

PARTNERSHIP FOR
clean competition

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From the Desk of the ED

For the PCC, 2017 has been a year of incredible growth and multiple firsts.

We filed our first patent this year, for a novel dried plasma spot (DPS) card developed by Dr. Jack Henion and Dr. Imelda Ryona. We were also proud to watch the first graduate of the PCC's Fellowship Program, Dr. Geoff Miller, transition to a full time employee of SMRTL as Research & Laboratory Manager. The PCC also welcomed our first ever Conference Sponsor in 2017, Thermo Fisher Scientific, whose support helped provide an incredible program of 40+ speakers to our largest audience to date.

Also this year, recognizing the importance of a data-driven approach to assess the impact of current (and future) PCC-funded research, the PCC embarked on a 'Research Impact Project' to collect and analyze metrics which help tell the PCC's story and will be used to guide future funding priorities. Preliminary results were presented at the PCC Conference, including the number of PCC funded projects producing publications and/or presentations (approximately 2 in 3), and the number resulting in spin-off projects (approximately 1 in 2). Such metrics will be invaluable to the PCC as we strive to improve future programming and researcher support.

Another such metric, 'Adoption,' revealed only 36% of completed PCC research was implemented into a scientific environment or anti-doping laboratory upon project completion. This finding emphasized the need for a PCC investment in transitioning research into real world settings, so we established the PCC Translational Research Fund (TRF).

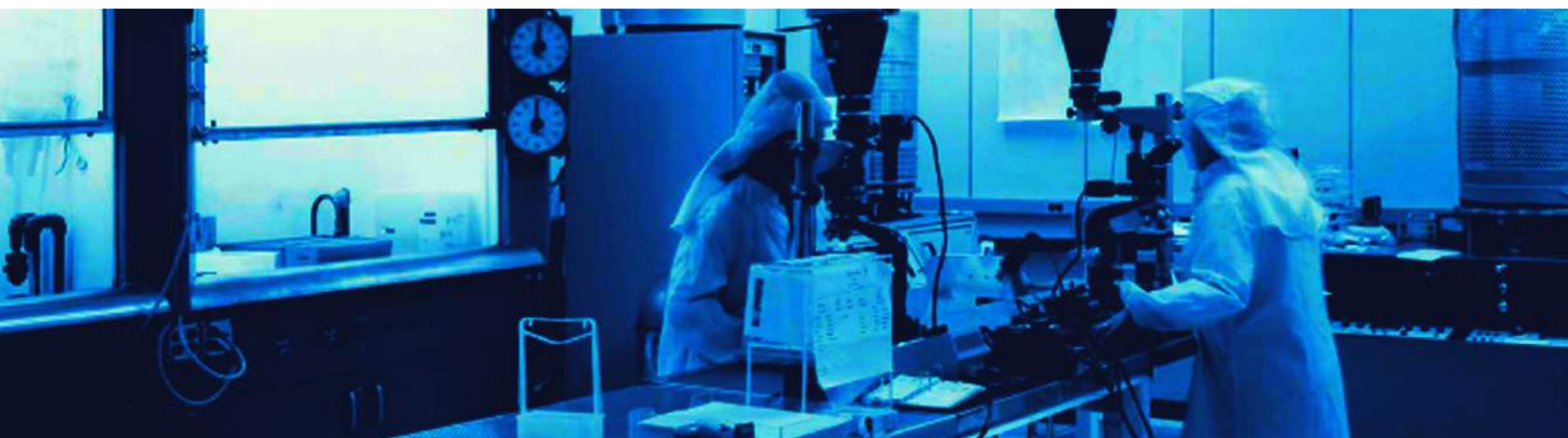
The TRF's inaugural project was evolving IRMS research conducted by Dr. Tom Brenna and Dr. Herbert Tobias of the Dell Pediatric Institute. The project showcased proof of concept for groundbreaking methodology to consistently and accurately detect steroids in urine, but the equipment necessary to implement the advancement was not ready for a laboratory setting. The PCC provided the resources to create a prototype suitable for anti-doping laboratory dynamics. Learn more about the project on page 2. Two other projects involving alternative matrices (breath testing and dried plasma spot testing) have also been supported by the fund, which we look forward to growing in 2017 and beyond.

Looking forward to all that 2017 has to offer,

Michael Pearlmutter

Research Spotlight: IRMS Steroid Detection through Novel Catalytic Combustion Reactor

Dr. Herbert Tobias, PhD, talks to the PCC about the research that could change the way labs detect steroids in urine and the PCC research fund that made it possible.



In 2008 Dr. Tom Brenna at Cornell University was awarded the PCC's first grant for a project entitled "Characterization of the Human Urinary Steroidome for Anti-Doping Applications." The project's ambitious aim was to improve the efficiency with which labs can detect steroids in urine by enabling the characterization of the whole profile of steroids in urine, compositionally and isotopically.

More specifically, Dr. Brenna's research would enable the coupling of comprehensive 2D gas chromatography (GCxGC), an advanced chemical separation technique, with isotope ratio mass spectrometry (IRMS) for carbon isotope ratio (CIR) analysis in 2D for the detection of synthetic steroids. The development would not only reduce the laborious sample preparation currently limiting molecular and CIR analysis of human urinary steroids for anti-doping tests, but combining the scientific techniques would offer the prospect of wide scale, highly precise isotope analysis of steroids – as well as detection of other possible doping agents excreted in urine.

Dr. Herbert Tobias, who also works on the project and is now Associate Professor at the Dell Pediatric Institute at the University of Texas (and the primary investigator for the research since 2015), puts the project's goals in perspective: "We are trying to develop tests that can be implemented easily in all labs so they can do the best isotope test for every urine sample. We will also develop well characterized standard materials that the anti-doping laboratories use to harmonize results."

Research Spotlight: IRMS (Contd.)

In addition to methodology, work has been done to microfabricate more robust on-line high temperature reactors to replace the fragile ceramic-based reactors normally in use and required for combustion of separated steroids.

However, the microfabrication research ran into an unexpected problem: despite proof of concept by utilizing the reactors at low temperatures, use at higher temperatures presented issues. Per Dr. Brenna, while the methodology was sound, "with available technology we were not able to make reliable connections at the high temperatures required for steroid analysis."

The project stalled. Nevertheless, understanding the important impact the research could have on the anti-doping framework, Dr. Brenna and Dr. Tobias were not deterred. Research in highly impactful areas continued while solutions to the project's technological obstacles were sought: "This research has a two-item portfolio of projects," stated Dr. Brenna, "a low risk one (for us, because we know how to do this) for isotopic standards, and a high risk, never attempted steroid one. The isotopic standard one kept us engaged and enabled us to make a scientific contribution, whereas the steroid one we keep pecking away at."

But additional resources were required to spur the next evolution of the project. The PCC's newly created Translational Research Fund (TRF) was the ideal solution. Michael Pearlmutter, the PCC's Executive Director, explains why the steroid one project was a natural fit for the TRF: "The obstacles experienced in this situation were not methodological in nature; Dr. Brenna and Dr. Tobias could have circumnavigated any such barriers expertly. What was needed is collaboration with a technology company that can build a combustion reactor able to handle the unique demands of Dr. Brenna's scientific process. The implementation of novel research outputs often requires expertise, technology, and resources outside of the daily scope or interest areas of our primary investigators. Sourcing and connecting PCC scientists with such external assets is precisely what the TRF was created to achieve. This project is an ideal candidate for such funding."

So where is the project now? According to Dr. Tobias, after receiving additional funding through the TRF, "We have made great strides in method & instrument development that benefit the anti-doping laboratories. Through collaboration with Activated Research Company we have created a prototype low temperature (<500°C) catalytic combustion reactor to convert organic materials to CO₂ and water for carbon isotope ratio (CIR) measurements used in synthetic steroid detection. The reactor should reduce complexity, improve robustness, and address flow connection issues associated with high temperature (>900°C) reactors currently employed in these systems."

"If this new technology works for our applications, it will be used by the anti-doping laboratories, and for many areas of research and applications over the globe."

- Dr. Herb Tobias

Research Spotlight: IRMS (Contd.)

Preliminary characterization for CIR shows promise, and Dr. Tobias has already been awarded funding through the TRF to thoroughly characterize the new on-line chemical technology, and tweak the chemistry with the project's industry collaborators.

The aim of the TRF is to provide the unique and meaningful support required to help scientists apply their research to a real-world laboratory setting. In the case of the TRF's inaugural project, the PCC is proud to be on track with that aspiration. Per Dr. Tobias, "The PCC Translational Research Fund has been very important to catalyze collaboration and innovation in new chemistry and instrumentation technology that will advance techniques in the anti-doping laboratories. The fund helped start a new, more intensive project to develop and advance low temperature combustion...[which may be] the next big discovery for stable isotope detection in general, but is also directly applicable to synthetic steroid detection for anti-doping laboratories. If this new technology works for our applications, it will be used by the anti-doping laboratories, and for many areas of research and applications over the globe."

The PCC is excited to continue support for this exciting, important research.

The PCC's Translational Research Fund (TRF)

Enabling Real-World Implementation of Brilliant Science



The PCC's newest program, the Translational Research Fund, aims to both identify and support the implementation of PCC research with a high potential for impact on the anti-doping framework. Support may include the funding of additional studies, the identification of opportunities for commercialization of research, the evaluation of new technology for licensing potential, the development of patent applications, and work with inventors to expand, license, or extrapolate their findings.

If you have a project that may benefit from a TRF award, please email Jenna Celmer at Jcelmer@cleancompetition.org.

Congratulations Corner

PCC Researcher Wins Prestigious British Mass Spectrometry Society (BMSS) Award



The PCC extends hearty congratulations to Danielle Moncrieffe for winning **The Barber Prize**, awarded for the best young person's oral presentation at the BMSS Annual Meeting.

Danielle is a PhD student at King's College London working with renowned laboratory director Dr. David Cowan. Her important PCC funded research aims to demonstrate whether liquid chromatography tandem mass spectrometry (LC-MS) can be used to quantify Procollagen III amino-terminal propeptide (PIIINP), one of the two biomarkers used for detecting human growth hormone administration.

The PCC spoke with Danielle to discover why she chose anti-doping research and what her future holds:

What path led you to working in an anti-doping lab?

As part of my MSc. Forensic Science course, I was very fortunate to be selected to undertake a three month research project at the highly prestigious Drug Control Centre (DCC) at King's College London, one of only 32 WADA accredited anti-doping laboratories worldwide.

Here, I was awakened to the high standards and use of analytical science in anti-doping control. This led me to develop a deep passion for the research in this field. On completion of my Master's project, I was offered the position of routine analyst within the DCC and I am now pursuing a PhD within this field.

Congratulations Corner (Cont.)

What do you like best about working in the anti-doping sphere?

The science is never static, hence it constantly requires new approaches and research which allows you to continually increase and expand your knowledge. For example, I started using LC-MS (liquid chromatography-mass spectrometry) for small molecules and now resulting from my PHD research, I focus on the analysis of proteins by MS.

What's next for you?

On completion of my PhD, I am hoping to be able to take on a post doctoral position to continue developing as a protein mass spectrometrist.

Who would you recommend pursue a career in anti-doping?

Anti-doping is an application of science. However, it also requires scientists to adhere to very strict and high standards. To any bioanalytical scientist wanting to work in a compelling environment where their knowledge base will constantly be expanding, this may be a good field for you.

We are proud to see such an accomplished young scientist contributing to the anti-doping movement, and look forward to a manuscript detailing the results of her PIINP research (currently in progress), as well as her future scientific endeavors. Congratulations, Danielle!

"The science is never static, hence it constantly requires new approaches and research which allows you to continually increase and expand your knowledge."

- Danielle Moncrieffe



Featured Stakeholder

Drug Free Sport™

Founded in 1999, Drug Free Sport is a premier provider of drug-use prevention services (such as testing and education) for athletic organizations, including PCC Sponsors such as MLB, the NFL, and the PGA TOUR.

Learn more at www.drugfreesport.com, and check out some of Drug Free Sport's upcoming initiatives:



WEBINAR: ATHLETES, NOT ADDICTS: MANAGING PAIN DURING THE OPIOID CRISIS

Wednesday, October 11 – 12PM CST

A topic on front pages and in leading news every day, we will be discussing the current opioid crisis in America and how it affects athletes. Emphasis will be on strategies to limit opioid use in your athletes and what other strategies are available to achieve adequate pain control.

For more information and to register, visit:

www.drugfreesport.com/events/webinar-athletes-not-addicts-managing-pain-opioid-crisis/



THE SPORT EXCHANGE SUMMIT, POWERED BY DRUG FREE SPORT

June 11 - 12, 2018

Kansas City, MO

Join us as we explore innovative and pressing topics that impact all levels and professional disciplines within the sports industry. The Sport Exchange Summit 2018 is "Advancing the team behind the team."

For more information, visit:

www.sportexchangesummit.com

Grant Deadline Reminder

Pre-Applications Due Nov. 1, 2017

Nearly \$1 M USD awarded to researchers on four continents in 2017's first annual cycle.



Apply for a PCC
Grant or Fellowship:

Pre-Applications Due November 1, 2017

Full Applications Due December 1, 2017

CleanCompetition.org

Future Cycles: March/April 2018 and July/August 2018

PARTNERSHIP FOR **clean competition** 2017 Conference

Thank You

To our speakers, supporters, and 110 + attendees

The PCC would like to extend special thanks to **Major League Baseball** for usage of their impeccable event space, **NFL Films** for their expert videographers, and **Thermo Fischer Scientific** for their generous support of this year's educational programming.

The 2017 PCC Conference:

Spurred

DIALOGUE

And created new connections through bringing together 100+ anti-doping stakeholders representing distinct disciplines, yet united by common goals.

Facilitated

AWARENESS

Of exciting advances in anti-doping technology, important new PCC programming, and remaining challenges to tackle through high quality science.

Inspired

INNOVATION

By securing highly prominent and influential speakers well-suited to motivate and encourage future research (and researchers) to contribute to the field.

Audience:

**110+ attendees from 14 countries and
56 unique organizations**

The crowd represented administrative, legal, athletic, and scientific sectors of the anti-doping movement.

Anti-Doping and Human Exercise Performance PhD Course

Free to Participate. November 20-24, 2017.

Offered by The Department of Nutrition, Exercise, and Sports at the University of Copenhagen, Denmark.

Featuring lectures and labs from more than 15 anti-doping specialists, including PCC Scientific Advisory Board member Dr. Mike Sawka, the course aims to disseminate state-of-the-art knowledge of physiology and methodology related to anti-doping efforts to PhD level students, with a special focus on hematology and other important anti-doping topics. Course organizers include anti-doping experts Nikolai B. Nordsborg (PCC grantee), Carsten Lundby, & Lars Nybo.

To register, or for more information (including final program and speakers), visit:
www.nexs.ku.dk/english/calendar/2017/phd-course-anti-doping/

Upcoming Dates

Drug Free Sport™ Opioid Webinar

Oct. 11, 2017



NADO Ad Hoc Working Group Meeting

Oct. 16-17, 2017

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2017 Round Three Pre-Applications Due

Nov. 1, 2017

UNIVERSITY OF
COPENHAGEN



Anti-Doping and Human Exercise Performance PhD Course

Nov. 20-24, 2017

PARTNERSHIP FOR
clean competition

2017 Round Three Full Applications Due

Dec. 1, 2017

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