CELL AND MOLECULAR BIOLOGY STUDENT NEWSLETTER

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IN THIS ISSUE

LETTER FROM THE EDITORS

Dear CAMB students, faculty, and alumni,

In this issue of the CAMB Student Newsletter, we highlight recent work by CAMB DSRB student Aaron Weiner and learn about alumna Dr. Theonie Anastassiadis' position at Flagship Pioneering. We also sit down with Dr. Will Bailis, a new faculty member in the Department of Pathology and Laboratory Medicine, and learn about BeTheMatch, a national bone marrow registry. Finally, we catch up with GRAthlete Coral Kasden, and wrap up this issue with a Philly in the Fall-themed crossword.

For additional articles, past publications, and to learn more about the CAMB Student Newsletter team, visit our blog at cambnewsletter.wix.com/blog. Current students interested in contributing to the CAMB Student Newsletter can contact us at camb.studentnews@gmail.com. We hope you enjoy the November 2019 Issue!

Sincerely,
Somdutta Mukherjee and Sylvia Stankov

RESEARCH SPOTLIGHT

Regenerating the Lung: Harnessing the Untapped Potential of AT2 Cells

Hannah Kolev

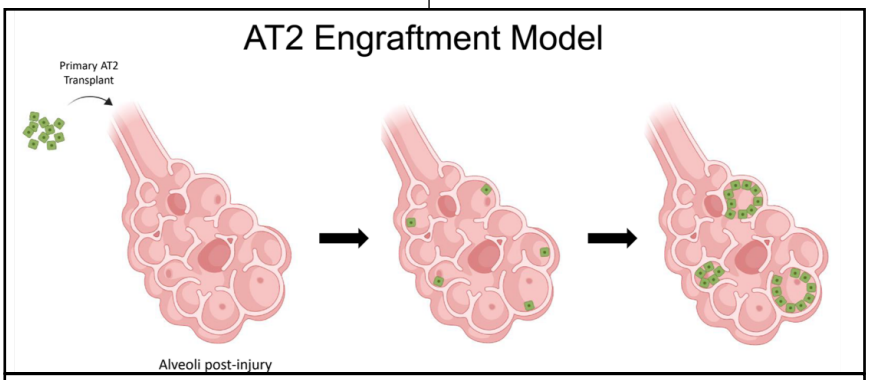
Runny noses, body aches, and chills – dreaded signs that the flu season is upon us. The cough, however, remains one of the most painful flu symptoms and is a clear indication that the influenza virus has successfully invaded the lungs. Though the lungs provide critical protection from environmental insults, they are also highly susceptible to injury caused by influenza. Fortunately, the lungs have a remarkable ability to regenerate in response to infection and disease. Damage to the lung often results in loss of alveolar type 1 (AT1) cells, which make up the majority of the lung epithelial surface and mediate oxygen and carbon dioxide gas exchange. Regeneration of AT1 cells is therefore critical for restoring pulmonary function following injury. To address this regenerative need, alveolar type 2 (AT2) cells repopulate the lung epithelial surface with new AT1 cells. Under homeostatic conditions, AT2 cells secrete surfactant to prevent lung collapse; however, following damage to the lung, AT2 cells function as facultative stem cells to regenerate the AT1 cell compartment. This regenerative response is often plagued by the formation of dysplastic tissue, which hinders lung recovery. New tools and therapies are therefore needed to promote lung regeneration and limit dysplasia in response to injury.

To help improve lung regeneration, Aaron Weiner, a third year DSRB graduate student in Andrew Vaughan's lab, is turning towards the use of organoids – "mini" organs that can be grown in a dish and that recapitulate the native tissue in both structure and function. Transplanting organoids into damaged tissue facilitates tissue regeneration in animal models of disease and injury. For example, intestinal organoids can be successfully transplanted into damaged colonic tissue to aid in crypt regeneration. However, within the lung, developing transplantable AT2 organoids has been limited by current culturing methods, which require co-culturing the organoids with mesenchymal cells to provide critical niche-derived factors that support AT2 cell growth. AT2 organoids are not conducive for transplantation, as introducing ectopic mesenchymal cells into an injured lung

may worsen tissue damage and contribute to fibrosis. Developing mesenchyme-free culture conditions is therefore necessary if AT2 organoids are to be used to facilitate lung regeneration.

Weiner's recent publication in *Regenerative Medicin*e describes his work identifying mesenchyme-free culturing methods that promote AT2 organoid growth and transplantation. First, Weiner and colleagues isolated fresh AT2 cells from the lungs of mice and grew them into organoids using twelve different mesenchyme-free culture conditions. By measuring organoid diameter and AT2 cell-specific gene expression, the authors quantitatively determined the specific cocktail of culture components that produce the healthiest AT2 organoids. Interestingly, they found that the use of growth factors and developmental signaling pathway modulators facilitates organoid growth and renders AT2 organoids independent of mesenchymal co-culture.

Weiner and colleagues next asked whether AT2 cells grown *ex vivo* are functionally competent to repair injured lung. He isolated AT2 cells from the mouse lung, grew them as organoids using the newly developed culture conditions, and then transplanted them back into mice with influenza- injured lungs. Weiner observed successful engraftment of the transplanted AT2 organoids into the injured lung and found that subsets of engrafted AT2 cells retain their cell identity. These results demonstrate that AT2 cells can be successfully grown into organoids without using mesenchymal co-culture and can be subsequently transplanted into injured lungs.



Results from Aaron Weiner's recent Regenerative Medicine publication demonstrate that primary AT2 cells can successfully engraft into injured lung. Figure provided by Weiner and edited by CAMB newsletter staff.

Surprisingly, Weiner found that some engrafted AT2 cells adopt a dysplastic fate in the recipient lung. Weiner initially considered this finding a setback, as the ultimate goal of AT2 cell transplantation is to promote lung regeneration while limiting dysplasia. To interrogate this puzzling finding further, the authors transplanted freshly isolated primary AT2 cells into injured lungs to determine if cells that have never been cultured maintain their correct cell lineage following engraftment. Indeed, primary AT2 cells transplanted into influenza-injured lungs produced robust engraftments, maintained their AT2 cell fate, and even differentiated into AT1 cells, thereby contributing to regeneration of the injured lung epithelium. Encouragingly, primary AT2 cells did not produce dysplastic cells upon transplantation. To extend these findings even further, Weiner collaborated closely with the Morrisey, Worthen, and Shen labs at Penn to test primary AT2 cell engraftment in other lung injury modes, such as acid- and chemotherapeutic-induced injury. Again, in all injury conditions, primary AT2 cells engrafted into the lung without contributing to the formation of dysplastic cells.

In a final set of experiments, Weiner performed a pulse oximetry assay to measure blood-oxygen saturation, a metric of overall lung function and a method to see if primary AT2 transplants provide physiological benefit to injured recipients. Weiner showed that transplantation of primary AT2 cells into influenza-injured lungs not only improves pulmonary function but tended to allow for quicker recovery than control mock-transplanted lungs. This critical experiment demonstrated that transplantation of primary AT2 cells into injured lungs improves regeneration and function, opening up further areas of investigation for therapies to treat lung injury.

The results from this study provide important insight into AT2 cell biology and lung regeneration. Weiner and colleagues show that AT2 cells can be successfully grown into organoids without the support of mesenchymal cells. Even more, these culture conditions offer an attractive *ex vivo* model that can be used to further study AT2 cells. The authors also demonstrate that primary AT2 cells can engraft into injured lungs, maintain their cell fate, and aid in the regeneration and restoration of lung function. When reflecting on these findings, Weiner notes that the "most exciting thing for [him] was pushing the limits of how "stem-like" AT2 cells really are and figuring out if they could really regenerate the lung." He explains that his current work highlights the robustness of AT2 cells as progenitors and facultative stem cells. Even after being removed from their native environment and undergoing transplantation into an injured lung, these cells maintain their stem cell ability and can robustly regenerate AT1 cells.

Weiner acknowledges that there is much more exciting work to be done to understand AT2 cell function. When asked about his future plans, Weiner eagerly describes his interest in understanding the precise mechanisms that enable AT2 cells to regenerate AT1 cells in the injured lung. As a starting point, Weiner cites recent findings that suggest AT2 cells dedifferentiate to a more pluripotent-like state prior to differentiating into AT1 cells. In the future, Weiner would like to follow up on these results to help identify the mechanisms that enable AT2 cell dedifferentiation.

The findings reported by Weiner and colleagues ultimately enhance our understanding of the regenerative capabilities of AT2 cells and have great implications for healing patients suffering from lung injury. Weiner hopes that through future investigations of AT2 cells and their ability to regenerate the lung, "we can use more specific, better defined subsets of cells to help heal ourselves."

Reference: Weiner, A.I. *et al.* (2019). Mesenchyme-free expansion and transplantation of adult alveolar progenitor cells: steps towards cell-based regenerative therapies. *NPJ Regenerative Medicine*. **4:** 17 (eCollection).

Theonie Anastassiadis

Somdutta Mukherjee

Dr. Theonie Anastassiadis, 2017 alumna of CAMB/Cancer Biology, thought she knew what she wanted to do after graduate school. Theonie always pictured herself on the academic track and eventually running her own lab. However, in the summer of 2017, Theonie pursued an opportunity that changed the course of her career by participating as a Summer Fellow at a biotechnology venture creation firm known as Flagship Pioneering in Cambridge, Mass. After her summer at the company, she was offered a full-time position, where she now works as part of an entrepreneurial team to originate, resource, manage and grow bioscience companies that create breakthroughs in health and sustainability.

Theonie Anastassiadis, Cancer Biology

Theonie did her thesis work in Dr. Eric Brown's lab, where she studied DNA replication fork dynamics in the context of cancer development and therapeutics. As she was finishing up her graduate studies, she heard about what sounded like her dream job during a career development information session on Flagship Pioneering and its Fellowship. Theonie decided to apply for the 12-week summer Flagship Fellowship, which is designed to provide Fellows with insight into Flagship Pioneering's unique innovation process. It also gives them the opportunity to generate ideas that can be developed into the next breakthrough companies, to work directly with highly experienced Flagship Pioneering team members, and gain exposure to leaders in science. After completing the Flagship Fellowship, Theonie was thrilled to be offered a job, and she hasn't looked back since.

Flagship Pioneering is an enterprise built around the idea that innovation can be institutionalized and streamlined. As such, Flagship creates biotechnology companies from scratch, beginning with seemingly unreasonable propositions and converting them into testable hypotheses, and ultimately transformational outcomes. Flagship's pioneering process is broken into four phases. In the Exploration phase, entrepreneur scientists begin by asking "What if?" to generate novel scientific concepts that challenge dogma. Through an iterative and evolutionary methodology, they grow and shape these ideas to establish a potentially transformative new platform company. During the ProtoCo phase, these companies prototype their ideas, with an emphasis on performing proof-of-concept experiments to test the hypotheses generated in the exploration phase. If successful, a ProtoCo moves to the NewCo phase. Here, the company further develops its platform and creates value. The fourth phase is the GrowthCo, in which a NewCo platform company becomes a fully-fledged company with a higher degree of operational independence.

When Theonie started at Flagship Pioneering, she gained experience in all phases of the pioneering process. As part of a team in the NewCo stage, she learned about regulatory process, clinical trial design, target product profiles, and market research. At the same time, she ran a project in the Exploration phase, as part of which she proposed an RNA biology platform idea and oversaw the resourcing and launch of a new venture within Flagship Labs, called "Flagship Labs 63" (FL63). FL63 has a number of hired scientists and is currently in the ProtoCo phase, doing experiments to validate the team's ideas. Theonie always knew that she wanted to run a lab and manage a team, and while it's different from academia, she's now in a position to do just that. Theonie has really enjoyed working for Flagship Pioneering because it provides her with the freedom to delve into unexplored research areas and to leverage newly discovered biology to make a therapeutic impact.

Theonie found that Penn provided her with a deep academic foundation that prepared her well for the scientific aspects of her job. As a graduate student, she learned how to think critically about scientific principles, carefully examine the literature, and most importantly have grit. She was not, however, exposed to intellectual property strategy, personnel management, and business operations. Although these skills were all very new to her, she learned on the job and picked them up quickly.

For those interested in a job like Theonie's, she highly recommends looking into the Flagship Fellowship applicants. She encourages graduate students to explore all of their options; "Even if [you] think [you] know what [you] want to do, look at what is out there. It can't hurt to know what opportunities exist, and who knows, maybe you'll discover your dream job," she says. Theonie's experience exemplifies the benefits of keeping an open mind when it comes to choosing a career path.

For more information on Flagship Pioneering and its innovation process, visit their website at https://www.flagshippioneering.com/. For those interested in the Flagship Fellowship, visit https://www.flagshippioneering.com/join/fellows.

Will Bailis

Jesse Weber

I recently sat down with Dr. Will Bailis from the Department of Pathology and Laboratory Medicine. A relatively new faculty member and alum of our very own Immunology Graduate Group, I had a few questions that needed answering.

Q: Take me through your academic timeline

I grew up on the Mainline right outside of Philadelphia and attended Vassar College, where I was originally interested in studying history and foreign policy. Eventually, after not getting into some of the summer positions I wanted, I sent out tons of emails to labs at the major schools in Philadelphia and the only person to respond was Dr. Susan Ross at Penn. I ended up working in her lab for two summers. Susan's mentorship along with the exciting research going on in the lab changed everything for me and pushed me to redirect my studies from policy to science. With strong support and encouragement from Susan, I applied to graduate schools and started my PhD in the Immunology Graduate Group at Penn in 2008. There, I worked with Dr. Warren Pear for six years. After all of that, I actually planned on pursuing an industry career or something outside of academia, but I was eventually convinced by Warren and other mentors to pursue a postdoc and see how it went. That then lead me to Dr. Richard Flavell's lab at Yale, where I spent four amazing years as a postdoctoral researcher, before getting the opportunity to apply for a position at Penn.

Will Bailis, PhD Department of Pathology and Laboratory Medicine

Q: What made you come back to Penn?

I love it here. It is a truly wonderful place to do science, with a remarkably collaborative and egalitarian culture throughout the University. It is also a perfect place for my lab to carry out the research we are interested in. There are few institutions in the world that have the level of immunology, epigenetics, cell biology, and cancer biology research all in one campus, like Penn does. I am particularly excited to work at CHOP, where there are so many opportunities for clinical collaborations.

Q: Could you describe some of your projects in the lab?

Sure! In an overview, the lab is interested in understanding how biology involved more than just turning genes off and on. Both prokaryotes and eukaryotes make DNA, RNA, and protein, but what really distinguishes multicellular life is that we compartmentalize our biochemistry, especially when it comes to metabolism. Metabolites move around inside the cell between their organelles, amongst the cells that compose tissues, and around the organ systems that make up our bodies. We want to learn how that spatial compartmentalization of biochemistry helps explain human health, in the context of the immune system. We hope to use what we learn to inform diet- and metabolism-based therapies to improve treatments of human disease. Much of the world doesn't have consistent and reliable access to healthcare. If we can better understand how diet, nutrition, and drugs that modulate metabolism can be used therapeutically, then we can hopefully expand access to healthcare and offer treatments that are lower cost than protein and antibody-based therapies. We're exploring a few ways in the lab currently. One project we have ongoing is to investigate how the movement of calcium from the cytosol to mitochondria regulates immune cell metabolism, development, and function. Along the same line, we are also looking more generally at how the full landscape of metabolites that move between the cytosol and mitochondria impacts histone remodeling in the immune system. Zooming out from individual cells, we have begun studying how the movement of metabolites between cells impacts immune responses; in particular we are exploring the interplay of metabolism and neurotransmitter production in the immune system. Finally, in a collaboration with the Baur lab, we are interested in understanding how aspects of organismal metabolism, such as the NAD salvage pathway, are uniquely utilized during lymphocyte activation.

Q: What is your mentorship style like?

I've had a lot of amazing mentors throughout my career, and they've all played a role into the style of mentorship that I have today. I'd describe my own mentorship style as being focused on supporting people's individual needs and wants as a scientist rather applying a single model and idea system to everyone. Sure, you have to keep the work focused and the lab funded, but I believe there's always a way to keep one's own research program aligned with the research interests and career goals of the trainees in a lab. Creativity leads to the best science, and people are the most creative when you support their individuality.

Q: What's something that you think yourself and other upcoming new faculty members should do more of?

One thing that's unique about millennials is that we're good at advocating for our wants and needs instead of being quiet. And that goes for the students we are starting to mentor as well. We need to be open to listening and supporting those that are expressing themselves. Sure, we are all here to do amazing and hard science, and the students doing their PhDs are inherently going to have tough times. But we are more than ever in need of keeping an open dialogue to hear what trainees need to be supported in, and we as faculty can be a central part of that. It is important to remember that it isn't about entitlement when trainees speak up, they're just advocating for what they think is right. Our job as mentors is to listen and then respond accordingly when necessary or start an open discussion about why we feel differently, when we disagree. There is a workplace paradigm shift happening across the country in all job sectors, and it is happening here in academia too.

Q: What's some advice you would give first year PhD students?

Get involved! Graduate school is about taking ownership of your own training and taking advantage of all the amazing resources available on campus. That mostly means spending time in lab on research if you are a biomedical PhD, but if you are interested in non-academic careers, Penn also has a lot to offer. When I was here, I joined the Penn Biotech Group Healthcare Consulting (check them out at https://pbgconsulting.org/PBGsite/) and it opened my eyes to potential career paths that I was unaware of. Even Wharton offers the Startup Challenge and the Y-Prize student run pitches, open to any Penn student on campus, where you can either pitch an idea or be on the team that decides who wins. Even if you aren't planning on staying in academia, there are plenty of opportunities to build these translatable skills for PhDs available on campus. Having your PhD can take you just about anywhere, you just have to figure out where you want to go and what's even out there. Getting involved helps you do just that.

***Q:* Where do you see yourself in 5 years?**

Hopefully still here! I want to be at Penn making some serious contributions to science and mentoring some amazing students and trainees.

Q: What's the best scientific advice you've ever been given?

When I was in grad school, I was once told that there are three types of questions you can ask: (1) questions with answers that only you want to know, and ultimately no one is really going to care about the answer (2) questions where one possible answer is exciting, but the other answers no one cares about (3) questions where no matter your answer, it's interesting. It's advice that changed at how I approached my own work and helped me realize that projects and experiments can be designed in a way that no matter the answer you have something worth reporting.

Q: Thoughts on Science Twitter?

One of the greatest challenges in science is communicating research to the public. Scientific journals have been the main way the public is expected to get this information, but these articles are typically meant more for consumption by fellow academics than laypeople. This leaves it to science journalists to disseminate the information to the public and ultimately decide what's worth talking about. Most media companies support themselves by getting readership, which incentivizes journalists to report highly consumable science that may be fun or easy to relate to but doesn't always give the public the opportunity to hear about all the amazing science people are doing. We have a duty as scientists to go into the community and explain what we're doing with their taxpayer dollars, and Twitter happens to be a pretty decent place to get that across!

Q: What's your Twitter handle?

@metabailism

Q: What are some of your hobbies?

Karaoke. 100% karaoke. I love going to Chinatown and singing some good karaoke. Back at Yale, we used to go several times a week and just sing our hearts out with the lab and some good friends.

Q: Amazing – I must know, what is your go to song in karaoke then?

You're really putting me on the spot here, but it depends on the time of the night. London Calling is a good one if I just want to loudly scream. The Hurricane is a good one just to take up a solid eight minutes of stage time with friends. But, I think my solid go to has to be Modern Love by David Bowie.

***Q:* Did you watch Game of Thrones? Give me all the thoughts on that ending…**

Yes. Yes I did. The show was great – the action, the scenery, the acting, the character development… but yeah that ending. All of these people were relevant and then from the second episode of the final season on, nothing really mattered anymore. It was all just back to petty squabble and unanswered questions. I did, however, absolutely love the books. The way George R.R. Martin played with the character perspectives and almost tricked the reader into thinking one way then the other was fascinating.

Q: Is a hot dog a sandwich?

Yes. (I should note that there was absolutely no hesitation to Will's answer)

Q: If you could be a kitchen utensil, what would you be and why?

A whisk. It's different than all the others, but it can be used in a ton of different settings to completely change the texture and everything

...

For all of those interested in Will's work, or just wanting to chat about some good karaoke spots, feel free to send him an email at bailisw@email.chop.edu.

Be The Match

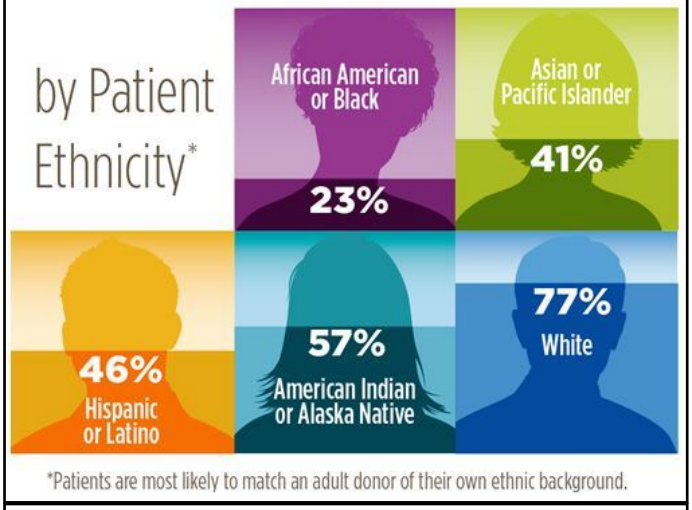
Aishwarya Pawar

A person is diagnosed with a blood cancer in the United States every 3 minutes. In 2019, blood cancer is expected to make up 10% of all new cancer cases diagnosed in the country. While chemotherapy remains the standard of care for blood cancer patients, hematopoietic stem cell transplant (also called bone marrow transplant) has improved the survival rate for some of these cancers from 0% to nearly 80%. Bone marrow transplant is a complex procedure where the patient's damaged hematopoietic stem cells are completely removed with radiation and chemotherapy, and replaced with healthy stem cells from a matched bone marrow donor.

Be The Match is a national bone marrow registry that connects thousands of patients suffering from blood cancers and blood disorders with their potential donors. The registry is operated by the National Marrow Donor Program and has over 20 million registered donors in the US. Through its international partnerships and associations, it has access to 13 million additional donors worldwide.

Bone marrow donors are selected by how well 10 of their human leukocyte antigens (HLA) loci match with those of the recipient. HLAs make up proteins of the Major Histocompatibility Complex on the cell surface, and are responsible for distinguishing self from non-self. A minimum of 6 out of 10 loci match of HLA antigens between donors and recipients is extremely important for the success of the transplant, and to avoid transplant rejection and graft-versus-host disease. While the highest chances of finding matched donors are within family member between siblings, parents, and children, around 70% of patients do not find matched related donors. In such cases, the only chance patients have of receiving lifesaving bone marrow transplants are unrelated donors through registries like Be The Match.

Currently the biggest challenge the registry faces is its lack of ethnic representation. The likelihood of a white patient finding a matching donor from the registry is 77%, whereas that of a Native American and African American patient is just 57% and 23% respectively. These numbers improve as more people with diverse ethnic backgrounds sign-up, since individuals within an ethnic group tend to have similar HLA types compared to those outside of it.



bethematch.org: How does a patient's ethnic background affect matching?

Signing up for the registry is easy. You can start the process online by creating an account at https://join.bethematch.org and answering a few questions about your medical history. Within a week, you receive a cheek swab kit in the mail, which consists of two swabs and a return envelope, and instructions on how to collect your DNA using the swab and return it to the registry. Collecting a cheek swab is easy and involves rubbing the inside of your cheek with the tip of the swab for a minute. Once the registry receives your samples you are notified via email that you are part of the registry.

If you are recognized as a potential donor for a patient through the registry, you are contacted for additional blood tests to confirm the match and safety of the transplant. You will then be asked to confirm your willingness to move forward and sign consent forms. Depending on the patient's requirement and doctor's recommendation, you would be asked to donate in one of two ways. In certain cases, you would donate peripheral blood stem cells in a nonsurgical procedure, after receiving injections of a drug called filgrastim that temporarily increases blood stem cells. This process is similar to regular blood donation. In other cases, you could be asked to donate bone marrow through a surgical procedure where liquid marrow is drawn from the back of your pelvic bone. Marrow donation is performed under anesthesia and involves a day long hospital stay. While the entire cost of the transplant is covered for the donor, the procedure requires a commitment of 20-30 hours. While some registrants are contacted within days of signing-up, a significant number remain on the registry till they turn 60 years old, without ever being requested for a donation.

Be The Match and similar donor registries are saving lives by connecting patients with potential donors, and their success depends on willing and healthy individuals signing up and being a part of the program. By joining the registry, you could offer hope to one of the 18,000 patients with blood cancer, beta-thalassemia, and sickle cells disease that need a lifesaving bone marrow transplant every year.

Coral Kasden Competes at 2019 Pan American Games in Lima, Peru

Corey Holman

Coral Kasden, a second year GTV student, was featured as one of CAMB's professional GRAthletes ("graduate athletes") in last year's November issue of the CAMB Student Newsletter. Then, her goal was to be selected as coxswain for the United States boat in the 2019 Pan American Games in Lima, Peru. Now, as an exciting update…Coral did just that and made history as the first female coxswain of a men's crew for Team USA!

Coral leading Team USA at the Pan Am Games

Coral is a rowing coxswain for the New York Athletic Club Men's High Performance Group. Tucked into a small seat at the back of the boat, she steers, keeps the rowers on time, and directs the whole course of a race – an integral position that carries an immense amount of responsibility. In her incredible national team debut this past August at the 2019 Pan American Games, Coral served as coxswain for the men's eight and was one of only 21 athletes to represent the United States in rowing. Competing internationally in Lima, Peru brought new challenges to an already taxing sport, but Coral was ready to lead Team USA. Having minored in Spanish at UC Santa Barbara, Coral was able to communicate with the Spanish-speaking officials for the regatta. However, nothing could have prepared the team for the outbreak of the highly contagious norovirus in the athlete village. If an athlete came in contact with an infected individual or consumed contaminated food or water, they were wiped out for 24 hours with the sickness and needed days to recover. Many athletes could not race. Those who were not affected had to substitute into events that they were not scheduled to compete in just to fill out the numbers in the boats. Coral's competition was the last race of the Pan Am Games, and her eight-man boat was reduced to four tired but healthy athletes with no substitutes left. Doing their best to race half-staffed, a favorite to win the race came in 6th place. Coral was an integral part of keeping the team together during this less-than-optimal time and is hungry for a rematch.

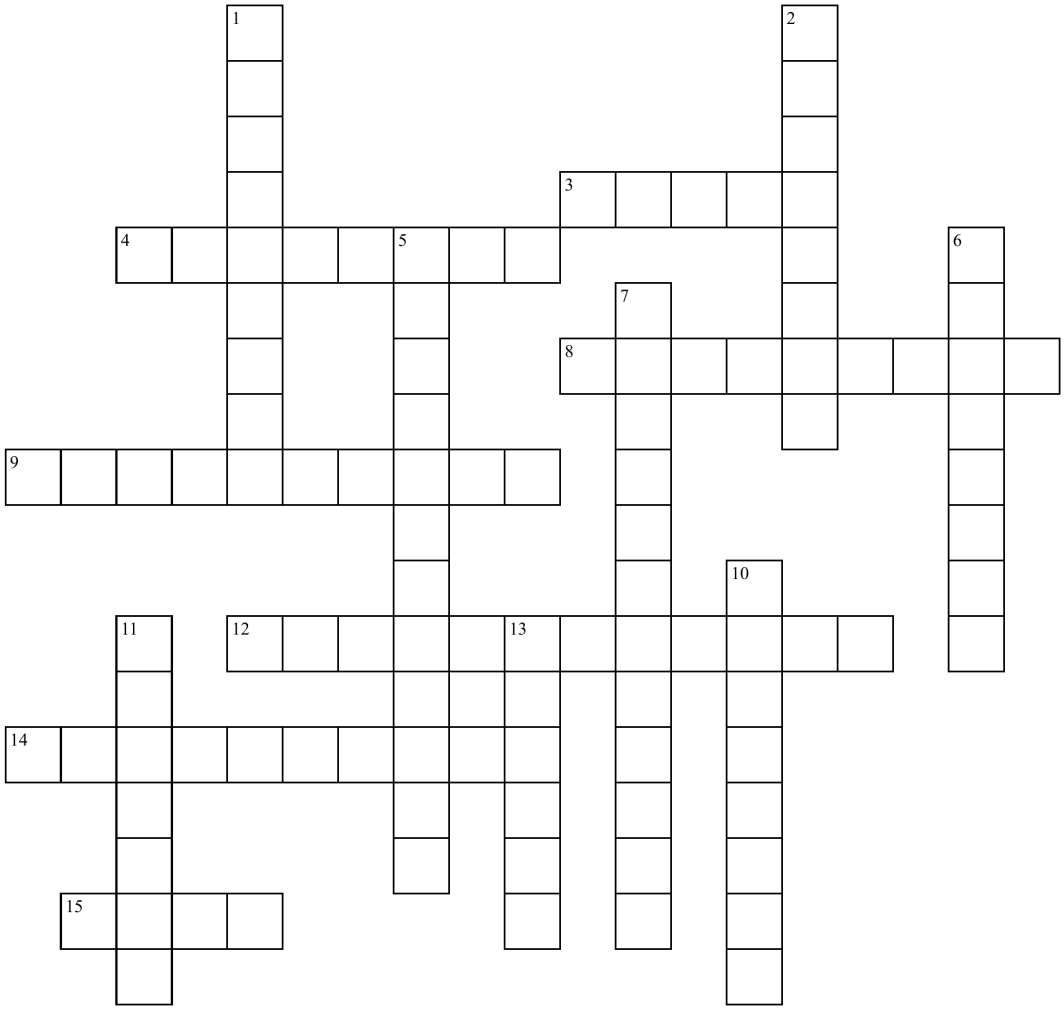
After the competition, Team USA tackled the Salkantay Trek to Machu Picchu in Cusco, Peru. World class rowers are some of the fittest athletes - rowing is one of the only sports that requires all the body's muscle groups to generate insane amounts of power, catapulting to upwards of 50 strokes per minute (~15 mph) during a race. But, 16,500 feet of altitude affects even the most fit individuals. Coral described this four-day trek as "the hardest, most insane thing [she had] ever put [her] body through." The team hiked during the day and slept in tents at night surrounded by breathtaking views. Local porters carried their food and cooked – a vital necessity on the hardest trek at Machu Picchu. The lack of oxygen took its toll and made the trek even more challenging, but it was an incredible experience that Coral would do again in a heartbeat.

Coral and her teammates trekking to Machu Picchu.

Competing at such a high level requires dedication but competing while also being a PhD student requires superhuman commitment and a very supportive academic environment. While Coral thought it was awesome to be selected for Team USA, she was only able to compete because of the support and encouragement from her PI, Hansell Stedman. She explained that her PI encourages the pursuit of things outside of the lab and agreed for Coral to take two weeks off to represent Team USA. To accommodate these plans, Coral and her PI worked together to make a timeline for her project so that she could hit the ground running when she returned. Work-life balance is incredibly important in graduate school. Whether you represent Team USA, do fun things to explore Philly, or just make it to happy hour, it is important to get out of lab and enjoy life. You will be more productive at work if you have stress relieving activities scheduled later. It is incredible that many PI's understand and encourage this balance, and we need to continue to foster this atmosphere at Penn.

As for what's next, Coral is training to be a rower herself. Restrained in the coxswain seat, she sits and watches people push their bodies to their limit. As a highly competitive athlete, she wants in. This past summer, Coral rowed in the women's lightweight pair at US National Championships in Cincinnati, Ohio, and was first across the line. She hopes to row faster next summer and will continue competing as a world-class coxswain. We wish Coral the best in her future GRAthlete endeavors and encourage everyone in CAMB to strive to have balance in graduate school!

Philly in the Fall



Across

3. Orchard

4. Founding Fathers Meet Broadway

8. Blue Cross __ Winterfest

9. Tchaikovsky-Scored Production

12. Terror Behind the Walls

14. Penn Quakers vs Cornell Big Red

15. Gershman Philadelphia Jewish __ Festival

Down

1. Department Store Organ

2. Bavarian Christmas Village

5. America's First __ Day Parade

6. __ Gardens Christmas

7. City Hall Winter Garden

10. 26 Miles and Then Some

11. PSL

13. Go Birds!

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