International Society on Aptamers

NOVEMBER 07, 2017 VOLUME 2, NUMBER 2

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EDITORIAL

It's the beginning of November! Where did the time go? I hope all your experiments have worked, your grants successful, your papers accepted, and you're managing to have some work-life balance! We've eight weeks left until we break up for the year so I'm sure you are all trying to tidy up loose ends before taking some well-earned rest, and maybe writing that next paper. While you're winding down in the lab and starting to focus on writing, don't forget to submit your abstract for our 5th Aptamers Symposium. Can you believe it's our 5th year already?! I know I'm looking forward to it. Dr Julian Tanner has kindly agreed to be our Symposium Chair and while I can't tell you any more now (see our next issue!), we already have a number of guest speakers lined up that I'm sure you're going to enjoy. Julian is our interviewee this issue, so scroll through to page X to hear his thoughts on aptamers and the future of his research. We also have some additions to the program so keep reading below to see what they are. Also, don't forget that we are offering free publication on papers submitted before 15th December to the Aptamers journal. Connect with us on social media to get continuous updates! You'll find our details in the sidebar.

As a final note, have you liked our Facebook page? We are currently providing links to new aptamer research papers on a daily basis. Don't have time to keep up to date on current literature? Get our daily updates in your morning newsfeed at https://www.facebook.com/AptaSoc/.

May you all have a great few months, get a well-deserved break, and start planning your trip to Oxford in April!

Dr Sarah Shigdar
President

Aptamer 2018 Symposium

Dr Julian Tanner is our Symposium chair in 2018 and I've already chatted to him about some additions to the program. We will be introducing 3 minute student/ECR presentations for all poster presenters. This will provide students/ECRs a chance to practice their scientific 'elevator pitch' and also provides a great opportunity to network later at the conference dinner. We are also providing travel grants again so if you are a PhD student or within 2 years of completing your PhD, and presenting a poster or an oral talk at the symposium, please submit your application by 20th January 2018. These travel grants are highly competitive so make sure to take the time to prepare your application.

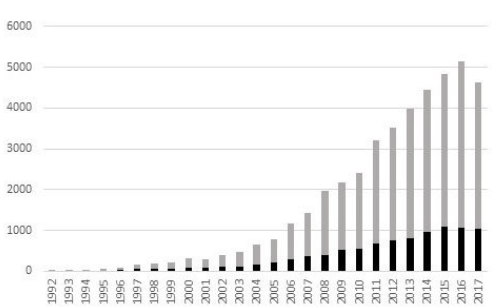
From the Editor

If you have anything you would like to see in the next issue of the INSOAP newsletter, send it directly to sarah.shigdar@deakin.edu.au. Please ensure that your articles and information are in by close of business on 31st August 2017

Aptamers Journal

We announced the official journal of INSOAP at Aptamers 2017. Please email us at aptasoc@gmail.com to express your interest in joining the editorial or reviewer team. Please see http://libpubmedia.co.uk/aptamers/ to submit your article.

Aptamer round-up for 2017



Each year I generally receive an email asking me to contribute to a special issue on aptamers for a particular journal. In the last 6 months, I received three requests. I think that means we're starting to break into mainstream. We have seen the number of publications each year peak, with close to 1100 publications each year for the last three years, according to PubMed. I know my PubCrawler search is giving me around 20 new articles that have been published each week. And remember that PubMed only provides indexed journals so there are more papers than are represented in this graph with the black bars. For the same search, Google Scholar returns around three times as many papers (grey). We're hoping to have a list together of aptamers for the next newsletter so watch this space. Also, depending on which global market report you read, the aptamer market is expected to grow by around 18-28% within the next seven years. Diagnostics have so far dominated the market, with a growing demand for biomarker discovery, molecular imaging, diagnosing chronic diseases, and other diagnostic applications. However, in the next few years, therapeutic applications may see rapid growth as aptamers exhibit several advantages to other modalities. There are currently 32 clinical trials listed at Clinicaltrials.gov though I'm hoping to see that number increasing soon as more researchers partner with industry and demonstrate superior results to current therapeutics for a number of diseases. We've seen from the attendance at our symposium, the number of companies interested and invested in aptamers has been increasing over the last four years, and I am having many conversations with sales and technical representatives from larger companies regarding how aptamers can be used for many applications that have previously been the mainstay of antibodies. It will be interesting to see what I'll be writing next year in terms of publications, clinical trials, and company engagement!

Share your stories

One of the comments made by Dr Julian Tanner in his interview made me chuckle, and I wonder how many of you do the same. Julian said that he is always trying to find an aptamer angle when he is discussing research with colleagues. I am constantly promoting aptamers to colleagues at conferences, and have had many a conversation, especially here in Australia, regarding how aptamers could solve someone's problem. My main field of research is in circumventing the blood brain barrier to deliver drugs specifically to a diseased cell. So of course, whenever I have discussions at conferences about the inability to get drugs across the blood brain barrier, my first comment is about the aptamers I've developed. But I also have many discussions about chemotherapeutic delivery and how difficult it can be to attach drugs to antibodies and maintain their specificity and sensitivity. I then discuss the many aptamers that have been developed to various targets and attempt to match these aptamers with the researcher's area of interest. I also fully promote the many benefits of aptamers as therapeutic agents, such as their small size, their lack of immunogenicity, and their lack of batch to batch variation. I've had some great conversations and have developed many friendships. I've also won a few prizes along the way, and I'm slowly moving a small group of researchers away from antibodies to start working with aptamers. So, do you have a story from an encounter at a conference or with a researcher that has led to a great networking opportunity?

Diagnosing bacterial and viral infections – can we do it quicker?

In the last edition of the newsletter, we published an article about aptamers replacing antibodies in traditional assays and suggested that aptamers will gain their foothold in the diagnostic arena due to their uniqueness. I thought I'd provide some more details on how aptamers are proving their uniqueness in a number of ways. I was recently at a conference where there was a discussion on the need to diagnose viral and bacterial infections as fast as possible and I was reminded of the DREFLA (dual-recognition element lateral flow assay) technique that Professor Anthony Cass presented at the conference earlier this year (1). This assay is capable of differentiating specific influenza strains from other similar strains. More specifically, this device pairs antibodies and aptamers, to overcome the cross-reactivity of antibodies and the slow binding kinetics of aptamers, to discriminate a particular virus strain against those of the same subtype or other common respiratory diseases in a lateral flow device. It's hard to overstate the importance of such an exciting device or the life-saving potential it represents in its application. The use of this technology during an outbreak scenario would allow not only accurate, but critically, rapid in-field diagnosis not just of viral presence but also sub-typing of those tricky H and N numbers. Knowing such information quickly will allow for much more effective interventions to be put in place. A conversation I had at the same conference was with a researcher from the UK who is developing a device to rapidly diagnose the common cold. Obviously, this could provide real impact in GP surgeries and emergency departments and has the potential to save both time and money when it becomes available in the near future. But what about other applications that can have a major impact in healthcare? Could we develop aptamers to some of the more potent food borne bacteria and be able to address the ever growing food safety concerns? There are a number of aptamers that are being generated for the development of rapid detection methods and proving to be more reliable and speedier than the traditional microbiological testing methods of plate counting or qPCR. What about pan-specific aptamers that recognise conserved regions so we can detect more than one bacteria at once. A study reported this year showed the viability of producing individual aptamers capable of specifically binding a number of unrelated bacterium whilst showing low cross-reactivity to other bacteria (2). Could such a technique not be used to generate a device that in one test can detect any or all of the most common food-poisoning bacteria, saving both time and money? And if we can, then why limit ourselves to food safety concerns? What of a device utilising pan-reactive aptamers capable of detecting the most common nosocomial infectious agents, be they bacterial or viral, for use in hospitals and age-care facilities? Aptamers can also be generated to detect the microbial metabolic products, such as bio-toxins. And if we can detect different strains of viruses and bacteria, can we take this one step further to detect arising mutations that may lead to therapeutic resistance? And once we have these developed, can we use them to block the function of essential proteins and thus use them as therapeutic agents? A search on PubMed using the term 'aptamer AND bacteria' finds 310 publications from the last 12 months, with some very interesting applications described and using Google Scholar that same search saw a 5-fold increase in publications in the 10 years ending 2016, greater than the overall increase in aptamer publications for the identical period. Given the growing aptamer market in diagnostics, I'd say that we may well be seeing an explosion of diagnostic devices in the next 5 years, with the uniqueness of aptamers providing unparalleled success in this area.

1. Le TT, Chang P, Benton D, McCauley JW, Iqbal M, Cass AEG. Dual Recognition Element Lateral Flow Assay (DRELFA)-Towards Multiplex Strain Specific Influenza Virus Detection. Analytical Chemistry. Published 2017/5/30

2. Song MY, Nguyen D, Hong SW, Kim BC. Broadly reactive aptamers targeting bacteria belonging to different genera using a sequential toggle cell-SELEX. Sci Rep. 2017 Mar 8;7:43641.

Interview with a researcher: Julian Tanner

One of the suggestions to come out of the AGM this year was a request for interviews with leaders in the field of aptamer research. This edition sees an interview with Dr Julian Tanner, our 2018 Symposium Chair, who is based at University of Hong Kong

Julian's research field is nucleic acid nanotechnology and applied molecular evolution for biomedical application. The Tanner lab brings together interdisciplinary experimental approaches at the interface of science, medicine and engineering to tackle major challenges in global health. His highly internationalised research team have developed radical new approaches for the point-of-care diagnosis of malaria, bridging nucleic acid evolution to 3D printing to clinical application. Recent accomplishments include the development of innovative designs of DNA nanotweezers and DNA origami, enabling sensing and detection of biomolecules driven by triggers of conformational change at the nanoscale. In more basic research, his team is exploring the biological functions of the fundamental yet enigmatic long-chain inorganic polyphosphates. Julian also has experience in educational research, with particular interest in how to build the best environment for research excellence and student achievement at the nexus between research, teaching and innovation.

Q1) How did you become interested in the field of aptamers?

I started out as a chemical biologist and protein biochemist. I had interests in evolutionary methods to develop inhibitors of enzymes then learnt more about aptamers. The directed evolution aspect of aptamers really attracted my interest as a postdoc then I wrote my first grant on aptamers as I established my own laboratory here at the University of Hong Kong.

Q2) From your point of view, what is unique about aptamers?

I think the SELEX process to identify aptamers is probably the fastest in vitro evolutionary experiment. I love the concept of developing functional molecules by evolution rather than by design. And then the applications and potential for collaboration – anyone I speak to I can imagine an aptamer angle on their particular challenge. Multidisciplinary collaboration is where there is so much opportunity for discovery and learning - aptamers can open that door in many ways.

Q3) What do you think is the future of aptamers?

Many exciting angles in future, but I will mention two. One is all of the new chemistries which long-term will enable all sort of functionalities of nucleic acids. Coupling the diversity of protein types of biochemistries to the ability to replicate molecules by PCR will be exceptionally powerful when all the tools are in place. The second is the integration of aptamers into the fast-developing field of nucleic acid nanostructures and supramolecular chemistries. Very exciting areas to be learning about.

Q4) What are the major challenges that need to be solved?

I am always asked why aptamers cannot be so routinely applied as antibodies yet across the range of techniques for which antibody use is routine. It would be great to develop methods which are more robust to enable more widespread aptamer adoption. Maybe the new chemistries will solve that.

Q5) What we should do for the aptamer science?

The field overall needs more funding, more awareness, more collaboration, more impact. A couple of big success stories with real-world impact then I think it can happen.

Q6) Tell us about your research.

Our focus is in diagnostic applications of aptamers and integrating aptamers with nanostructures. We have made significant progress on aptamers for malaria diagnosis – I hope that can make a

real clinical impact soon. The aptamers with nanostructures work is very fun and I am learning a new field.

Q7) How did you know about the INSOAP?

Through the annual Oxford aptamer meetings.

Q8) How will you support the INSOAP?

Attend the Oxford meetings and help out with the newsletter. I hope to spread awareness in Asia in particular – at present the aptamer communities are a little too disparate globally.

Q9) What kind of advice can you give to the young researchers about aptamers?

Find an angle you are passionate about and try your best to be creative.

Q10) What is your personal philosophy on life and science?

It is a privilege to work in science which is one of the great human accomplishments. But it is important to find balance in your life so that you can thrive with the ups and downs of laboratory research, grant cycles and paper rejections!

Q11) What is your favourite part about research?

I love the potential for learning and then matching that to solving real-world problems. The way that as your interests shift from year to year, and what you feel is most important change, you can adjust the research direction. That is exciting.

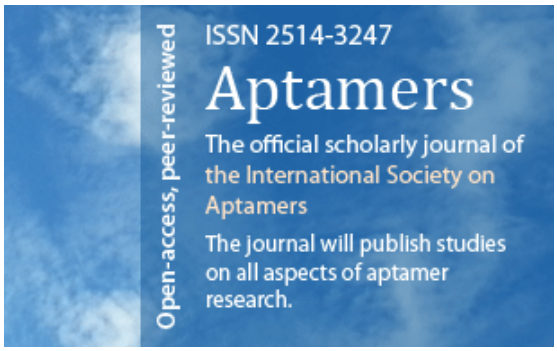
Q12) What do you like to do in your free time?

I am a pretty busy father with three children, play a lot of music and play lots of squash. It is important to balance your scientific research with other areas of your life so they all complement and help support each other.

Q13) Any other fun facts/tidbits you'd like us to know!

I am based in Hong Kong – I'd love to welcome anyone in the aptamer community to this great city – just drop me an email at jatanner@hku.hk. It is also the perfect stopover en route anywhere else in Asia so think about it for your next trip through the region.

Aptamers Journal



The Aptamers journal is the official journal of the International Society on Aptamers and will publish studies on all aspects of aptamer research. The journal has a strong belief that both positive and negative data can have a large impact on scientific research so we encourage the submission of both. Do you have a troubling troubleshooting issue that you want to share? A protocol that you are proud of and want to share? Or even some R & D news or an Editorial you want to contribute? We would like to hear from you. We will also be accepting full research articles, research reports, reviews and mini reviews, as well as meeting reports. We're hoping to publish the first meeting report of 4th Aptamers Symposium soon. So if you'd like to publish your work in the first Aptamers journal, please follow this link http://libpubmedia.co.uk/aptamers/. We will be publishing free of charge until 15th December 2017. Have you seen our first articles?

Nominations for INSOAP committee

We are currently asking for expressions of interest for membership of the management committee of INSOAP. If you would like to be an integral part of our Society as it moves forward, please contact me at sarah.shigdar@deakin.edu.au.

Updates to the website

We have been working on updating the website for INSOAP and you will now see that we have a listing of all aptamer companies throughout the world, as well as a listing of all the aptamer laboratories to date. If we haven't got you listed, please get in touch and we will add you to our growing list. We are also providing a careers page so please get in touch with any vacancies you wish to be listed. Finally, if there are any suggestions for improvements to the website, please contact us and we will make the changes.

Keep in touch

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