that the reason for the education is that you have the background to ask questions.

Now what isn't pushed is the idea that in the history of mankind until now no one has had access to this almost sum total of human knowledge. And with Google if you've a question, you can get an answer. So, you can educate yourself.

And once you began to realize that everything isn't known, even though you get that impression because they have to cram so much into you, and how much fun it is to explore unknown things, then you can teach yourself. In a way that's the whole idea of education and research is that you can think, you can think of your own questions, you know how to look for an answer, and maybe you can get it.

So, there are several pieces of advice. First is, if you do locate some field you're interested in, it’s usual for the person in that field to answer letters from interesting students that just say “what do I need to know to study with you.” Almost no one gets that kind of question from somebody that just looked at a TV program on, let's say, the details of human vision and says to himself, “I'd like to learn in that area. I know a lot is not known, but what should I do?” And if he has the name of somebody in the field, find out. The other is -- I don't know whether high schools do this generally but I am sure the science clubs.

Now people in research are not -- they don’t want to spend their life doing it, but they don't mind once in a while talking to such groups and that's a way of getting some feel for, whether it's something you

would like to do, because now so much of research and researchers are parodied on TV. And it used to be that a geek was a person that you saw for five cents at the circus.

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Now to apply that name to people in science does represent a problem in a definite attitude, and you don't find that attitude towards any other group of people: physicians, lawyers, etcetera. These are people that cannot be understood, and they're not sure that they're human even.

So it's a do-it-yourself business, educating yourself, but you have to realize that there are people of all levels that are interested in helping anybody that seems to have a clue. There is no book to read, you didn't find yourself on Google, and there is no read-this-book-and-become-a-successful-scientist because that's not the way it works.

Host: Dr. Norman Anderson is a Senior Scientific Advisor to the Plasma Proteome Institute in Washington, D.C. And he's been our guest in this podcast from *Clinical Chemistry*. I am Bob Barrett. Thanks for listening.

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