Ushering in a New Era of Cancer Medicine. Recent advances in our understanding of radiation biology, molecular biology, and imaging are allowing our scientists to see and study tumors like never before. We can now develop unique treatment strategies for patients in ways only dreamed of by previous generations of physicians, scientists and patients. The possibilities for increasing cancer cure while at the same time minimizing the side effects of treatment are real.
Our interdisciplinary team of clinicians and scientists continue to provide hope to cancer patients by improving cancer detection, diagnosis, treatment and prevention, both at Johns Hopkins and across the globe.

Through discovery, translation, and application, our experts are transcending the boundaries of the laboratory and moving research discoveries to the clinic with personalized and targeted radiation therapies for cancer patients. We are ushering in a new era in cancer medicine.

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Proton therapy is targeted radiation therapy. It very precisely zeroes in on tumors, increasing the damage to cancer cells, while minimizing radiation exposure to healthy tissue and organs. It is the state-of-the-art in radiation treatment for several types of cancer. With its precision and safety, it has become the standard of care for pediatric tumors, tumors of the brain, spine and eye, lung, head and neck, and bone (sarcoma) cancers.

Our clinical and research teams are world leaders in radiation oncology technology development, radiation quality and safety, and it is one of the few medical institutions with a pediatric radiation oncology expert. Johns Hopkins has become synonymous with excellence in patient care, and so it is critically important that we acquire this technology.

Proton therapy is not a new radiation oncology tool, but it has now become essential to providing cutting edge cancer care. Of the top-ranked cancer centers nationally, Johns Hopkins is the only one that does not currently treat patients with proton therapy. Many experts question whether our institution can remain a leader in cancer medicine without acquiring proton beam therapy.

Johns Hopkins Radiation Oncology and Molecular Radiation Sciences investigators would conduct clinical research to provide some of the first evidence-based approaches to proton therapy. Our scientists will have the opportunity to become the global leaders in the study of cellular response to proton therapy. Because proton therapy is so well targeted, many have theorized, fewer high dose treatments of proton therapy may be more effective than longer, lower dose conventional therapies. Our researchers would be among the first to test this as well as begin to explore the benefits of combined therapies with radiosensitizers and chemotherapy. In addition, our team could use basic and clinical research to resolve the scientific controversy surrounding the benefits or proton therapy in treating prostate cancer.

Johns Hopkins would locate its proton therapy facility at our Washington D.C. campus where there is ample space to construct the facility necessary to house the equipment and staff. An investment in proton therapy would mark the first signature investment in the advancement of cancer care in the National Capital Region, and it would be the foundation of the D.C. campus of the Kimmel Cancer Center providing opportunities to grow cancer diagnostic, treatment, and research services and collaborations with the National Cancer Institute, Children’s National Medical Center and other critical D.C. partners.

Radiation sensitizers
Radiation kills cells by damaging the DNA inside the cell. The great challenge in the radiation treatment of cancer is effectively killing cancer cells without causing harm to surrounding healthy tissue and organs. Radiation Oncology investigators have developed a technology that now makes this possible. Targeted radiation sensitizers are specific to cancer cells and prevent them, and only them, from repairing radiation damage. As a result, clinicians could deliver the same cancer-killing effect using much lower doses of radiation or, conversely, maintain the dosage and obtain a far greater destruction of cancer cells.

The breakthrough focuses on small inhibitory RNA (siRNA) molecules that have the ability to interfere with the expression of genes. The researchers use aptamers, a guidance system of sorts, to get the RNA molecule to its target inside of cancer cells where it shuts down cancer cells’ ability to make repairs, and as a result, they die.

The Radiation Oncology team at Johns Hopkins team was the first to show that small inhibitory RNA could be used for cancer therapy. The aptamers, which allow the repair-blocking inhibitory molecules to be targeted specifically to cancer cells, are unique...
to Johns Hopkins and considered the medical standard. Moreover, it is a platform technology that can be used in any cancer type, simply by changing the aptamer.

Now, a multidisciplinary team of experts, led by scientists in Radiation Oncology, has developed a combined imaging/treatment approach at the molecular level that allows researchers and clinicians to see inside the cancer cell and view them as they are being treated. The team has developed a first-of-its-kind approach for prostate cancer that uses nanoparticles filled with an anticancer drug that also sensitizes cancer cells to radiation and a radiopharmaceutical or cell-imaging agent. The nanoparticle is targeted to PMSA, a biomarker for prostate cancer, so that it zeroes in on and delivers its anticancer payload specifically to prostate tumors and also allows investigators to track and monitor the drugs journey and affect against its cancer target. All of the agents have been used separately in patients before and deemed safe. The only remaining hurdle to move this promising method to patients is funding.

When prostate cancer spreads, it is usually to the bone, so investigators are building upon this nanotech approach using alpha particles, a type of radium isotope that is naturally targeted to the bone. It captures the killing power of decaying radium, but in this form it has a short life of about ten days and only causes damage in the limited path it travels in the body. Radium has a chemical relationship to calcium, and so acts in the human body like calcium, naturally traveling to the bone—the site of prostate cancer metastasis. Investigators are studying a combined nanoparticle/alpha particle/radiation treatment. The nanoparticle, loaded with its radiation-sensitizing anticancer drug, is given simultaneously with the bone-metastasis-targeting alpha particle to exquisitely and precisely attack prostate cancer and its spread.

LABORATORY ACCELERATOR PROGRAM

Identifying drugs that sensitize cancer cells to radiation is a difficult and complex because drugs must sensitizes cancer cells without sensitizing the many more normal cells. The difficulty is in finding drugs that distinguish normal cells from cancer cells.

With expertise in drug screening, pharmacology, radiology, and radiation biology, Johns Hopkins Radiation Oncology is among the very few places that have the combined expertise required to perform comprehensive drug screening of radiosensitizers.

The Laboratory Accelerator Program would provide a dedicated and centralized resource for investigators performing this research critical to personalized cancer medicine and delivery of targeted radiation therapy.

FACULTY SUPPORT AND RESEARCH TRAINING PROGRAM

Like other Johns Hopkins departments, Radiation Oncology attracts the best and brightest young minds in medicine. Professorships, fellowships, and scholarships provide resources for faculty and young trainees, allowing us to attract, train, and retain the best and brightest in the field.

Among our current class of fellows are two Rhodes Scholars. The Radiation Oncology fellowship program has five years of funding, but fellows have five years of training. Four years are spent in clinical work, and the fifth is centered on research. Additional support is critical if we are to maintain this level of excellence.

WHY JOHNS HOPKINS? WHY NOW?

Radiation Oncology is particularly dependent upon technology to provide the best and safest care, and philanthropic support ensures that our laboratories and clinics are outfitted with state-of-the-art equipment and devices so that we may better explore and deliver radiation therapy. Our team of experts is leading the way, inventing new systems and technologies that are revolutionizing the nature and delivery of radiation treatment. This pursuit of excellence has resulted in new discoveries that are transforming cancer care. We are poised to advance the effectiveness of radiation delivery at this critical time in history. Working with our colleagues in the Kimmel Cancer Center, we are uniquely positioned to make revolutionary advances against cancer.
Rising to the Challenge:
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