Pyriscence: A Novel Antimicrobial Foley Catheter

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2018

UMMS Capstone for Impact
Branch: Systems Based, Hospital Based
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Project Summary

Pyriscence is a project that myself and another M4, Alex Blaty, started working on in early 2017. In a nutshell, it is a project, now company, that is dedicated to bringing a new biotech product to market. The product is a Foley catheter that produces antimicrobial free radicals on the inner and outer surface following application of energy from a special power supply to embedded wires in the catheter. This project started out as Alex and I simply trying to see what we could make happen in our backyard with a soldering iron, but soon gained traction, in no small part to the University of Michigan Medical School (and the greater University of Michigan) supporting us.

Action Items/Outcome

Critical Thinking/Discovery: We've spent a great amount of time going back to the basics of physics to refine the design of our catheter, as well as delving into the lab-based microbiology techniques to create our own in vitro testing protocols for our catheter. Every step, along the way, we were doing something with no instruction manual, and there was always something that didn't work that we needed to fix or optimize.

Leadership/Teamwork/Communication: Starting right from the start, Alex and I were partners and actually had skin in the game, by starting an LLC for legal protection. This involved negotiations regarding assignment of percentages. Also, we developed over the first few months in particular, to be more independent and trust what the other member was doing without needing to check their work. Another great example of when teamwork came into play was when we started working with the Law Clinic at UM to do a full Intellectual Property review of previously submitted patents, and then draft up a rather unwieldy document with facts and figures. It took several months, which actually spanned 3 different pairs of law students, so trying to keep them on-track and always up to speed was quite important.
Finish prototype: not finished, went to Cook Medical, saw the production line, spoke to VPs, chose to pivot and protect IP more firmly with the limited time and funds we had available.

Animal Testing: could not complete, given lack of final prototype with balloon occlusion tip.

Mechanism of action: Worked with the chemistry department, found there is a slow ellution of reactive oxygen (and other species) from the polymer, even when not activated. May explan in vitro testing inconsistencies, needs to be further refined.

In Vitro testing: quite robust, but some needs to be redone, given the potential new found mechanism of action.

IP: Preliminary patent submitted, working on finding council that will file the final patent. Have one offer to do so for IP.

Business: Won a Venturewell grant, went to conference in Boston, learned more about next steps moving forward.

Conclusion/Reflection

We have now brought it to a point where we have a preliminary patent application submitted to the US Patent Office, we have done in vitro testing in an ID laboratory demonstrating efficacy, and have been in frequent communication with people throughout various schools (Chemistry, Engineering, Physics, Law) throughout the university as well as industry outside of the University. Moving forward, we are trying to bring this product to a point where it has enough momentum to be picked up by a larger biotech company before we start residency. The things we need to do before that happens is garner some in vivo data, which we are planning on doing through a sheep model of UTI in Dr. Bartlett's lab. In order to do this, we still need to further optimize the catheter's design, primarily focusing on creating a more stable occlusive balloon at the tip, which has been proving difficult. We are in the process of applying for the Venturewell grant, which will provide additional funding, but also more guidance/structure moving forward. We are also discussing with various biomedical engineers the best way to solve our occlusive balloon issue. Overall, this has been one of the most educational experiences of my life, and it is because of the true interdisciplinary requirements of tackling a project like this. This was a super educational experience, and it was certainly worth the time and effort I've put into it over the last couple of years. The extra time during the M4 year did give extra flexibility, that let us push it forward much more than I expected. We've run into walls, though, and ultimately didn't get it as far as we had hoped, before residency starts. It is in an uncertain place, and likely needs to be handed off to a BME person to take on full time.