



DIVISION OF RADIATION ONCOLOGY

RADIATE EXCELLENCE

RESEARCH & EDUCATION

Delivering Treatment in a FLASH

Expanding Our Reach to
Local Communities

The Thrill of Discovery:
A Medical Physicist's Drive
and Passion for Knowledge

THE UNIVERSITY OF TEXAS
MDAnderson
Cancer Center
Making Cancer History™

Division Research & Education



Dear reader,

Welcome to the second issue of the Division of Radiation Oncology Research & Education magazine. It has been another busy and challenging year, and we are excited to once more share some of the highlighted initiatives and achievements led by our faculty, trainees, students and staff throughout the fiscal year 2021 (FY21).

In this issue, you will find features describing our continued efforts to expand access to innovative clinical trials to our Houston-Area Locations and our collaborators beyond. Some of our faculty and teams are exploring at the leading edge of radiation oncology to help advance technologies such as FLASH-radiotherapy, through strategic industry alliances and other collaborations. Together with internal and external collaborators, our faculty in Radiation Physics and Radiation Oncology have renewed a National Institutes of Health-funded multi-project program focusing on the biology of proton therapy. Just as important, our top-ranked residency program and the division's initiative to support women and underrepresented minority students interested in careers in radiation oncology are helping to build a robust pipeline of outstanding individuals preparing for a career in academic medicine.

Living and working through the second year of a global pandemic, all of us have had to dig deep into our reserves of creativity and resilience to not only persevere, but also to flourish and find joy in the evolution of our life and work journeys. We invite you to share our journey through the previous year's stories of remarkable achievements and growth.

Hanh H. Hoang, Ph.D.
Division Administrator, Division of Radiation Oncology

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ABOUT THE MAGAZINE

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ABOUT THE DIVISION OF RADIATION ONCOLOGY

The Division of Radiation Oncology at MD Anderson provides compassionate, state-of-the-art, quality radiation treatment to cancer patients while integrating education, laboratory and clinical research, and radiation physics to achieve improved outcomes.

<https://www.mdanderson.org/research/departments-labs-institutes/divisions/division-of-radiation-oncology.html>

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2021: The Year in Photos

A Message from Our Division Head



Albert Koong, M.D., Ph.D.

As the pandemic continued to challenge us in all facets of life, I have never been prouder of the ways we have risen to face numerous unforeseen obstacles, demonstrated steadfast commitment to our patients, and shown care and empathy to each other. Through the efforts of our faculty and staff, our Division excelled and achieved several major milestones. The dedication to our mission and to MD Anderson is what enables our Division to thrive and grow. Our work environment and, for some, even work scope, has changed drastically in the time since the pandemic directly impacted our operations. Many of the staff have taken on additional duties to ensure that our patients and clinical teams are able to safely access their treatments and care providers.

We were able to provide care for almost 10,000 patients across our campuses in the Texas Medical Center, University of Texas Medical Branch in Galveston, League City, Sugar Land, West Houston, the Woodlands, and Albuquerque. We managed to do this safely by working together and by embracing new workflows.

We received institutional approval for the launch of the first Gastrointestinal Radiation Oncology Department (GIRO) in the country. This is a historic moment for our Division and the field of radiation oncology. Having a dedicated

GI Radiation Oncology Department will enhance patient care, optimize quality and safety, and accelerate progress in research and education priorities. Establishing this department will elevate the profile of GI radiation oncology both inside and outside of MD Anderson. With the current 11 faculty as founding members of GIRO, we will be uniquely positioned to impact the future direction of this subspecialty within the field of radiation oncology.

Our research portfolio continues to grow. Our faculty teams developed another strategic industry alliance (focused on FLASH-radiotherapy), significantly increased extramural research funding, published more high-impact research articles, activated more complex and therapeutic clinical trials, and for the first time, registered over 10% of our patients in therapeutic trials. In many ways, we have persevered through very challenging times and have come out even better than we started. I look forward to the day when we can more frequently meet in person again, to reconnect and celebrate together.

With gratitude,

Albert
Division Head & Chair,
Radiation Oncology



5

strategic alliances
ongoing (FY21)



\$31M

in funding
(FY21)



13

ROSI projects
funded (FY21)



82

active therapeutic
trials (FY21)



>600

publications
(FY21)



Maria Angelica Cortez, Ph.D.

A New Discovery in Immunotherapy Research

FACULTY PROFILE

Being in the same academic home to Dr. Jim Allison, one of the 2018 recipients of the Nobel Prize in Physiology or Medicine, is akin to having the ultimate “North Star” in one’s own backyard. He is an inspiration to junior faculty investigators such as **Maria Angelica Cortez, Ph.D.**, research faculty assistant professor in Radiation Oncology Research. Ever since Allison’s transformative discoveries, researchers have continued full steam to explore the possibilities of

a scientific peer-reviewed translational research grant from the U.S. Department of Defense, an agency that has long been well known for its support of innovative projects.

This funding will allow Cortez to further investigate the role that BMP7 plays in treatment resistance, with the overall goal of targeting this protein or others with a combination of certain molecules and immunotherapy.

“I think about patients every day when I am in the lab. We are really here for them,” Cortez expresses. “I play a very small part of the whole research community, but we are trying to make a difference and we are trying to give patients options.”

this powerful approach to cancer treatment. Published in the high-impact journal *Nature Communications* article “Bone morphogenetic protein 7 promotes resistance to immunotherapy”, Cortez and her team presented some significant discoveries based on clinical observations by her faculty mentor, James Welsh, M.D., a physician scientist and professor of Radiation Oncology. They discovered that the protein named bone morphogenetic protein 7 (BMP7) was overexpressed in a significant portion of lung cancer patients who are resistant to a common immunotherapy.

“Some patients secrete this protein that makes cancer invisible again to the immune system,” Cortez explains.

In order to study the underlying mechanism(s) of this observation, their research group then generated an animal model that mimicked what they saw in patients. With this new knowledge of resistance to immunotherapy, Cortez won

“If we can understand why people do not respond to immunotherapy, we can overcome resistance and make it available for more people,” Cortez says. Working with the institution’s Experimental Radiation Oncology, they have created several in vitro and in vivo models to test their hypothesis.

“I think about patients every day when I am in the lab. We are really here for them,” Cortez expresses. “I play a very small part of the whole research community, but we are trying to make a difference and we are trying to give patients options.”

Cortez has always felt the drive to find a cure for cancer since her father instilled the value of science and education from a very young age. Her passion for research and discovery truly shines through in the work that she does in the lab at MD Anderson.

MD Anderson Research: Bringing Quality Clinical Trials to Our Communities

Access to cancer care, especially quality care, is not always easy due to geographical and other constraints.

RESEARCH

In an effort to offer MD Anderson's quality of care to patients across the nation and the globe, we are partnering with our Houston area locations to provide the best possible care for patients with MD Anderson's exceptional oncologists sharing their knowledge and expertise with their peers. In turn, we also learn from other institutions.

"Working across different sites, including the Texas Medical Center, Houston area locations, and beyond to achieve a research goal helps bring people together and unites us around a common goal."

We are able to leverage our collaborations with other organizations to increase patient access to our innovative clinical trials and enhance the diversity of trial participants.

Radiation oncologist **Benjamin Smith, M.D.** is the Director of Network Research for the Division of Radiation Oncology. He supports and promotes the growth of radiation oncology-focused clinical trials across the network of hospitals.

"Our current collaborations provide a unique opportunity to support the conduct of large-scale clinical trials that have the potential to change standard of care in radiation oncology," Smith explains.

"Working across different sites, including the Texas Medical Center, Houston area locations, and beyond to achieve a research goal helps bring people together and unites us around a common goal."

Smith also has the help of Program Manager, Kelsey Kaiser, who provides guidance and support to faculty members that want to open their clinical trials beyond the MD Anderson campus.

One challenging aspect of network research is securing funding to jump-start and sustain the trial activities.

"Research is expensive, and many trials are investigator-initiated without much funding support," Smith says. With philanthropy and support of the institution, along with healthy doses of perseverance and ingenuity, radiation

oncology faculty have been able to achieve some critical milestones, including large-scale clinical trials that are open and poised to be practice-changing.

One of these trials led by radiation oncologist Karen Hoffman, M.D., received a foundation grant to support expansion of the SAPHIRE trial to other sites. Our division is currently funding similar expansion of two trials through the Radiation Oncology Strategic Initiatives (ROSI) seed award program.

Without teamwork across the institution, cancer care and clinical trials would not be as accessible for patients across the United States. It is teamwork and the shared goal of ending cancer that keeps these collaborations strong and productive.

Some of the work of Smith and his colleagues within the division are at early stages but have already served as a model to design and open successful trials in our Houston area locations and other sites across the country. The hope is that this web can be spun to new heights, reaching all patients that need quality cancer care.



Benjamin Smith, M.D.

Shark Tank Awardees



Emil Schueler, Ph.D.



Cullen Taniguchi, M.D., Ph.D.

"Translating FLASH-RT to Improve Outcomes in Pancreatic Cancer"

Swimming with **The Sharks**

"The best way to predict the future is to invent it," says Mark Cuban, billionaire entrepreneur and celebrity judge on the critically

RESEARCH

These words drive our own twist to the show to spark ideas and projects that will lead to innovative, potentially practice-changing approaches or treatments in radiation oncology.

For the past four years, our division has hosted the annual Radiation Oncology Strategic Initiatives (ROSI) Shark Tank competition, as a funding opportunity to encourage our faculty to develop multi-investigator, multi-project proposals that will eventually be submitted to the National Institutes of Health (NIH) or other funding agencies. Proposals from faculty teams first undergo a scientific peer-review process, and the top teams are invited to pitch their ideas in the final phase of the competition, which is modeled after television's Shark Tank.

Our "celebrity sharks" are leaders from across the institution such as Chief Technology and Digital Officer of MD Anderson,

David Jaffray, Ph.D., and Professor and Chair in the Department of Health Disparities, Lorna McNeill, Ph.D., MPH.

They scrutinize, challenge and question the teams on the merits, feasibility and investment potential of their proposals. The winning team receives a \$100,000 award to further develop their proposal and position for competitive external funding.

The Shark Tank awardees were clinician scientist Cullen Taniguchi, M.D., Ph.D., and medical physicist Emil Schueler, Ph.D., who was recently recruited from Stanford University to the Department of Radiation Physics in the Division of Radiation Oncology. Their project, titled "Translating FLASH-RT to Improve Outcomes in Pancreatic Cancer," focuses on FLASH-Radiation Therapy (RT), a rapidly growing area of radiation oncology that emphasizes the near-instantaneous delivery of radiation to

Celebrity Sharks



Lorna McNeill, MPH, Ph.D.



David Jaffray, Ph.D.



David Piwnica-Worms, M.D., Ph.D.



ally acclaimed reality show, Shark Tank.

tumor cells with tissue-sparing effects with less harm to the surrounding areas.

“For reasons we don’t completely understand, when you give radiation in this ultra-quick manner, it kills the tumor but doesn’t affect normal tissues,” Taniguchi says. The funding from ROSI will aid in more fundamental discoveries and validations of FLASH-RT with the goal of providing another viable treatment option for cancer patients. With preliminary data from this team and their collaborators, Taniguchi and Schueler aim to acquire additional funding from government agencies like the NIH to advance FLASH-RT research. “FLASH-RT represents an entirely new paradigm of potentially curative therapy that is broadly applicable across all cancer types,” Schueler explains. “The ability to treat tumors while sparing normal tissues is essentially the “holy grail” of cancer therapy.”

Cancer patients and the important need to develop and offer the best treatment options for a largely intractable and deadly disease drive both Taniguchi and Schueler.

“My clinical practice allows me to help patients right now, but research allows me to help future generations of patients, which is really exciting to me,” says Taniguchi, who specializes in pancreatic and other gastrointestinal cancers. This perfectly explains why research is a vital component of cancer treatment and why the division provides this opportunity for forward-thinking faculty and innovators.

“I’m inspired by what I see in the clinic and how I can improve on what we are doing for our patients,” Schueler adds. The ROSI Shark Tank award is a significant step to help these two physician scientists invent the future.

ROSI Non-Faculty Seed Awards: Supporting Aspiring Researchers in Their Scientific Journey

Innovation can be found and cultivated in all who are motivated and passionate about discovery. It is in this spirit that the Radiation Oncology Strategic Initiatives (ROSI) funds trainees, students and other researchers who are at the very early stages of their academic careers.

EDUCATION

Rui Ye is a graduate student from Yale University who is pursuing his Ph.D. at MD Anderson. “I became very interested in cancer research while studying for my master’s degree,” Ye explains. “The tight connection between basic research and clinical research here at MD Anderson makes me feel it is the right place to study for my Ph.D.”

cell from treatment-naïve EAC patient samples,” Ye says. “We hypothesized that tumor cells harboring CNAs that confer resistance to chemoradiation could exist before chemoradiation treatment.”

With the funding from the ROSI seed award, Ye and team were able to profile the CNAs in thousands of tumor cells

“I really appreciate both of my mentors giving me the highest level of freedom in exploring the new areas emerging from the project”

With mentors, Steven H. Lin, M.D., Ph.D., professor in Radiation Oncology, and Nicholas Navin, Ph.D., Genetics professor, Ye has been able to take a more in-depth look at the underlying molecular mechanisms of tumorigenesis and the therapeutic resistance in tumor cells.

Ye was awarded a ROSI Non-Faculty Seed Award, which is designed to encourage and support researchers who are not on a faculty track to explore creative ideas that may blossom into more mature projects or help to enrich their academic journeys.

As a recipient of this award, Ye is studying esophageal adenocarcinoma (EAC), a deadly disease that has only a poor 5-year survival rate. Approximately 20%-30% of patients respond to the conventional combination therapy of chemotherapy and radiation, but those who do not respond have little to no treatment options. Previous studies have shown that EAC is a disease likely driven by copy number alterations (CNAs), or changes in the genetic code.

Ye submitted his project for selection through a scientific peer-review process titled “Tracking the pre-existing copy number alterations (CNAs) of esophageal adenocarcinoma that confers resistance to chemoradiation at single-cell resolution.” One of the aims of his project is to map the genetic signatures in tumors from patients to help identify commonalities or differences that may contribute to their resistance to treatment.

“We use cutting-edge single cell DNA sequencing technology to investigate the CNAs present in each tumor

from 10 patients with EAC. They observed extensive differences in copy number profiles across different patients. For the majority of patient samples tested, the investigators were able to also detect various tumor subclones harboring different CNAs, and this diversity in the tumor genome could

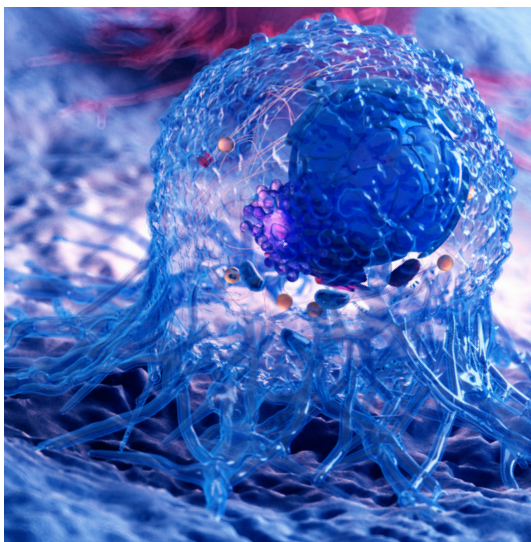
confer resistance to treatment. Interestingly, they detected specific CNA signatures that could potentially be used to predict patient response to chemoradiation, opening up additional avenues to develop treatment options.

“With the ability to investigate the genomic changes in each tumor cell treated with radiation or combination of radiation and other treatments using single cell DNA sequencing technology, we will be positioned to better understand the molecular mechanisms of how tumor cells respond to the treatments,” Ye says.

Faculty mentorship and division programs such as ROSI are critical support to build and cultivate our pipeline of future radiation oncologists and researchers.

“I really appreciate both of my mentors giving me the highest level of freedom in exploring the new areas emerging from the project,” Ye says.

The preliminary outcomes of this project, while encouraging and significant, are part of ongoing studies. The group’s ultimate goal is to further validate these findings and design future studies to translate the discoveries into potentially practice-changing clinical implementation to benefit our patients. And this is what the ROSI seed award program is all about.



Expanding Our Reach to Local Communities

RESEARCH

One of the challenges patients face in cancer care is the access to clinical trials. Over the past six years, in alignment with institutional goals and support, faculty in the Division of Radiation Oncology have significantly focused our efforts and increased enrollment of patients on clinical trials, particularly therapeutic trials.

“Expanding our trial portfolio to all our campuses allow patients improved access to cutting edge treatments that would otherwise be unavailable to them.”

“Clinical trials are how we gain the highest level of knowledge to improve and evolve in medicine,” explains radiation oncologist **Stephen Chun, M.D.** “Furthermore, numerous studies have shown that patients who participate in clinical trials generally have better survival than those who do not.”

MD Anderson has locations around the Houston area that offer a broad range of services. Chun is one of the radiation oncologists who works mainly at the West Houston location. A myriad of reasons, including the COVID-19 pandemic, has further shifted focus to expand research to our Houston-area locations to mitigate the need for patients to travel to the Texas Medical Center.

“As the distance that patients must travel is a known barrier to clinical trial participation, the Houston-area locations have the potential to reduce the geographic barriers for patients to participate in trials,” Chun says.

In addition to increasing patient access and enhancing safety protocols, we are also able to leverage the increased diversity of patient populations enrolled to our radiation oncology trials, which continues to be a main focus, and challenge, of clinical trials in general.

Despite geographical and logistical hurdles, radiation oncology faculty at our Houston-area locations and at the main campus have been at the vanguard to demonstrate the design, approach and implementation of therapeutic trials that can be successful in these locations. Patients from

our Houston-area locations comprise over a quarter (26%, or nearly 300 patients) of all radiation oncology patients enrolled in therapeutic trials in fiscal year 2021 (FY21).

We increased our enrollment in therapeutic trials by 85% from FY19 to FY20, and by 15% from FY20 to FY21. Across all campuses in FY21, we averaged 14% (as a function of new

treatment starts) of patients enrolled in therapeutic trials, with the West Houston location enrolling as high as 25% of patients.

Extraordinary efforts rely on significant support from the division as well as the institution, as our faculty continue to focus on partnering with industry collaborators and leveraging various extramural funding streams. Institutional and division leadership, as part of our institutional themes of reach, value and discovery, are investing in additional resources to enable the expansion of clinical trial capacity at our Houston-area locations, including staffing, equipment, space, technology and translational research capabilities.

Shalin Shah, M.D., the section chief for the Houston-area locations, oversees the faculty and clinical research portfolios in the community centers.

“The Houston-area locations treat a very diverse population, including a large number of underserved minorities,” Shah says. “Expanding our trial portfolio to all our campuses allow patients improved access to cutting edge treatments that would otherwise be unavailable to them.”

The pandemic has had a silver lining, as it relates to our goal of expanding clinical trials access. It is anticipated that the future will further bring exciting opportunities for radiation oncology and MD Anderson, to grow our research portfolio to our Houston-area locations and beyond.





Delivering Treatment in a FLASH

STRATEGIC ALLIANCE

The Division of Radiation Oncology has formed a strategic alliance with IntraOp, a medical equipment manufacturer, to examine the safety and efficacy of their Mobetron, a mobile electron linear accelerator.

This machine is designed to deliver radiation treatment at a fraction of the time compared to the current clinical standards. In recent years, FLASH-radiation therapy (RT) has taken the field by storm. It is the near-instantaneous delivery of radiation to tumors that has equal tumor damage potential as conventional treatments but induces significantly less side effects on normal tissues.

Radiation oncologist, **Steven H. Lin, M.D., Ph.D.**, and medical physicist, **Emil Schueler, Ph.D.**, are leading the strategic alliance to demonstrate the utility of the

trial will focus on skin lesions, with the goal to begin studying other tumor types embedded more deeply in the body in the future. A fundamental challenge in FLASH-RT is to perfect the treatment delivery and optimize the radiation dose.

“This study will help us determine the right dose, either as a single fraction or in multiple fractions, to take forward in future larger trials,” Lin explains. If successful, this approach could truly revolutionize the field of radiation oncology.

“What makes it special in comparison to our normal clinical units is that it is capable of producing radiation at a rate that is more than 1,000 times faster than what is used clinically today,” Schueler explains. The early-feasibility



Steven H. Lin, M.D., Ph.D. and Emil Schueler, Ph.D.

Mobetron in preclinical, translational and early-feasibility clinical studies, with the ultimate goal of changing the way radiation therapy is delivered.

“The alliance between MD Anderson and IntraOp is for developing the necessary infrastructure, expertise, and strategy for clinical implementation of FLASH-RT using IntraOp’s Mobetron unit,” Schueler explains. This alliance will provide the necessary testing and research to facilitate the use of the Mobetron unit in cancer care.

Currently, they are working closely with IntraOp to make specific upgrades to the machine so that it will be ready and safe for trial implementation. The first planned clinical

clinical trials will begin soon, and with that, we will be several steps closer to new treatment options.

“We aim to show that FLASH-RT using the Mobetron unit is not only feasible and safe, but that it can also deliver treatment in a split second while maintaining adequate tumor control and reduced normal tissue toxicity as compared to standard radiation approaches using biologically equivalent doses,” Lin says.

There is still a lot to learn, but this special machine is potentially a new treatment modality that we are on the cusp of discovering and using in cancer care.

Radiation Oncology Summer Student Program

Broadening Horizons for Researchers in Training

For students who are exploring careers in biomedical research, radiation oncology usually does not come to mind. This makes developing our pipeline especially critical. Two members of our faculty are among many in the division who devote significant efforts to address this challenge.

EDUCATION

Aligning with the institutional summer student program, **Jillian Gunther, M.D., Ph.D.** and **Devarati Mitra, M.D., Ph.D.**, have developed a program and culture within radiation oncology where mentorship is key, opportunities abound and the only things one need is an inquisitive mind and willingness to ask questions.

During the 13-week long Radiation Oncology Summer Student Program, students are paired with faculty mentors who will guide them through a focused research project. These faculty leaders recognize the importance of exposing students to research opportunities early in their learning journey toward a potential academic career. As a student's typical curriculum may not always include research experience, providing this opportunity is an effective way to demonstrate a glimpse of what the world of research entails.

"Students are familiar with the process of studying information they are given to be able to reproduce that information on an exam," Gunther explains. "Research helps students develop an entirely different way of thinking that surpasses pure memorization."

Practicing research shows students the vast world of academia and can help them make important career choices. Gunther and Mitra had their own personal research experiences as students that informed their paths.

"My first summer research experience was working at the National Cancer Institute (NCI) in the brand new lab of Manu Hegde, M.D., Ph.D., as a recent M.D. and Ph.D. graduate," Mitra says. "This was the foundational experience that led to my future plans to major in biology in college and pursue a career in academic medicine."

Gunther was also practicing research early in her academic experience as an undergraduate student. "It was amazing to me that some of the seemingly routine tasks that I was helping to perform could eventually lead to big discoveries and potentially improve people's lives," Gunther says.

Both faculty leaders were inspired by their research experiences and ultimately took on leadership roles, especially for the Division of Radiation Oncology, to further develop the summer student program to offer others the opportunity to experience the benefits of a supportive research environment.

Our main goal is to expand the program so that more students can participate and leverage the community of

peers and faculty mentors, including those from underrepresented minority backgrounds.

"Helping put together this program provided an opportunity for us to applaud individual student accomplishment while simultaneously introducing students to the incredible depth and breadth of MD Anderson research," Mitra says.

Part of the students' learning experiences include the development of presentation skills to showcase their hard work throughout the program. In service of this goal, the division hosts a symposium or series of oral presentations to an audience of their peers, mentors

and others across the institution. The COVID-19 pandemic compelled these faculty leaders and their teams to become creative with their didactic toolbox in putting on a hybrid in-person and virtual symposium last summer. This helped stimulate and maintain engagement while simultaneously adhering to safety protocols.

"I hope the symposium becomes an annual event for our department that will engage more students in future years. The hope is that post-COVID-19 era, it will be a fully in-person event where more students can meet each other, and faculty and researchers can be recognized for what they've accomplished," Mitra says.

With foundational programs such as this, as long as the students have gained knowledge and a positive experience, it is always a win for us – even if they end up elsewhere in their careers. It is a double win if that journey takes them to radiation oncology.



Devarati Mitra, M.D., Ph.D. and Jillian Gunther, M.D., Ph.D.

The Critical “Bench” of Bench-to-Bedside: Where Mechanistic Discoveries are Made

RESEARCH

In the Division of Radiation Oncology, there are currently two clinical departments (Radiation Oncology and Gastrointestinal Radiation Oncology), as well as Radiation Physics and Experimental Radiation Oncology (ERO). ERO is where radiation oncology faculty and their teams conduct laboratory-based cancer research, studying the biological mechanisms of cancer and how radiation affects normal and tumor tissues, especially the tricks that tumors use to acquire resistance to radiation therapy.

Li Ma, Ph.D., a professor in ERO, is inspired by cancer patients every day. “I know quite a few cancer patients, including my relatives, friends and patient advocates at MD Anderson,” Ma says. “They are desperately looking for cures, but cures are rare for certain cancers, especially metastatic cancers. This inspires me to study tumor progression and metastasis.”

Metastatic disease is when the cancer has spread from the primary tumor location to one or more sites in the body and usually has less desirable outcomes. This is why Ma is challenged to ask complex questions and use innovative technologies to design and implement the appropriate scientific approaches to understand, often at the molecular level, the many facets of metastatic cancer.

Part of Ma’s work, together with her team of researchers at MD Anderson, has shed light on defining microRNA regulation and redefining long non-coding RNA regulation of metastasis. These RNAs stem from our genetic code, but do not code for proteins, although they still have significant impacts on cellular activities in normal physiology and disease manifestations.

In recognition of her outstanding work in this field, Ma received the Sue Eccles Award in Cancer Metastasis Research at the 2021 Metastasis Research Society meeting and gave an award lecture.

Recent discoveries in Ma’s laboratory are leading to breakthroughs in pancreatic cancer, a largely intractable

disease. Pancreatic cancer, primarily pancreatic ductal adenocarcinoma (PDAC), is a leading cause of cancer-related mortality, with a 5-year survival rate as low as 6% in the United States.

Surgery and adjuvant chemoradiation are the treatment options only for a small subset of patients with resectable

disease. Radiation therapy combined with chemotherapy developed over the past decade, improved the survival of patients with non-resectable late-stage pancreatic tumors. However, nearly all patients relapse eventually and second-line treatment options are poor. Although recent developments led to new clinical trials and the Food and Drug Administration (FDA) approval of targeted therapies, these drugs only work for a small subset of PDAC patients. Except for the <1% of patients with microsatellite instability-high tumors, PDAC is refractory to immune checkpoint blockade (ICB) therapies that transformed the treatment of multiple cancer types such as melanoma and lung cancer.

“Recently, our lab discovered a therapeutic strategy for sensitizing pancreatic tumors to immunotherapy. Hopefully, we can translate our discovery into clinical trials soon,” Ma explains.

This recent discovery was published in the high-impact journal *Nature Communications* titled “Glucocorticoid receptor regulates PD-L1 and MHC-I in pancreatic cancer cells to promote immune evasion and immunotherapy resistance.”

Ma’s laboratory has been largely funded by multiple grants from the National Cancer Institute, a premier federal sponsor of cancer research, the Cancer Prevention and Research Institute of Texas and others.

“Research is a fundamental process to reveal the truth about life and the world,” Ma says. With this principle, she continues to push the boundaries of technology and knowledge to reveal these truths, always keeping cancer patients as the guiding light.



Li Ma, Ph.D.



The Thrill of Discovery: A Medical Physicist's Drive and Passion for Knowledge

FACULTY PROFILE

Some faculty members touch the lives of cancer patients from both within and outside the walls of a treatment room. Radiation Physics Professor **Radhe Mohan, Ph.D.**, has brought transformative changes in cancer care throughout his long career with his research in the physics of radiation oncology.

"I have been fortunate to have had the opportunity to conduct research and develop technologies on the widest conceivable array of topics in physics, biophysics, radiation oncology and related fields at the world's two top cancer research and treatment centers – MD Anderson and Memorial Sloan-Kettering," Mohan explains. "The clinical translation of the results of the research I have been a part of has led to major gains in outcomes with radiotherapy."

Mohan and his team of collaborators were recently awarded an approximately \$15 million, 5-year National Cancer Institute Program Project Grant (P01) for his research proposal titled "Integrating Patient-Specific Clinical and Biological Factors towards Individualizing Utilization of Proton and Photon Radiation Therapy." This is the third in a series of program projects awarded jointly to MD Anderson and Massachusetts General Hospital (MGH) since 2009. Mohan and Theodore Hong, M.D., from MGH, serve as the multi-Principal Investigators of the P01.

Conventional photon (or high energy x-ray)-based radiotherapy has been advancing steadily over the last

practice where the corresponding models are one-size-fits-all population averages.

The new models will allow accurate prediction of outcome of treatment based on each patient's personal characteristics. They will also allow the more appropriate choice between proton or photon treatments and the optimized tailoring of radiation dose patterns to maximize the therapeutic ratio of tumor control versus side effects.

New P01 Program Project

The new P01 program includes three research projects. The first aims at understanding radiation-induced normal tissue toxicities and developing personalized models and strategies for minimizing toxicities. The second similarly addresses the radiation-induced suppression of the immune system, which is a common side effect of conventional photon therapy. The weakened immune system increases the risk of treatment failure, toxicities and infection. There is also increasing evidence that it compromises the benefit of immunotherapy after radiotherapy.

The third project studies the sensitivity of an individual patient's tumor to radiation based on genomic and DNA repair factors. The combined results of all three projects are expected to lead to a significant improvement in the effectiveness of radiotherapy alone and in combination with chemotherapy and immunotherapy. Due to the way the protons deposit radiation dose and our ability to control



Radhe Mohan, Ph.D.

"The clinical translation of the results of the research I have been a part of has led to major gains in outcomes with radiotherapy."

many decades. Proton radiotherapy is relatively recent and has considerably greater therapeutic potential. However, continuation of the major program of proton therapy research effort started about a decade ago is required to exploit such potential. This research is expected to lead to a paradigm shift from conventional radiotherapy in many ways.

Examples include the development of treatment response prediction tools (models) that are "personalized" to each patient's clinical characteristics, e.g., age, gender, stage of the disease, tumor size and location and genetic sensitivity to radiation. This is in contrast with conventional clinical

the penetrability of protons, we believe that the therapeutic gains with proton therapy will be greater than with photons. This hypothesis will be tested through his group's research.

Mohan and the multi-institutional teams involved in this project have a big task ahead of them, but his commitment to research and his passion for science continue to push him beyond boundaries to achieve breakthroughs in cancer care.

He notes that "the thrill of discovery, the passion for learning, the satisfaction of collaborating with his colleagues and mentoring junior faculty and trainees and, especially, contributing to the improvement in outcomes of cancer patients" are what inspire him.

Educating and Empowering the Next Generation of Radiation Oncology Researchers: A Core Part of Our Mission

EDUCATION



Radiation Oncology Education Statistics as of the end of FY21

Creating learning opportunities for our students and trainees not only rely on didactic platforms, but also on hands-on, direct experiences such as research in the laboratories, in the clinic, or using various technological platforms. Our division faculty devote much of their effort to foster this educational environment, and our students and trainees are among some of the best and demonstrate their potential for a successful career in academic medicine. **Hayden Lydick**, a medical student in the department of Radiation Oncology, was awarded the Radiological Society of North America (RSNA) Education and Research Foundation Medical Student Grant for 2021. The funding provides the opportunity for medical students to gain research experience in medical

and techniques coming down the pipeline and, as a future physician, I think it is important to not only understand where a field is currently, but where it is going,” Hayden explains. The results from the studies are intended to help inform physicians to make necessary adjustments to a patient’s radiation treatment plan early.

Lydick conducts his research under the guidance of his mentor, Dave Fuller, M.D. “Dr. Fuller is one of the best mentors I have met,” Hayden says. “It’s important to Dr. Fuller to foster a positive work environment which reflects his commitment to career development.” Mentors like Dr. Fuller at MD Anderson inspire researchers like Lydick to explore areas of research that are of interest and important

“It’s important to Dr. Fuller to foster a positive work environment which reflects his commitment to career development.”

imaging while still pursuing their education. Ultimately, this experience gives students a chance to consider academic radiology as a future career option.

Lydick’s research is focused on using the powerful technology, magnetic resonance imaging (MRI), to detect osteoradionecrosis (ORN), which is a rare but serious side effect of radiation therapy, specifically to the head and neck regions. The goal of his project is to mitigate symptoms of ORN through early detection in patients by evaluating quantitative properties of tissue seen in MRIs. “Research provides an opportunity to experience the new technologies

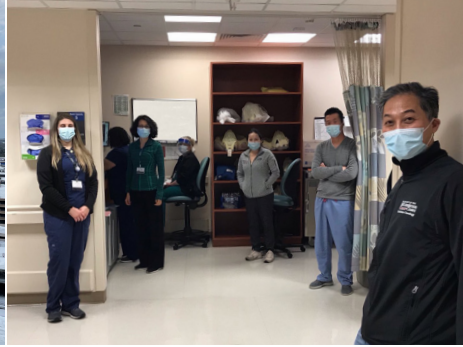
to them. Fuller gives them the freedom and encouragement to contribute to potential breakthroughs in cancer research.

Lydick’s drive and passion for research, specifically using MRI, is apparent and underscores MD Anderson’s core value of discovery. “MRI’s ability to inform complex simulations like cancer modeling and tissue perfusion with little hardware changes can empower physicians and patients to make more informed decisions on treatment planning and expectations,” Lydick says. The future is bright for these student researchers, whether or not they commit to radiation oncology.

2021: The Year in Photos



The Texas Medical Center after the winter storm in February 2021



Back to treating patients after the Houston freeze thanks to facilities and ClinOps teams



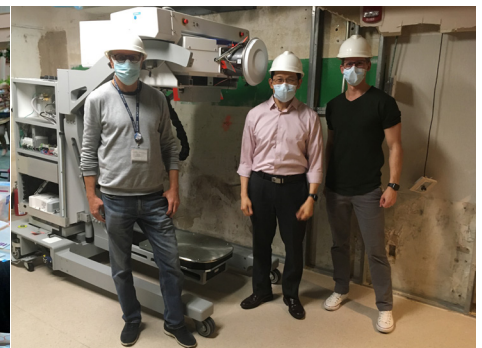
RadOnc nurses doing outstanding work to support our patients during the COVID19 pandemic.



Construction continues on PTC 2



Dr. Pamela Schlembach gets her COVID-19 vaccine



Drs. Beddar, Lin, and Schueler with the FLASH capable Mobetron Unit



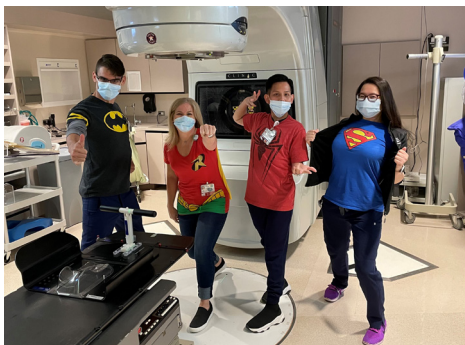
Dr. Caroline Chung showing her Boot Walk spirit



West Houston HALS therapy team



Dr. Hanh Hoang and family participating in the Boot Walk.



Our RadOnc therapists are super heroes that take great pride in taking care of our patients



Albuquerque therapist dress up as nerds for Spirit Week



Medical Student Program in Radiation Oncology Summer Student Esther Soyebo

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