International Society on Aptamers

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EDITORIAL

Welcome to the 2018 first issue of INSOAP times, your source to what's happening in the aptamer world presented by the INSOAP team. Happy New Year everyone. I hope you had a great start to 2018. New questions to be asked, new answers to be discovered, new topics to be discussed and old topics to be updated this year. We are currently gearing up for the 5th Aptamer Symposium to be held at Oxford, UK on April 11-12th 2018. Registration is open and we are looking forward to catching up with you all in April. If you've been keeping an eye on the program schedule, you'll be aware that Emeritus Professor Uli Hahn is receiving a life-time achievement award. I can't tell you how happy I'll be to see Uli receive this. He has been a member of INSOAP since the beginning and has brought his outstanding humour to the conference each year. You'll also remember that we featured Uli in our 'Interview with a researcher' section in our first newsletter issue last year. I'm also excited about our new feature at the conference this year which will see poster presenters giving flash talks.

You will see a few updates in this newsletter as we try to stay ahead of changes. We have updated the companies offering aptamer based services globally, and provided an update on clinical trials of various aptamers. We also have a new section on new aptamers and in this newsletter we covered the aptamers generated in 2017. In each issue, we will be providing updates on which new aptamers are appearing in the literature. If you'd like to ensure your aptamers make the list, please get in touch with us. We've also, keeping with our intention of introducing you to as many researchers as possible, interviewed Professor Dr Beatrix Suess and I hope you enjoy her answers to the questions as much as we have!
I would like to take this opportunity to thank the entire INSOAP team for their efforts, and generation donation of time and talent. Things wouldn't have been possible without you and I am greatly appreciative of all the assistance of the team for ensuring we produce timely updates for INSOAP. If you would like to contribute to the newsletter, please get in touch! As always, the INSOAP welcomes your ideas and suggestions.

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/. Please don't forget to also follow us on twitter (@Aptamer Society, @Japtamers).

May you all have a great few months, and we'll see you in Oxford in April!

Dr Sarah Shigdar
President

Inside this issue:

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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://JAptamers.co.uk to submit your article.

Aptamers 2018 Symposium

Web: http://libpubmedia.co.uk/aptamers-2018
Twitter: @AptamerSociety; @JAptamers; #AptaOx18
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I'm so excited reading our list of confirmed speakers for the 5th symposium. There are so many familiar names, both from previous attendees at the conference and from papers that I've read. As we are all focussed on developing our aptamers for clinical applications, I'm also pleased to announce that we will have a presentation from a patent attorney. I'm so happy to announce additional sponsors, and we have secured a sponsor for best poster award. Which leads me to our new feature at the conference this year – 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. As I mentioned in the editorial, we are also awarding our inaugural life-time achievement award to Emeritus Professor Ulrich Hahn and I can't wait to hear his speech. While we wait for the conference, check out our report on last year's conference in the Aptamers Journal. See you all in April in Oxford! And if you can't make it, check out our conference report in the Aptamers Journal later this year.

We would like to thank our sponsors (so far) for their generous support, making this meeting possible.

GOLD RIBOMIC · SILVER SomaLogic · SILVER Centauri THERAPEUTICS · SILVER pure biologics · BRONZE aptamer group novel solutions driving discovery

Aptamers Journal

Aptamers The Official INSOAP 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://JAptamers.co.uk.

Aptamers generated in 2017 – list of newly published aptamers

It has been an ongoing challenge to maintain and update a resource to reliably search for aptamers and their targets. There have been several efforts towards storing aptamer information in a database format. For example, Ponomarenko et al. developed the first aptamer database, SELEX_DB, in 2002 that focused on sequences from SELEX to help define natural DNA and RNA recognition sites for proteins 1. In 2004, the Ellington group created a more complete database, the Aptamer Database, which encompassed information from all in vitro experiments 2. This database was intended for identifying aptamers and unnatural ribozymes that already existed as well as for collecting information about SELEX experiments to gain an understanding of the distribution of functional nucleic acids in the sequence space. In 2006, RiboaptDB was created and contained the same information as the Aptamer Database with a greater emphasis on artificial ribozymes 3. More recently, a collaborative database was introduced (Aptamer Base), using an openly licensed community-built resource 4. Ironically, the goal of this effort was to use this platform to keep the database readily available and updated. Unfortunately, all of these and other databases are either no longer publicly available, or are considerably out-of-date.

Perhaps one of the most currently functional databases is run through Aptagen (https://www.aptagen.com/aptamer-index/aptamer-list.aspx). Here, you can search a list of over 500 aptamers. However, this list is certainly far from complete! In fact, each month, there are several publications reporting new aptamers. In spite of this, the research community continues to make use of a small subset of common aptamers (e.g., thrombin, theophylline) 5. Therefore, our goal is to bring newly-reported aptamers to your attention! Specifically, in each issue we will provide a list of new aptamer targets that have been reported in the literature since the last Newsletter. We hope this will be a valuable resource.

Since this is a new effort, here we first provide a list of reported aptamers that have been characterized with a dissociation constant throughout 2017 (Table 1). We will be using the Pubmed search engine (keywords "aptamer" and "SELEX"). If we have missed any newly reported aptamers, please let us know (mmckeague@gmail.com)! Readers should consult the literature (link provided) for verification and further information.

Table 1: Newly-reported aptamers published in 2017.

Target	Link	Nucleic acid type
Human fatty acid binding protein (FABP3)	http://www.ncbi.nlm.nih.gov/pubmed/27545084	DNA
Proteasome-Associated Deubiquitylating Enzyme UCH37	https://www.ncbi.nlm.nih.gov/pubmed/27930845	RNA
von Willebrand Factor A1-Domain	https://www.ncbi.nlm.nih.gov/pubmed/27966933	DNA + one unnatural hydrophobic base
Human epidermal growth factor receptor 2 (HER2)	https://www.ncbi.nlm.nih.gov/pubmed/28122449	DNA
Group A Streptococcus serotype M3	https://www.ncbi.nlm.nih.gov/pubmed/28121169	DNA
Bacterial sepsis agents	https://www.ncbi.nlm.nih.gov/pubmed/28119514	DNA
Clenbuterol Hydrochloride	https://www.ncbi.nlm.nih.gov/pubmed/28161951	DNA
Respiratory syncytial virus	https://www.ncbi.nlm.nih.gov/pubmed/28220811	DNA
Vaccine antigen in the human papillomavirus (HPV) vaccine Gardasil	https://www.ncbi.nlm.nih.gov/pubmed/28233502	Somamer
Geniposide	https://www.ncbi.nlm.nih.gov/pubmed/28264528	DNA
Carbendazim	https://www.ncbi.nlm.nih.gov/pubmed/28264568	DNA
Proprotein convertase subtilisin/kexin type 9	https://www.ncbi.nlm.nih.gov/pubmed/28265062	Somamer
E. coli, E. aerogenes, K. pneumoniae, C. freundii, B. subtilis, and S. epidermidis	https://www.ncbi.nlm.nih.gov/pubmed/28272554	DNA
AMPA and kainate receptors	https://www.ncbi.nlm.nih.gov/pubmed/28325839	RNA
Dimethylindole red	https://www.ncbi.nlm.nih.gov/pubmed/28391845	DNA
Filament vimentin	https://www.ncbi.nlm.nih.gov/pubmed/28396463	RNA
Bifidobacterium bifidum	https://www.ncbi.nlm.nih.gov/pubmed/28441340	DNA
Gremlin-1	https://www.ncbi.nlm.nih.gov/pubmed/28452949	DNA
Mycobacterium tuberculosis	https://www.ncbi.nlm.nih.gov/pubmed/28454652	DNA
Benzylpenicillin	https://www.ncbi.nlm.nih.gov/pubmed/28522308	DNA
Coagulation factor Xia	https://www.ncbi.nlm.nih.gov/pubmed/28522812	DNA
VEGF and Doxycyline	https://www.ncbi.nlm.nih.gov/pubmed/28634758	DNA and RNA
ATP	https://www.ncbi.nlm.nih.gov/pubmed/28661647	RNA
Mycobacterium tuberculosis H37Rv	https://www.ncbi.nlm.nih.gov/pubmed/28689112	DNA
Cholangiocarcinoma (CCA) cells	https://www.ncbi.nlm.nih.gov/pubmed/28713479	DNA

Glucagon receptor (GCGR)	https://www.ncbi.nlm.nih.gov/pubmed/28775305	DNA
Amanita phalloides	https://www.ncbi.nlm.nih.gov/pubmed/28787470	DNA
E. coli O157	https://www.ncbi.nlm.nih.gov/pubmed/28818557	DNA
Insulin like growth factor II receptor	https://www.ncbi.nlm.nih.gov/pubmed/28839458	RNA
renal cell carcinoma	https://www.ncbi.nlm.nih.gov/pubmed/28841985	DNA
CD123	https://www.ncbi.nlm.nih.gov/pubmed/28845698	DNA
Posaconazole	https://www.ncbi.nlm.nih.gov/pubmed/28861519	DNA
Human lung cancer cell line PC-9	https://www.ncbi.nlm.nih.gov/pubmed/2887519	DNA
PD-1 and PD-L1	https://www.ncbi.nlm.nih.gov/pubmed/28912094	XA Library
Muscovy duck parvovirus	https://www.ncbi.nlm.nih.gov/pubmed/28917743	DNA
Lysosomal-associated membrane protein 1	https://www.ncbi.nlm.nih.gov/pubmed/28918021	DNA
Cytotoxic T lymphocyte antigen-4	https://www.ncbi.nlm.nih.gov/pubmed/28918052	DNA
LAG3 (CD223)	https://www.ncbi.nlm.nih.gov/pubmed/28934318	RNA
Thrombin	https://www.ncbi.nlm.nih.gov/pubmed/28938065	Diversely functionalized DNA
Pseudomonas aeruginosa 692 (PA692)	https://www.ncbi.nlm.nih.gov/pubmed/28937998	DNA
Proteolytic Amyloidogenic Fragment of β2 m	https://www.ncbi.nlm.nih.gov/pubmed/28960840	DNA
Sickle Hemoglobin	https://www.ncbi.nlm.nih.gov/pubmed/29039727	2'F-RNA
Interleukin 2 receptor alpha	https://www.ncbi.nlm.nih.gov/pubmed/29055191	DNA
Breast cancer cells	https://www.ncbi.nlm.nih.gov/pubmed/29054799	DNA
Mammaglobin B (MGB2) and mammaglobin A (MGB1)	https://www.ncbi.nlm.nih.gov/pubmed/29101327	DNA
Escherichia coli O157:H7	https://www.ncbi.nlm.nih.gov/pubmed/29242148	DNA
EpCAM	https://www.ncbi.nlm.nih.gov/pubmed/29245156	DNA
Polymorphonuclear myeloid-derived suppressor cells	https://www.ncbi.nlm.nih.gov/pubmed/29290791	DNA
Lambda cI repressor	https://www.ncbi.nlm.nih.gov/pubmed/29284756	RNA
Fipronil	https://www.ncbi.nlm.nih.gov/pubmed/29283416	DNA

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Aptamers in clinical trials

Aptamers embrace refined properties as therapeutic molecules that are functionally comparable to antibodies such as the high binding affinity and specificity. However, aptamers have superior advantages compared to antibodies including low toxicity, lack of immunogenicity, can be chemically modified and functionalized with stealth stabilizing motifs, fast chemical and enzymatic production, small size which allow deep tissue penetration, can be selected to bind wide range of targets and can distinguish very closely related molecules, highly stabile and have flexible structure. For therapeutic approaches, aptamers can work as agonist, antagonist, and targeting ligand for drug delivery. Although, aptamers were discovered 28 years ago, there is only one federal approved aptamer-based drug, Pegaptanib (Macugen), which is anti-VEGF used for the treatment of AMD. Moreover, there are several aptamers involved in clinical trials (Table 1), either as direct therapeutic molecules or as targeting ligands for selective delivery of other therapeutic molecules. Such clinical trials offer valuable information for more understanding of aptamers behaviour in human. Despite the tremendous success and the future promises of using of aptamers as therapeutics, there are crucial challenges that need to be solved. The physiochemical properties are complicated and need more investigation and development, the lack of safety data, the pharmacokinetics and pharmacodynamics are not well understood and need more deep exploration. Moreover, the protection by intellectual properties portfolio limit the commercial use and distribution of aptamers. In addition, the promising clinical applications of aptamers need more education and expansion into clinical practitioners. There are more and more researchers dedicated to develop aptamers for clinical applications and the believe that such efforts will provide more understanding to the behaviour aptamers as therapeutic molecules and provide class of therapeutic aptamers that meet the market demands.

Table 2: Clinical trials on aptamers

Location	Aptamer/ Drug	Phase	Status	Condition or disease	Trial Name
Xijing Hospital Nuclear Medicine Department, Xi'an, Shaanxi, China Xijing Hospital, Xi'an, Shaanxi, China (2017-	68Ga-Sgc8	Early phase 1	Recruiting	Colorectal cancer	The Clinical Application of 68Ga Labeled ssDNA Aptamer Sgc8 in Healthy Volunteers and Colorectal Patients
No Contacts or Locations Provided (2016-	No information	No informati on	Active	Arrhythmia AtrialFibrillation Hypertension Diabetes Mellitus	Atrial Fibrillation Research In CATalonia (AFRICAT)
Fresno, California, United States Fullerton, California, United States Mountain View, California, United States and other 31 more locations (2016-	Zimura	Phase 2	Recruiting	Geographic Atrophy macular degeneration	Zimura in Subjects With Geographic Atrophy Secondary t Dry Age-Related Macular Degeneration
University of California Irvine, Orange, California, United States (2015	No information	No informati on	Recruiting	Urinary Bladder Neoplasms	Molecular Biosensors for Detection of Bladder Cancer
Pheonix, Arizona, United States (2015-2017)	Zimura	Phase 2	Completed	Idiopathic Polypoidal Choroidal Vasculopathy (IPCV)	Establish the Safety and Tolerability of Zimura® (AntiC5 Aptamer) in Combination With Anti-VEGF Therapy in Subjects With (IPCV)
Pheonix, Arizona, United States Beverly Hills, California, United States Sacramento, California, United States and other 21 more locations (2015-2017)	Anti-PDGF BB Pegylated A ptamer/ Fo vista®: bevacizuma b : ranibizuma b : aflibercept	Phase 2	Terminated	Age related Maculare degeneration	An 18 Month Phase 2a Open Label, Randomized Study of Avastin®, Lucentis®, or Eylea® (Anti-VEGF Therapy) Administered in Combination With Fovista® (Anti-PDGF BB Pegylated Aptamer)
Retinal Consultants of Arizona, Phoenix, Arizona, United States (2014-2015)	Fovista™(A nti-PDGF-B pegylated a ptamer) Drugs: Lucentis® Anti-VEGF \ Avastin® Anti-VEGF \ Eylea® Anti-VEGF	Phase 1	Unknown Status	Neovascular Age-Related Macular Degeneration	An Open-Label Investigator Sponsored Trial to Investigate th Safety, Tolerability and Development of Subfoveal Fibrosis By Intravitreal Administration of Altering Regimens of Fovista and Anti-VEGF Therapy in Subjects With Neovascular Age-Related Macula Degeneration
Gilbert, Arizona, United States Phoenix, Arizona, United States Tucson, Arizona, United States	E10030, Drug bevaci zumab or aflibercept\ E10030 sham	Phase 3	Terminated	Age related maculare degeneration	A Phase 3 Safety and Efficacy Study of Fovista® (E10030) Intravitreous Administration in Combination With Either Avastin or Eylea® Compared to Avastin® or Eylea® Monotherapy

and other 204 more locations (2014-2017)					
Germany/ Italy/ United kingdom (2014-2015)	Lexaptepid pegol (NOX-H94) (anti-hepcidin L-RNA-aptamer)	Phase 1,2	Completed	Anemia End Stage Renal Disease	Lexaptepid Pegol (NOX-H94) in ESA-hyporesponsive Anemia in Dialysis Patients
Phoenix, Arizona, United States Bakersfield, California, United States Beverly Hills, California, United States and other 112 more locations (2013-2017)	E10030, Drugs: ranibizumab \ E10030 sham	Phase 3	Terminated	Age related maculare degeneration	A Phase 3 Safety and Efficacy Study of Fovista® (E10030) Intravitreous Administration in Combination With Lucentis® Compared to Lucentis® Monotherapy
Bankstown Lidcome Hospital Bankstown, New South Wales, Australia Royal North Shore Hospital Sydney, New South Wales, Australia Barwon Health Geelong, Victoria, Australia and other 2 more locations (2013-last update 2017)	Nab-Paclitaxel	Phase 2	Active	Breast cancer	IST Neoadjuvant Abraxane in Newly Diagnosed Breast Cancer (Neonab)
Retina Institute of Hawaii, Honolulu, Hawaii, United States, (2011-	pegaptanib sodium (Macugen)	Phase1	Completed	Proliferative Diabetic Retinopathy (PDR)	A Single-Center Trial of Intravitreous Injections of Macugen (Pegaptanib Sodium) Given at Least 7 Days Before Vitrectomy Secondary To Tractional Retinal Detachment in Proliferative Diabetic Retinopathy
Retina Institute of Hawaii, Honolulu, Hawaii, United States (2011-	pegaptanib sodium (Macugen)	No information	Available	Diabetic Macular Edema	A Single-Center Trial of High Frequency Pegaptanib for Rapid Restoration of VEGF Levels in Diabetic Retinal Edema (GUARDIAN)
Palmetto Retinal Center, West Columbia, South Carolina, United States (2010-2017)	E10030 plus Lucentis Drug	Phase 2	Completed	Age related macular degeneration (AMD)	E10030 (Anti-PDGF Pegylated Aptamer) Plus Lucentis for Neovascular Age-Related Macular Degeneration
Scope Life Sciences GmbH Hamburg, Germany (2009-2014)	NOX-A12	Phase 1	Completed	Autologous Stem Cell Transplantation	NOX-A12 First-in-human (FIH) Study
Ophthotech, New York, New York, United States (2009-2017)	ARC 1905	Phase 1	Completed	Age related maculare degeneration	ARC1905 (Anti-C5 Aptamer) in Subjects With Dry Age-related Macular Degeneration
No Contacts or Locations Provided (2009-2013)	NOX-E36	Phase1	Completed	Chronic Inflammatory Diseases Type 2 Diabetes Mellitus	NOX-E36 First-in-Human (FIH) Study

				Systemic Lupus Erythematosus	
Ophthotech Corp, New York, New York, United States (2008-2012)	ARC1905	Phase 1	Completed	Age related macular degeneration (AMD)	ARC1905 (ANTI-C5 APTAMER) Given Either In Combination Therapy With Lucentis® 0.5 mg/Eye In Subjects With Neovascular Age-Related Macular Degeneration
No Contacts or Locations Provided (2008-2009)	ARC1779	Phase 2	Withdrawn (sponsor decided not to go forwaed with the study)	Von Willebrand Disease	A Study of the Pharmacokinetics, Pharmacodynamics, and Safety of ARC1779 Injection in Patients With Von Willebrand Disease Type 2B
Archemix Investigational Site, Vienna, Austria (2008-2009)	ARC1779	Phase 2	Completed	Purpura, Thrombotic ThrombocytopenicV on Willebrand Disease Type-2b	ARC1779 Injection in Patients With Von Willebrand Factor-Related Platelet Function Disorders
Denise Teuber, New York, New York, United States (2007-2010)	E10030	Phase 1	Completed	Age related macular degeneration (AMD)	A Phase 1, Safety, Tolerability and Pharmacokinetic Profile of Intravitreous Injections of E10030 (Anti-PDGF Pegylated Aptamer) in Subjects With Neovascular Age-Related Macular Degeneration
Charlotte Eye, Ear, Nose and Throat Associates, P.A., Charlotte, North Carolina, United States (2006-2007)	pegaptanib sodium	Phase4	Terminated	Macular degeneration	A Clinical Trial to Explore the Safety and Efficacy of Three Different Doses of Pegaptanib Sodium in Patients With Wet Age-Related Macular Degeneration (AMD)
National Heart, Lung and Blood Institute (NHLBI), Bethesda, Maryland, United States (2005-2008)	REG1	Phase 1	Completed	Health\ anticoagulant treatment	Safety and Dosing Evaluation of REG1 Anticoagulation System
National Eye Institute (NEI), Bethesda, Maryland, United States (2003-2008)	EYE001 (Anti-VEGF Pegylated aptamer)	Phase 1	Completed	Hippel-Lindau disease	EYE001 to Treat Retinal Tumors in Patients With Von Hippel-Lindau Syndrome
No Contacts or Locations Provided (2002-2006)	pegaptanib sodium (Macugen)	Phase 2	Completed	Diabetic macular edema	Pegaptanib Sodium Compared to Sham Injection in Patients With DME Involving the Center of the Macula
No Contacts or Locations Provided (2002-2006)	pegaptanib sodium (Macugen)	Phase 2,3	Completed	Age related macular degeneration	Study of the Safety, Tolerability and Pharmacokinetics of 1 Mg/Eye and 3 Mg/Eye Pegaptanib Sodium in Patients With Exudative Age-Related Macular Degeneration (AMD)
No Contacts or Locations Provided (2001-2006)	pegaptanib sodium (Macugen)	Phase 2,3	Completed	Age related macular degeneration	A Clinical Trial to Explore Safety and Efficacy of Different Doses of Pegaptanib Sodium, Compared to Sham, in Patients With Wet AMD
Foundation for Fighting Blindness, Baltimore, Maryland, United States (2001_2005)	EYE001 (anti-VEGF apta mer)	Phase 2,3	Completed	Macular Degeneration Choroidal Neovascularization	Phase II/III Study of Anti-VEGF in Neovascular AMD

Aptamer Companies- Updated!!

Given the growing market in the field of aptamers in recent years and few lingering questions in my mind, I thought of performing extensive web search about aptamer companies and updating the list of companies offering aptamer based services or involved in aptamer research. Are there more companies involved in aptamer research than we know off? Are the companies focused in therapeutics only? Are they all clustered in the US? Quite unexpectedly, I found companies that focus on aptamer development are present worldwide and not limited to the US. As a matter of fact, there are more companies in Europe and UK compared to the US and more and more companies emerging in the Asia Pacific region. Another interesting observation I found during my search is aptamer development in the industry is not restricted to therapeutic applications. Several companies are working towards translating basic aptamer science into development of customizable diagnostic assays and detection products. Furthermore, these companies are developing and using diverse and innovative ways of aptamer selection technology starting from basic chemical synthesis of aptamers through SELEX to use of exclusive technologies such as High Throughput Screening of Aptamers (HTSA) approach and Rapid Isolation of DNA Aptamers (RIDA) method for aptamer discovery. I hope to see all these promising companies growing tremendously in the near future and more new companies coming up and bringing aptamer based products and services to the customers all around the globe.

Table 3. Commercial entities working on aptamers

Name of the aptamer company	Location	Focus and exclusive technology
2bind, GmbH	Germany	The company's customers and collaborators mainly work in the fields of drug development, aptamer generation, and antibody discovery.
AM Biotechnologies	USA	The company uses a proprietary bead-based technology to select X-Aptamers.
AMSBIO'S	UK/USA/Deutschland/ Switzerland	The company provides a full range of high quality custom services for a number of key areas including aptamers.
Aptabharat	India	The company aim to address all the diagnostic and research need by creating specific and high affinity aptamers and by developing aptamer based innovative diagnostic assays, research and teaching products
Aptagen	USA	The company offers aptamer (synthetic antibody) products and services as research reagents, diagnostic and biomarker discovery tools, as well as for use in drug discovery and targeted delivery for therapeutics, and bioindustrial applications.
Aptahem	Sweden	The company develops aptamer-based pharmaceuticals for the treatment of life-threatening conditions in which a combination of coagulation and inflammation are involved.
Aptamer Group	UK	The Aptamer Group of companies focuses on the development of aptamer technologies. The company develop nucleic acid aptamers for use in research & development, biomarker discovery, diagnostics or therapeutic developments.
AptaIT GmbH	Germany	The company is providing innovative solutions to exploit the full potential of next-generation sequencing data analysis and SELEX: Custom NGS data analysis services and software platform COMPAS.
Aptamer Sciences, Inc.	South Korea	The company is focused on commercializing cutting-edge technologies for analysis of proteins, based on its proprietary aptamer technology platforms.
Apterna	UK	The company focuses on developing chemically synthesized RNA aptamers that bind to target molecules with outstanding specificity and affinity. They are developing internalizing RNA aptamers that enable targeted delivery of various payloads including RNA, toxins, enzymes, chemotherapy agents, photodynamic molecules, radionuclides and nanocarriers.
Aptitude Medical Systems	USA	The company is revolutionizing molecular recognition – they are enabling the interaction with key molecules which have been out reach. Their products allow detection and manipulation of proteins for cancer, autoimmune, heart disease, and personalized drug response. The company's systems are integrated in devices which are deployable outside of central facilities, directly at the point of care.
Aptus Biotech S.L	Spain	APTUS activities are focused on: • Aptamer selection services.

		• Supply of customized aptamers for different biotechnological applications. • R&D projects in collaboration with other research centers and companies, where aptamers provide a competitive advantage.
Apta Biosciences	UK/Singapore	The company's focus is on the development of next generation affinity molecules for bespoke diagnostic applications.
AptaMatrix	USA	The company's focus is to accelerate the rate of aptamer discovery using its patent pending High Throughput Screening of Aptamers (HTSA) approach in addition to developing its novel AlloSwitch™ sensor technology capable of a) creating rapid diagnostic tools for detection of chemical and biological targets, and b) leveraging this diagnostic platform for drug discovery applications.
AptaTargets	Spain	The company is focused in developing therapeutic applications based on aptamer technology.
ATDBio Ltd	UK	The company supplies a wide range of custom-made unmodified and chemically modified oligonucleotides for small and large scale applications.
AuramerBio	New Zealand	The company specializes in the translation of aptamer science into analytical tools and diagnostic assays. It provides customizable sensing solutions for medical and environmental research and beyond.
Base Pair Technologies	USA	The company is the provider of highly customized aptamer discovery and development services.
BBI Group	UK	No response from the company yet
Centauri Therapeutics Ltd	UK	The company's Alphamer™ technology is based on "programmable immunity" in which chemically synthesised molecules redirect naturally occurring antibodies to selected pathogens to fight the infection. The molecules have two distinct parts: one end binds a cell-surface target on the pathogen using an aptamer whereas the other end presents specific epitopes that attach to the circulating antibodies.
DSM Biotechnology	Netherlands	No online information available.
Dhewa Biotech Private Limited	India	The company provides services of aptamer, aptamer library, monoclonal antibodies, antibody & diagnostics and biosensors
Firefly Bioworks		Acquired by Abcam
Iba GmbH	Germany	The company is dedicated to providing high quality product and service solutions for life science research in industry and academia. The comprehensive portfolio ranges from nucleic acid custom services to products and services for cloning, transfection, recombinant protein production and cell isolation.
Integrated DNA Technologies (IDT)	Global(USA/Europe/Asia-Pacific/Australia/Japan)	IDT synthesize nucleic acid aptamers and aptamer libraries, and collaborate with outside research groups on aptamer design and aptamer applications.
Izon Science	Global (USA/Europe/Asia-Pacific)	PhD student in the company are working on developing new platform for sensitively detecting small molecules like environmental pollutants using aptamer functionalized nanoparticles in conjunction with Izon's resistive pulse sensing technology.
LC Sciences	USA	The company provides unique aptamer microarray services using a novel µParaflo® technology, a list of aptamer sequences, and sequence design software. The aptamer microarrays are applied for protein bindings, drug candidate screening, and biosensor engineering.
LFB Biotechnologies	France	The company has patents and publication related to aptamer work. No additional information is available.
NeoVentures Biotechnology, Inc.	Canada	The company develops aptamers for different applications such as diagnostics, aphoresis, target identification/validation, therapeutics, and affinity column platforms.
Nexmos	Korea	Nexmos is focusing on research and development of early diagnosis devices for various diseases using aptamer.
Noxxon Pharma AG	Germany	NOXXON's proprietary technology generates compounds we refer to as Spiegelmers, which are a new class of therapeutics designed to combine the benefits of small chemical molecules and biologicals.
Novaptech	France	The company develops aptamer-based tools in the frame of technology transfer and innovation projects. The company's

		expertise is focused on the identification and the characterization of aptamers for biotechnological development of analytical and diagnostic aptamer projects.
Opthotech corp.	USA	The company's focus is developing novel therapeutics to treat ophthalmic diseases, with a focus on orphan and age-related retinal diseases.
OTC Biotech	USA	Company's website not available
Pure Biologics	Poland	The company is developing an innovative, chemically-modified aptamers discovery platform, called PureApta.
Ribomic	Japan	Ribomic Inc. aims to create artificial RNA aptamers to disease-causing proteins based on the aptamer's superior potential of strong and specific target capturing compared with antibody, and promotes their therapeutic development.
SomaLogic	USA	The company monitors health and disease through the analysis of protein concentration changes in biological samples. They developed the SOMAscan platform, which allows scientists and researchers to identify protein biomarkers for diseases and conditions, and apply them to drug and diagnostic research and development.
Tagcyx	Japan	TagCyx has established an innovative nucleic acid-based drug discovery platform, the "Xenoligo™ system". It enables screening of drug candidates from diverse oligonucleotide libraries containing the highly functional "fifth base", and stabilizing molecules using our proprietary technology.
Tocris Bioscience	USA	The company develops aptamers for CD133 and EpCam target.
TriLink Biotechnologies, Inc	USA	The company provides services for educators and academic researchers in gene therapy, nucleoside chemotherapy, oligonucleotide therapy, and diagnostics. It manufactures custom oligonucleotides, modified nucleoside triphosphates, and CleanAmp PCR products for research, diagnostic, therapeutic, and OEM markets; modified nucleic acid products, including phosphoramidites and other small molecules; and oligonucleotides, including custom synthesis and stocked oligonucleotides.
Veraptus	China	The company is focused on the research, development, and commercialization of Veraptus diagnostic and therapeutic aptamers.
Vivonics, Inc.	USA	The company has developed and patented a one-step rapid technique for developing Aptamers called RIDA. Rapid Isolation of DNA Aptamers (RIDA) is a technique for the isolation of high affinity and high selectivity Aptamers, which can be completed in days as compared to months and can produce better performing Aptamers.

Interview with a researcher: Beatrix Suess

Professor Dr Beatrix Suess studied Biology at the Ernst-Moritz-Arndt-University Greifswald and the Friedrich-Alexander-University Erlangen-Nürnberg. In Erlangen, she completed her PhD in the lab of Wolfgang Hillen studying structure-function relationship of a bacterial repressor protein TetR. It was the time when scientists discovered that RNA is more than simply the blueprint of our genome but that it has important cellular functions on its own. Therefore she decided to study this interesting biomolecule, with a special focus on the use of *in vitro* selected RNA molecules, so called aptamers, as molecular switches. During her time as junior group leader, she spent some time as a research fellow in the lab of Ron Breaker (Yale University) and Renee Schroeder (Vienna University). In 2007, she was appointed associated professor for Chemical Biology, and in 2013, full professor for Synthetic Biology at the Technical University, Darmstadt. Still, RNA is her main interest, and Beatrix wants to understand how RNA molecules can exert regulation.

Q1) How did you become interested in the field of aptamers?
To be honest – it was a fortunate coincidence. The topic was suggested by my former supervisor, right after finishing my PhD and I didn't really know what was coming, I was eager to learn something new, I never regret it … ☺
I was also fascinated by the interdisciplinarity of the field.

Q2) From your point of view, what is unique about aptamers?
Their perfect mixture of physics, chemistry, biology and how they interact with gene regulation. Also their widespread applicability (due to stability, size, inherent structure, specificity and affinity…) to a range of problems in vivo and in vitro.

Q3) What do you think is the future of aptamers?
Better and diversified SELEX will increase the ligand range, efficiency and open up new fields of research and application.

Q4) What are the major challenges that need to be solved?
Improved speed and reproducibility of SELEX, tackling difficult targets (maybe develop a universal SELEX procedure?), understanding the black box of the SELEX process better.

Q5) What we should do for the aptamer science?
Improve networks between people who need aptamers (specific or random) and people who have expertise in generating them. This would solve plenty of communications problems, speed up the development of real-world applications and further the standing of the field (e.g. as an alternative to antibodies).

Q6) Tell us about your research.
We specialize in developing novel, synthetic riboswitches based on small molecule binding aptamers. The goal is to establish a comprehensive and reliable toolbox for synthetic biology.

Q7) How did you know about the INSOAP?
From the very beginning, I was attending the Oxford Aptamer conferences – I was fascinated by the fact that there is a conference dedicated to the molecules I am mostly interested in ☺.

Q8) How will you support the INSOAP?
I will encourage all members and guests of my lab to become member the society.
Q9) What kind of advice can give to the young researchers about aptamers?
Aptamers are way more cool than proteins! Also, there are so many different methods you can apply to them, that studying aptamers teaches you a lot of the tools necessary for all of synthetic biology.

Q10) What is your personal philosophy on life and science?
Make science repeatable, scalable and reduce the "magic" that seems to go into some experiments.

Q11) What was your favourite part about research?
Exchange and discussion with my students and colleagues.

Q12) What do you like to do in your free time?
Spend time with family and friends, relax by doing sports or arts and crafts.

Q13) Any other fun facts/tidbits you'd like us to know!
If you do a PCR with an aptamer-pool, containing (for secret reasons) glucose, your PCR cycler starts to smell like caramel. We do not take responsibility of the downstream application, though.

(answers also contain input from the Suess lab members ☺)

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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