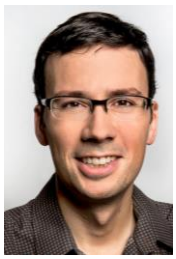
Clinical Chemistry

Paper-Based Quantification of Male Fertility Potential



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Guest: Dr. David Sinton is Professor and Associate Chair of Research in the Department of Mechanical and Industrial Engineering at the University of Toronto.

Bob Barrett: This is a podcast from *Clinical Chemistry*, sponsored by the. Department of Laboratory Medicine at Boston Children's Hospital. I am Bob Barrett.

The global problem of infertility is high, affecting more than 70 million couples. It has been estimated that male infertility accounts for 40% to 50% of such cases worldwide. The main causes of male infertility include low sperm count and poor vitality and low motility as well as abnormal sperm morphology. Semen analysis to quantify these factors is the cornerstone of male infertility diagnosis and also plays a critical role in monitoring male contraception after vasectomy to ensure permanent sterility. Cell counting chambers such as hemocytometers and Makler chambers are the traditional tools for quantification of sperm concentration and motility working via manual visual inspection under a microscope.

The March 2016 issue of *Clinical Chemistry* published a paper characterizing the low cost and rapid paper-based micro fluidic approach for quantifying male fertility potential simultaneously measuring three critical semen parameters in ten minutes, live sperm concentration, motile sperm concentration and sperm motility. The senior author of that paper is Dr. David Sinton. He is a Professor and Associate Chair of Research in the Department of Mechanical and Industrial Engineering at the University of Toronto, and he is our guest in this podcast.

Dr. Sinton, what opportunities do you see for Microfluidics to address fertility challenges?

Dr. David Sinton: There is a couple. First of all, in diagnostics, we see a real opportunity to inform, first clinics, and to process this in clinics cheaper, faster and better. But then also, the larger market, individuals, likely couples who are having trouble conceiving might first look to ovulation prediction kits in the drug store, and those are helpful. You can imagine tests side by side with that, that assess the fertility potential of the male. So, tests for sperm concentration, motile sperm concentration and motility, kind of an easy read out.

Bob Barrett: What is it about this new method that has people talking and excited?

Dr. David Sinton: Well, a few things. The key feature is that it works well and it's very simple. So, that is, simple and inexpensive to make. So these all take some assembly, but it's a very simple process, and the materials are all cheap, and then ultimately using the devices is very straight forward. So that makes it attractive compared to the current realm of sperm analysis, sperm diagnostics, they're all inside the clinics and not all clinics either have all the methods. So this is a welcome approach from that perspective.

Also, we did some testing to sort of push it towards practical applications a little further by making sure that we could store the tests for long periods of time and they wouldn't be adversely affected by, for instance humidity; with dry reagents, that could be a challenge sometimes. So we did certainly see that influence of humidity and so we looked at packaging and we've compared that with packaging the device in a sealed container with desiccants and that was sufficient to provide long term storage. So that's sort of a future headache averted, and those tests are looking more and more like it's ready to go.

Bob Barrett: And who exactly are you targeting with this? Is it individuals or clinics?

Dr. David Sinton: Yeah. I think the first stage, clinics could make use it right away, but certainly down the road we're thinking this could be a test sold in drug stores, to individuals. So that's the long term large market, and I think that's particularly exciting for this.

Bob Barrett: Well, what's next? How far are we from being able to purchase this and use the device?

Dr. David Sinton: We're working with MARS Innovation, that's the University of Toronto Commercialization Office here and as well as the Innovation Partnerships Office at U of T to find appropriate partners to work with us and license this technology and get it on the shelf and into clinics. So that's really the next step, and I'm sure that there will be some lessons along the way, but that's the plan and MARS has been very supportive in patenting, patent support for the technology that we're developing--a suit of male fertility, microfluidics for male fertility, products with them.

Bob Barrett: Well, as long as we're looking ahead, let's look ahead with that. What's next for your group, for microfluidics for male fertility?

Dr. David Sinton: We're excited about the diagnostics, as I mentioned, especially given the low cost and simple approach you can get to larger numbers, and there is not just a product at play there, but there might be opportunities to look at screening populations, and also looking at not just whether the general fertility potential of one male at one point in his life, but what about changes with cessation of smoking, what about lifestyle changes, what about nutrition and exercise and sleep and all of the personal health monitoring that is currently of much interest.

Can we put male fertility in that list of things are being monitored, and in that way contribute to not only individual health, but also into the broader knowledge of what affects male fertility. And then we have a parallel effort here that's not just on the diagnostics side, but on the selection side, so helping clinics select sperm for use in assisted reproduction. So, that's a really exciting and fundamental challenge. You've got many samples. We'd have hundreds of millions of sperm to choose from and we've got a very short time in which to select, in the case of ICSI procedures that are becoming more common, in those cases, you're selecting one sperm from these massive samples. So we have some methods that help perform that selection process. So that's another parallel area that we're really excited about.

Bob Barrett: Dr. David Sinton is Professor and Associate Chair of Research in the Department of Mechanical and Industrial Engineering at the University of Toronto. He has been our guest in this podcast from *Clinical Chemistry* on a paper-based assay for quantification of male fertility. I'm Bob Barrett. Thanks for listening!