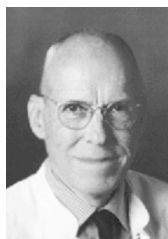


Ole Siggaard-Andersen: The man behind the legend

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Ole Siggaard-Andersen

When it comes to acid base, there is no getting around the name of Ole Siggaard-Andersen (OSA). acutecaretesting.org talks to the world-renowned Danish professor, who has become a legend in the field of blood gas.

Introduction

When it comes to acid base, there is no getting around the name of Ole Siggaard-Andersen (OSA). The world-renowned Danish professor, whose research has helped save the lives of patients with acid-base disturbances, received the prestigious AACC Edwin F. Ullman Award in July 2003. The award recognizes individual outstanding contributions that advance the technology of clinical laboratory science.

The award committee could not have picked a better recipient. Ole Siggaard-Andersen's lifetime contributions include the "The acid-base status of the blood" thesis (which has been reprinted five times!), the invention of the quantity for base excess, the mixing wire for capillary samples, not to mention various nomograms and mathematical equations incorporated in blood gas analyzers today.

In this interview, Ole Siggaard-Andersen talks about his beginnings as a young scientist, his breakthroughs, "The transatlantic debate", and living the simple life.

acutecaretesting.org: How did you begin working with blood gases?

OSA: I graduated from medical school in 1956. Shortly after, I got a three-month position as summer substitute at Poul Astrup's laboratory at the University Hospital in Copenhagen. Already on the first day, I asked Astrup if I could participate in the pH and blood gas research that was going on in the lab. This was just a few years after the polio epidemic in Copenhagen. In a way it was a coincidence, but back in those days blood gases were 'the thing to work with'. Blood gas was in the 1950s what molecular biology is today.

acutecaretesting.org: What happened during the first three months?

OSA: We developed the micromethods, and found out how to stop capillary samples from coagulating. Capillary samples coagulate very fast and, despite the addition of heparin, they would clot before we could

introduce them to the analyzer. Then it occurred to me to use a small piece of iron in order to mix the sample with an external magnet, and that stopped the capillary samples from coagulating. I was so excited about my discovery that I attached a few capillary tubes with a magnet to my scooter to show them to my wife when I came home from work.

acutecaretesting.org: How did your interests in base excess and buffer base start?

OSA: The person I was substituting for at Astrup's lab did not return, so I got a permanent position in the lab. One day, Astrup showed me an American paper on buffer base. Astrup was furious, since he advocated using standard bicarbonate (for more information, read the article To BE or not to BE by Johan Kofstad). Astrup thought that the author of the paper had clearly misunderstood the whole thing.

I read the original paper, which was by Singer and Hastings, and realized that Δ buffer base was a better indicator of a metabolic acid-base disturbance than standard bicarbonate. So I began working on the curve nomogram from which you can read buffer base and Δ buffer base. I gave Δ buffer base the name base excess. Actually, I constructed the curve nomogram on my honeymoon back in August of 1958.

acutecaretesting.org: What did your wife think of that?

OSA: My wife has always been extremely supportive of all my activities.

acutecaretesting.org: Why did you call Δ buffer base base excess?

OSA: I felt this was an appropriate name at that time. The big difference between Δ buffer base and base excess is that base excess refers to the hydrogen ions and can be determined experimentally by titrating the blood with strong acid or base, whereas buffer base refers to the electrolytes and requires measurement of all the strong electrolytes or a calculation of all the weak

electrolytes. Today I would have called it hydrogen ion deficit or with opposite sign titratable hydrogen ion. Many people still think of base as being a cation, not a hydrogen ion binding group.

acutecaretesting.org: What is so great about base excess?

OSA: I am always in favor of doing things directly, which I think base excess does. You can measure it and it's an operational quantity. Just like you measure lactate if you want to assess lactic acidosis.

acutecaretesting.org: The use of base excess has been very much debated among European and American scientists. Some would say the tone of "The great transatlantic debate" has sometimes been harsh and very personal.

OSA: In the beginning, the debate was quite fruitful, but lately the tone has been unpleasant. It will probably be forever unreconciled. On my part, it annoys me when things are introduced as 'new'.

All the basics about acid-base have been described before the 1930s by various groups in Denmark (K. A. Hasselbach, S. P. L. Sørensen, J. N. Brønsted, E. Warburg, and many others) and various groups in the US (L. J. Henderson, Donald D. Van Slyke, J. P. Peters, A. B. Hastings, and many others). Everything from then on has just been fine tuning. For the debate to be fruitful, all participants must have a deep understanding of biochemistry, chemistry and physical chemistry. Unfortunately, that has not always been the case.

acutecaretesting.org: Do you meet with your opponents?

OSA: Yes, also on friendly basis. The Boston group (W. B. Schwartz and A. S. Relman) once invited me to dinner at their men's club. My wife was invited as well, but had to enter the club through the back door.

acutecaretesting.org: How do you see your role in the future developments of blood gases?

OSA: Assuming that there will be further developments in the field, I see a certain role for myself in educating people in concepts. However, understanding these concepts requires much more chemistry and physical chemistry than medical doctors are taught these days. So you need to simplify the descriptions very much, if you want them to be applied and understood.

acutecaretesting.org: Do you like teaching?

OSA: Not really. I like presenting lectures as crystal clear as possible, but I've sometimes experienced that not everybody understands what I say. You have to be a little bit of an actor to be a good teacher. You have to dramatize some of the things to make an impact, and that's quite difficult for me. I don't think I'm a good teacher, I admit it. But other scientists have had the same problem. Take Niels Bohr, for example. He was a poor teacher in the classroom, but if he had to discuss a topic with one or two students, he was outstanding.

acutecaretesting.org: Do you see yourself as a "blood gas legend"?

OSA: I'm always surprised when I come to faraway countries and find out that they know my name and have read my work, and they think I made a significant contribution. It is flattering. But then again, I can also feel a little bit shy about the attention.

acutecaretesting.org: What do you see as your major contributions?

OSA: My most important contribution was way back in the 1950s when we succeeded in making a microequipment that could measure different parameters from one drop of blood. The nomogram I made during my honeymoon was an intrinsic part of that method. Having the nomogram together with the microequipment was indispensable.

acutecaretesting.org: Is curiosity a necessity to succeed in this field?

OSA: Certainly. 'Why' is the crucial question that

drives us all. I remember working late nights on new methods in the beginning of my career at Astrup's lab. In those days, we used to say: It's a bad day; we have not invented anything. It could be small modifications of the equipment, finding new and better ways of doing things. It was an exciting time. We felt we could make all sorts of contribution and do things ourselves. We even built our own spectrophotometer for oxygen saturation.

acutecaretesting.org: That would be difficult today ...

OSA: That would be virtually impossible today. Medical equipment is so much more complex.

acutecaretesting.org: So the one-person invention is a thing of the past?

OSA: I think you can still find many examples of inventions made by a single person. And you can still have ideas. But it is something else to create a whole new lab instrument on your own.

acutecaretesting.org: What is yet to be achieved in your professional career?

OSA: I have always finished what I set out to do. So in that way, I have no regrets.

acutecaretesting.org: Looking back, if you had the chance, what would you do differently?

OSA: I think I would take an MBA and be the director of Ericsson (smiles). No, I have no regrets nor the ambition of doing things differently. I'm a minimalist. My wife and I have not had a car for the past 25 years, we have no summerhouse, no boat... I enjoy biking, swimming, just living the simple life.

Interviewee

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