Clinical Perspectives
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Research Spotlight: Dr. Enderling Shares Why He Participated in Miles for Moffitt

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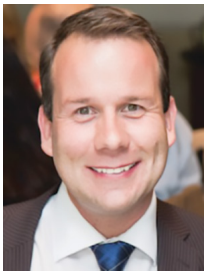
Dr. Heiko Enderling is an assistant member in the Integrated Mathematical Oncology Department. (/research-science/divisions-and-departments/quantitative-science/integrated-mathematical-oncology/about-imo/) His research interests are focused on developing clinically- and experimentally-motivated and quantitative models of cell-cell interactions within a tumor, as well as at the tumor-host interface. In particular, the work in his laboratory focuses on the role of cancer stem cells in tumor progression and treatment response, with the ultimate goal to improve patient-specific treatment design.



Dr. Heiko Enderling, Integrated Mathematical Oncology Department assistant member

Did you participate in Miles for Moffitt? Why is it important for team members to participate each year?

Yes, I did participate in Miles for Moffitt (/give/get-involved/miles-for-moffitt/) this year, as well as every year since joining Moffitt as a faculty member in 2013. I am not a runner, but my motivation to participate includes (1) fundraising for our innovative science here, (2) being part of the Moffitt family and joining other researchers, doctors, nurses, administrators, and support staff in supporting our patients and donors, and (3) getting the little bit of exercise once a year. The energy on race day is truly remarkable. Running together with patients who proudly sign their shirt with the months and years they are cancer survivors thanks to the treatment they have received at Moffitt is very rewarding. Discussing our science with community members and sponsors also gives the scientists in my lab and myself great exposure.

This year, you were awarded a Miles for Moffitt research grant. Can you tell us more about the research study being funding by this award?

Dr. Enderling with Miles for Moffitt team Research Rangers

Human papillomavirus related oropharyngeal cancer is one of the few types of cancers increasing in incidence. Treatment with radiotherapy provides 75-95% five-year locoregional control (LRC). Why most, but not all, patients are cured in cohorts of similar stage and tumor volume remains unknown. Reliable biomarkers are direly needed to predict radiation response and to maximize cure rates while minimizing associated toxicities. We propose the first step in filling this gap by investigating the patient-specific tumor-immune ecosystem as prognostic factor and actionable biomarker for individualized RT outcome. Our preliminary data suggests that the effectiveness of radiation in eliminating the cancer is a combination of the direct lethal effect of radiation on both tumor and immune populations, and the subsequent indirect effect of stimulating a successful antitumor immune response. The Miles for Moffitt research grant will help us to assess the tumor-immune ecosystem composition on retrospective tissue specimen. This will inform a mathematical model to simulate radiation therapy and identify tumor-immune ecosystems that may be associated with oropharyngeal cancer cure. We then want to use the model explore the immunologic consequences of different dose schemas, as well as innovative radiation protocols. This project will respond to two unmet clinical needs. Patient-specific biomarker information can be used to de-escalate RT and reduce common RT-associated toxicities without sacrificing cure, and therapy can be intensified or adapted (either alone or in combination with targeted agents) for patients that are predicted to fail the standard of care RT. This will motivate profound changes to how we conceive of and clinically prescribe radiation.

How did your career in mathematics bring you to a career in cancer research?

My undergraduate studies were actually in applied computer science in a joint degree with human medicine. The concept of this Bachelor and Master program “Computer Visualistics” is to train an interdisciplinary workforce with quantitative skills that can be applied in a hospital setting. I was a part-time computer programmer in my medicine professor’s lab, who participated in a European Framework on mathematical modeling in cancer. Through this framework I met the now IMO department chair Sandy Anderson, whom I had the pleasure of training with as an exchange student for 5 month. Sandy’s fascinating work motivated me to pursue a PhD in mathematical oncology. Since then, I a have had the pleasure of working in cancer biology, first in a hospital in Dundee, Scotland, then in Boston, and now here at Moffitt. What is important to notice is that I don’t see myself as a mathematician but as a cancer researcher. Mathematics is the tool that I use to analyze data and identify mechanisms that underlie complex biological processes and clinical treatment response pattern. The IMO department here at Moffitt is truly unique in its integration in cancer biology and clinical oncology. Mathematics alone will never be able to cure cancer. But in synergy with the many other expertise of our colleagues and collaborators we may be able to contribute a small piece of the big cancer puzzle.

You oversee the HIP-IMO Program. Can you tell us more about the program and why it is so important to mentor high school students interested in math and science?

The High school Internship Program in Integrated Mathematical Oncology (HIP IMO) delivers interdisciplinary team science research experiences for high school students to help prepare them for cancer research careers. The program runs for 8 weeks each summer. The first two weeks are busy with introductory lectures into cancer biology, mathematical modeling, and computer programming bootcamps. For the remainder of the program, students work under the direction and guidance of IMO faculty and postdoctoral fellow mentors in ongoing research projects. Most interns will develop their own mathematical models and computational simulations to answer specific questions posed by their mentors. The program includes different presentations so that the students learn to prepare and present their results, culminating in a final presentation on research day in front of their parents, teachers, and Moffitt researchers and patients.

HIP IMO raises awareness of the intellectual value and excitement of multidisciplinary cancer research for students with exceptional quantitative skills. Most students are unaware of the opportunity to apply mathematics, physics, engineering, or computer science in such a rewarding career. With the HIP IMO program we aim to challenge the technical and quantitative skills of the students and push them to also excel in life sciences research. We evaluate the

success of HIP IMO by program alumni pursuing double majors in college that includes both mathematics and biology. These students will successfully traverse established, long-standing department barriers to become leaders in multidisciplinary cancer research thus insuring our field will gain from the inclusion of motivated, talented and skilled individuals. The number of applicants has almost quadrupled from 17 in 2015 to 63 this year. With most IMO faculty donating their valuable time to mentor interns, we are proud to enroll 14 HIPsters in 2017. These students will, without a doubt, also teach us yet again what curious young minds can achieve if you let and guide them.

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