Transcript of rapidmicrobiology podcast with guest Tim Adams from Tecta PDS

Paul: Hello and welcome to the Rapidmicrobiology Podcast, and I'm your host, Paul Carton. Today's episode focuses on rapid automated tests for water, be it for drinking or recreation. Our guest, Tim Adams, from TECTA-PDS, is celebrating success even before the start of the Tokyo Olympics because his rapid test, the TECTA B16, has been announced as the official test to be used for open water sports events at the Olympics this summer. Hello Tim, and welcome to the Rapidmicrobiology Podcast.

Tim: Hi Paul. First of all, thanks so much for having us and allowing us to share what we're doing both at the Olympics and our technology with the crowd here.

Paul: Great to have you, Tim. The open water events include swimming, triathlon, surfing, rowing to name a few. They're happening in a couple of designated marine water spots around Tokyo, but one spot in particular, if you don't mind me mentioning, is Odaiba Bay, and it has suffered from terrible pollution in the last decade due to unpredictable weather events, sewage treatment across the bay overflowing, and it has been deemed unsafe for bathing up until the end of the last decade, and more suitable for a sewer rat, I read somewhere in the media.

Tim: (laughs)

Paul: But that was a couple of years ago, and they've put in measures to clean it up and improve the water quality, but if you have a sewage works across the bay in the world's biggest city, with rising temperatures, hurricane season as well, anything could happen in the lead up to the event. So, can you tell me, Tim, why, in your opinion, did the Olympics organizing committee choose the TECTA-PDS rapid test as the best approach for their water testing?

Tim: Well Paul, I think that's a phenomenal segue into why I think we were chosen. It's because of what you just mentioned is why they picked the TECTA. Really, it came down to three salient reasons, the first was the time to results, particularly when there's a positive detection or it is contaminated, decisions really need to be made fast as to whether to pull athletes out of the water, particularly in conditions like you just described. The second was there was no need for a lab or a lab technician to run the tests, as anyone can run a test with the TECTA. It's just as easy as taking a sample, and sticking it in, and hitting start. And finally, the third reason was the sample to test time, as the TECTA B16 is portable and can be placed right onsite as opposed to having to use labs. Our motto is ‘our test can be done by anyone, anytime, anywhere.’

I guess if you want to know the specific event which really won this for us was there was a pre-qualification triathlon event just before COVID, about eight months before the original date of the Olympics. During this event, ITU, the International Triathlon Union, was doing a side-by side comparison of our method to the lab method right on site down by the beach in a hotel. Just as the triathlon was kicking off, there was a weather event that took place. A typhoon was becoming active way out in the

ocean. And our TECTA picked up really high levels of *E. coli*, very, very quickly, these were dangerous levels, and the event was quickly changed immediately to a duathlon. Around 30 hours later, the traditional lab method confirmed the same levels, and if it wasn't for the TECTA, they might've actually run the triathlon, and there was a high chance that athletes could have gotten sick or something worse. We were pretty lucky because at this event, both the IOC and the TOCOG, TOCOG being the Tokyo Organization Committee for the Olympic Games, and a few of the other event federations were there, and they immediately saw the benefit, and it was a bit of a no-brainer from there on, and here we are today.

Paul: So, the TECTA is a third of the time quicker than the traditional method, it can automatically detect *E. coli*, *Enterococcus*, and can also give a coliform reading as well; a faecal coliform reading?! it's understandable that they're choosing it for Hurricane season. Tell me how it works and what's the average time to result.

Tim: For the PhDs out there, we're an enzyme substrate method, but for those of us, like myself, who are more laymen, what we're actually doing is as we're growing the bacteria in a portable incubator, which is the B16 to detect an enzyme that is expressed and has a fluorescent compound or a marker to it.

So essentially there's two parts of our product. There's the actual unit, the B16, and I like to always say that it's a really unremarkable piece of equipment. And I say that with pride, because basically we have two units, one's a 4 chamber and one's a 16, so 16 tests simultaneously or 4 tests. Within each chamber is an incubator, you incubate a cartridge slotted in, and at the bottom of each of these chambers is a UV spectrometer looking for this UV marker light. There's a bit of software involved as well. So proudly, there's not a lot that can go wrong with this unit.

All of our IP is actually in our cartridge, and in the cartridge, there's our media, which is loaded up, preloaded and sterilized. The media is a combination of different materials that they're meant to kill everything off in the water but grow the bacteria. Then, at the bottom of each cartridge, is our other IP; the Polymer Partition. We call it the 'rubber nub', and it's designed to allow everything through except for water. What we're essentially doing is taking a 100 mL sample in this cartridge, we're sticking it in one of the TECTA's slots. As it's incubating, the enzyme is expressed with a fluorescent marker. But it's also hydrophobic and wants to get out of the water, so it immediately goes down to this rubber nub which is sitting on a spectrophotometer, that immediately senses if there's UV light in it. That's how we were able to determine really quickly if there is *E. coli* in the water or not.

Depending on the contamination, we can detect as early as two hours and we're pretty proud of the fact that we can detect 1 CFU in the 10-hour mark, which is almost twice as quick as every other approved method, which needs to have a fixed incubation time of either 18 to 24 hours before someone even does a visual interpretation and then has to write a report. We're very quick, and a report is automatically sent out immediately with quants and all the information needed via an email to whoever needs it.

Paul: The sample doesn't need any preparation, concentration methods, or extraction of RNA, because it's not molecular, it's a culturing method. The technicians don't need any specialized training, but you'd usually need a microbiologist in there to know *E. coli* from other coliforms. How can the TECTA distinguish between *E. coli* from other coliforms or from any other of the billion species floating in the ocean?

Tim: It's a great question. First of all, the UV spectrum is vast, and what they've been able to do is provide different wavelengths that isolate for each one of the bugs. For instance, it's a certain colour or wavelength for *E. coli*, it would be another one for *Enterococcus*, it would be another one for total coliforms.

Paul: Okay, like a fingerprint of the bacteria?

Tim: Yes.

Paul: A lot of previous interest into developing a rapid water test method have been down the molecular route, but yours is a culture method. Other than this, what are the main differences that TECTA have to other tests on the market?

Tim: We do not require a lab or lab technician. We say it's the simplest of tests. You basically just take the sample, put it in the TECTA, and hit start. There's little to no training needed to operate. Wherever there's power, you can use it. This is a portable unit, so all of a sudden, now in these secluded communities or places where there needs to be a test, you can do it. This isn't a subjective analysis, no-one's actually reading the sample, so it's an objective analysis. What's really cool, and for people who are listening who are wastewater guys, no dilution is ever required because there's no visual interpretation. You can take sludge or even solids, put it right into the 100 mL slot, close, and stick it in. We can accurately provide results in as quick as two hours where every other method has a fixed incubation time I think of at least 18 to 24 hours, and really, at the end of it, there's no requirement to write any report, as the unit automatically sends out a report within seconds with all the information.

Paul: This is the device for the on-the road field technician that can just work from anywhere, isn’t it?! It doesn't need a laboratory, so she doesn't need a BSL to perform these tests. Everything's enclosed within the device itself.

Tim: Some people refer to this as a lab in a box. In some cases, where there's regulations that need a test to be done in the lab, it's used in labs around the world, but it truly is a lab in the box. As long as you have power, you can use this unit.

Paul: No need to write your report, device does it for you, I can see why it's become so popular. I know you've mentioned it already, but what level of training did the personnel at the Olympics have to undergo in order to operate this TECTA-PDS? And is it user-friendly?

Tim: Yes, it truly is. We have a partner in Japan, and they're fully trained on how to set the unit up. Once it's set up, there's really no training required. Basically, you take the sample up to the 100 mL level in the cartridge, you close the pre-sterilized lid of the cartridge and you stick it in the TECTA, and you hit start, and that's it. The TECTA does everything else.

Paul: Okay, so by purchasing this device, a company is saving a lot of money from overheads that come with testing. But how much does the TECTA instrument cost? And how much are the consumables when you compare them with other options, such as plate-based methods or other rapid methods?

Tim: There's two parts to the product, there's the actual unit and there's the consumables. We'll talk about the unit first. The TECTA B16, which has 16 tests, retails for about $21,000 USD, and the TECTA B4, that allows 4 simultaneous tests, is around $17,000 USD and that fluctuates with markets and quantities of course.

Per test, we try to keep it consistent with our major competitors within the market so that it's almost the same per test, if just a little more; we usually charge no more than about a dollar per test. Where the return of investment (ROI) really comes in is for those customers who are remote, and they're shipping samples in, because particularly with drinking water, you need to get the samples in same day, usually within hours, and that can be a FedEx cost of $20 per day per sample. Then there's usually a 10 to 15% loss rate, so you have to redo the test.

Where the true value lies, is understanding that about seven to eight times a year in a developed country, someone dies from an *E. coli* contamination, and in every case, if the results could have come back faster, deaths never would have happened. They could have put out their protocols, and there never would have been an issue. The cost is enormous, both from a human life factor but also in dollars. We started our company out of a tragedy in a town called Walkerton, Ontario, where several people died, this was a small community, the cost of the town was close to $500 million when all is said and done, in emergency services, lawsuits, and all of the peripheral costs. This is where the true ROI comes in for our solution.

Paul: Let's touch on that for a moment. You're understandably very excited about the product and the success it's having, but the origins of its invention start with a tragedy in Walkerton. Can you tell me more about that?

Tim: It’s a tragic story where we begin. For those who've been in the water game for a while, they might recall when a small Canadian town just outside of Toronto, a town called Walkerton, a municipality, back in the year 2000, was the location of some tragic deaths that occurred due to *E. coli*. It was spring time in the year 2000, and in Canada, like every municipality that has well water, where they're pulling their drinking water off well water, there's regulations in place. You can't be so close to farmland because of manure runoff. But this particular winter, there was a lot of snow and a quick thaw, and they took their sample on a Friday morning, there was no labs, so they shipped it into the nearest lab, which was in the next nearest major city. By the time it got to the lab, they had to prepare the sample. The sample goes

in Friday evening. By Saturday morning, the hospitals are filling up. By Saturday night and Sunday morning, there's several people that died, and then they found out, at that time, that it was actually the water that was contaminated.

The government said “this is insane. We change our proprietary technology on phones almost yearly, but we haven't changed the way we test water” ... I think the last real update was in the '80s. We're still using technology from World War II. And there's got to be a better way.

Paul: It's hard to believe that incidents that come from contamination from well water still happen in this day and age. I know of a particular incident, a food producer working off the farm using well water not to clean the vegetables but was actually cleaning the food packaging, and *Cryptosporidium* ended up infecting the people that consume the spinach leaves that they were used for. That only happened a couple of weeks ago.

Tim: It's hard to believe, because there was that big spinach outbreak, I think three or four years ago, out of California, where people around the world died because of contaminated spinach , exactly the same thing. It was tragic, not only because of people dying, but these farms had to be shut down and their whole crops were destroyed, even if they weren't part of the issue. The California government didn't take any chances and destroyed these farms.

So back to our story…the government of Canada Went out to the academia at the top universities and said, "We need something better. We need something that's faster. We need something that can be done remote and is an objective test." They put a lot of criteria down that now the TECTA fulfil. There was a professor, Dr Stephen Brown at Queen's University, one of our top universities in Canada, who came up and developed the TECTA-PDS solution. By the way, Dr Stephen Brown is still our chief scientist today. Dr Stephen Brown created a company called Pathogen Detection Systems (PDS), which pretty well nailed everything the government asked for.

In 2009, Veolia Water acquire PDS under their innovation division called ENDETEC. It was during the Veolia days that the PDS brand was able to acquire a US EPA approval and was introduced to various major cities around the world. I was actually part of Veolia and ENDETEC, I was head of sales and marketing for the ENDETEC division, and it was really cool. We actually were going around picking up companies and augmenting to the Veolia solution.

In 2014/2015, Veolia took a different route and they said, "Hey, we're not an incubation company. We want to concentrate on our core competencies," and we started to find partnerships and sold off some of these divisions. Doug Wilton, who's our president and CEO, and I led a management team to buyout the PDS brand and brought it all the way back to Canada under the name it is today, TECTA-PDS. Today, we're privately owned and operating out of Canada. The company has evolved and is now in over 50 countries in various markets, including drinking water, wastewater,

environmental, military, food and bev, recreational water. We're in oil and gas, and we also some college campuses too.

Paul: You saw a great opportunity and you went with it, and what could have happened to PDS if you didn't take it under your wing, who knows, but it's become very successful. You said it has US EPA approval, what does that do for the company?

Tim: The US EPA approval was key for us, it's huge. We got it in 2009 when we were with Veolia and it's one of the most recognized approvals worldwide for drinking water. Not every country recognizes US EPA approval, but if you have US EPA approval, it's recognized that you've gone through one of the toughest, most rigorous tests in the world, and it sure opened up a lot of doors for us.

It's a 2-year side-by-side comparison blind study to a reference method, and what we're proud of is that not only did we meet the requirements, but most of the times we were exceeding some of the reference methods. We were detecting *E. coli* hours before the reference method did, and when our write-up came out in the EPA, it actually references that.

Along with the EPA, they do something that's really cool, they do what's called an ETV study, which is an Environmental Technology Verification study, where they actually compare us to the commercial methods on the market, again, blindly, and they create a report. We have this report both in long form and short form, and we're pretty proud that within almost every category, we came out number one. It's a really cool study to have as a reference for us.

Paul: It came out number one? Okay. How long ago was that?

Tim: We got the EPA approval in 2015.

Paul: Okay. That's fairly recent in terms of coming out number one. I would say you're still top of the table in that regard. So most international customers will accept the EPA approval as validation?

Tim: If they don't actually accept it, it'll definitely open doors and it'll sometimes fast track their verification or validation process. A lot of times, they'll say, "Listen, if you have the EPA report, send it to us," and then basically they don't need to go through the whole rigors of the EPA. They'll accept that.

Paul: Besides its validation for open water and drinking water, has TECTA-PDS technology been adopted by food and beverage companies?

Tim: We do have AOAC approval globally for food and bev, and we actually do have a few customers. We work with Pepsi, and Nestle, and we have been approved for Coca-Cola within their bottling plants.

Paul: That's a very good contract to have, I'd imagine. I'm just looking over a list of international approvals that TECTA-PDS have, and the list is long. You have South

Korea, Philippines, New Zealand, and this is all for municipal water testing, Ontario, your hometown. Is Ontario your hometown?

Tim: Correct, Ontario would be the province.

Paul: Province. Apologies. Your third-party validations that you have across the globe, there's one or two that strikes me as interesting here, University of Miami, the Hurricane Irma study. Can you just tell me a little bit about that?

Tim: When the hurricane hit Florida, a lot of the labs were unable to perform a lot of the tests. This was for the environmental testing, when the water came back up on shore and then went back out into the ocean, they were specifically testing for *Enterococcus*, and we shipped down some TECTA instruments so that they could continue doing the testing and ensure that everything was safe, and they provided a real nice case study for us validating how accurate we were.

Paul: Obviously clean water is vital in a time of a humanitarian crisis.

Tim: It comes down to time to detect. The quicker you can get the information, especially when there's a tragic event or a weather event that happens, it all has to do with timing.

Paul: There's another one there, the Commonwealth Games. This is quite similar to what's coming up in the Olympics, the Gold Coast, Australia study. Do you mind talking about that?

Tim: The Commonwealth Games was what really catapulted us into winning the Olympics. From that, ITU, the International Triathlon Union, actually said, "Hey, we would like a TECTA now at every sanctioned event that we do around the world to make sure that the athletes are safe." They did a study on the benefits of using a TECTA at the Commonwealth Games and it really helped us with winning the Olympics.

Paul: There's good and bad things I can see about this fast test. I know in my hometown there is an annual swim through the Liffey every year, a river running through a very urbanized city, but people still swim it every year. I remember reporting on it before, the athletes I spoke to didn't want to hear about microbiological testing and I'm guessing because if you test that water with a TECTA, there's a good chance that that event that's been running for 100 years probably won't happen again.

Tim: Sadly, sometimes information can work against you. We never tell anyone what to do with the information. Every single city, municipality, and every commercial application will have their own protocols, we do not dare profess to know what they should do if an incident happens. All we do is provide them with the information. This is the level of contamination, if there is any, and here's the quant.

Paul: The information that this automated test provides is particularly suitable for remote areas, where you'd normally need to send off samples through FedEx, for example.

and that'll take days. Can you give me some examples of these remote areas that have adopted the TECTA rapid test method?

Tim: I think the two that come to mind that we've done some work with is the First Nations or Indigenous communities within Canada, and I'll talk a little bit about Africa as well.

For those First Nations, some of the remote communities, it was taking sometimes days to send a sample, sometimes via prop plane, from the community to the nearest city. I don't know if any of you are familiar with Canadian weather, but in the summer, it gets very, very hot, and in the winter, it gets very, very cold, so they were losing somewhere between 25 and 30% of their samples from either freezing in the fuselage, and then they'd have to redo the test and send it again, so that just adds on days and costs.

In conjunction with the Canadian government, we managed to have 90 units in remote communities, and it's growing. It's so easy to use that in one of these communities that we visited, there's this little old lady who makes the coffee in the morning at the community centre who performs the tests on the TECTA. She just scoops up the water, sticks it in the TECTA, and of course all the results are automatically emailed with the report to whoever needs it, wherever they are.

In Africa, we're doing some really cool things with another Canadian company that's in development. This company is basically taking a wastewater and drinking water plant, and condensing it into the size of a portable container, almost like a shipping container. In some of these countries and remote communities throughout Africa, getting water not only is hard, sometimes it can be deadly. I mean you're going for a couple of hours with buckets on your head to a water source that could have deadly predators there, and you're pulling it back up, it's just an awful situation. So, these pods or containers are going to be dropped into these communities where now all you need to do is go to it, which is a two-minute walk, pull a lever, and you've got fresh water.

The issue has always been how do you make sure that water is safe? It's the same issue as with the First Nation communities or any remote community, if there's no lab nearby, and in some of these countries, there's no lab in the country, sometimes there's not even any roads to drive a sample, how do you test it? With the TECTA, if you've got power, you can now test and find out in real time if the water is safe. It enables these communities to not only have water, but it's really the start of creating a community. If you think about water, it's really the beginning to sustain everything. All of a sudden, schools can start to be built, a true sense of community can start to happen in these areas.

Paul: You're looking for regional distributors. Is that right?

Tim: We are always looking for distributors. We're currently in around 50 countries and we think our distribution model is really cool. We try to give exclusivity, our competitors are traditional methods, and for distributors, it's a nice little business

model, it's a reoccurring revenue model, and you've got some really good references with the Olympics to get started.

Paul: That's an easy sale for sure. Great, Tim. Thanks very much for joining us today. Your test definitely sounds like a winner and I'm sure the name TECTA will become a common term worldwide.

Tim: Hey Paul, thank you so much for having me on. It's been a pleasure and I appreciate the time.

Paul: And thank you, our listeners, for joining us today. Until next time.

Ends.