



DEPARTMENT OF
ORTHOPAEDIC SURGERY

NEW FUTURES FOR ORTHOPAEDIC ONCOLOGY

Philanthropy



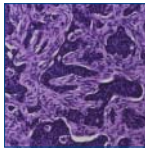
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has always played a crucial role in supporting the Johns Hopkins University's tripartite mission: patient care, education, and research. Gifts from our donors (people like you) allow us to make significant discoveries in the laboratory and to apply the results in the clinic.

Some people give money to Hopkins out of gratitude. Giving is their way of saying thank-you for the care they have received. Others give because they are frustrated that a cure or treatment regimen has not yet been identified.

Your gift, large or small, could support a specific initiative, enable us to purchase a piece of highly specialized equipment, or help a researcher create the next breakthrough. Gifts of any amount are welcomed.

It takes huge financial resources to conduct research of the caliber that we do at Johns Hopkins. Thank-you for helping us to be the best.

Frank J. Frassica, M.D.

Kristy Weber, M.D.

Scott Kominsky, Ph.D.



Research Projects I

Understanding the Biology of Metastatic Bone Disease

Rationale:

Metastatic bone disease is becoming more prevalent as patients are living longer with disseminated disease.

Bone metastases from RCC (kidney cancer) are characterized by rapid growth, increased blood supply, resistance to chemotherapy, and excessive bone destruction.

Since there remains no cure for patients with bone metastasis, the remaining months or years of life can be fraught with pain, pathologic fractures, immobility, and neurologic compromise.

A significant focus of our laboratory is **to discover methods to reduce bone destruction caused by tumor cells that have left major organs** such as the breast and kidney and lodged within bone.

A better understanding of the biology of how tumor cells interact with the bone environment **will allow us to develop treatments to target specific molecules to prevent or treat bone metastasis.**

Specific Needs

\$500,000 for personnel, supplies & core services



Targeted Treatment of Bone Metastasis

Rationale:

Bone metastases occur frequently in patients with advanced breast, prostate, kidney, thyroid, and skin cancers. Despite advances in treatment, a cure remains to be discovered. **The challenge of treating bone metastasis is to deliver high doses of antitumor agents directly to tumor areas with minimal exposure to the remainder of the body.**

An innovative project developed in our laboratory is focused on a drug delivery system to specifically target cancer within the skeleton. **We are developing microscopic biodegradable beads that can be injected intravenously and will**

travel to sites where bone is being destroyed through the use of specific targeting molecules attached to the bead surface. These beads can be loaded with virtually any drug, which is released slowly over time as the beads degrade.

The benefit of this delivery approach is that it is specific to the bone and the drugs should have a **minimal toxic effect on the remainder of the body.** The exciting potential of this work is that it could be used to target bone metastasis from any cancer. In addition, there is great potential for use in other diseases such as osteoporosis and as a way to bring healing agents to non-healing fractures.

Specific Needs

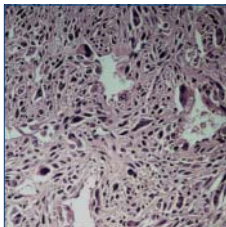
\$250,000 for personnel, supplies & core services



Resources for the Future



Prevention of Breast Cancer Bone Metastasis



Rationale:

Incurable bone metastases occur in 80% of patients with advanced breast cancer. Patients often have a poor quality of life due to pain, fractures or nerve compression by the tumor.

Great strides have been made in understanding how breast cancer cells interact with the bone leading to the development of new drugs. However, these drugs are primarily designed for the treatment of established bone lesions to decrease pain and the likelihood of fracture. **Focused work on the prevention of bone metastasis has yet to be done.**

We plan a novel approach of using a breast cancer vaccine combined with a powerful bisphosphonate to prevent the occurrence & growth of bone metastasis.

To test this approach we will develop a new mouse model of bone-specific breast cancer metastasis allowing real-time monitoring of tumor growth. This model will serve as a powerful tool for studying breast cancer & developing new therapies. **This work can be quickly applied to actual patients & addresses a very important issue in breast cancer prevention & treatment.**

Specific Needs

\$250,000 for personnel, supplies & core services

Electronic Database

Rationale:

Establishment & maintenance of a database for orthopaedic oncology patients is **crucial to improving our knowledge of natural history, radiographic and pathologic features and treatment.**

Database benefits include:

- Further understanding patterns of disease
- Measurement of outcomes of treatment
- Identification of key prognostic factors
- Refinement of reconstructive techniques
- Enhancement of patient education

Specific Needs

Database Manager	\$40,000 per yr
Software Dev (initial cost)	\$10,000

Musculoskeletal Tumor Tissue Bank

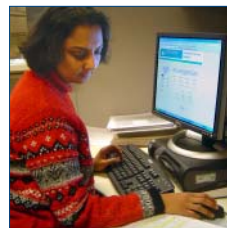
Rationale:

A tumor tissue bank for orthopaedic oncology patients is **vital to making basic science discoveries** which can then be applied to patients. By removing DNA and proteins from the tumor tissue in the lab **we can study what genes or proteins are altered within the tissue.**

Correlating tumor information with database information will help us understand why the tumor formed, its aggressiveness or ability to spread, & will foster discovery of new targets for diagnostic testing and cancer treatment.

Specific Needs

-80°C Tissue Freezer	\$9,000
Liquid Nitrogen Freezer (tumor cell lines storage & preservation)	\$20,000
Cryostat (cutting frozen sections)	\$15,000



Faculty Development

Associate Professorship in Basic Science Research

Rationale:

The establishment of an associate professorship will allow a **mid-level faculty member** to have financial support during the **formative years of scientific development**. This measure of support would allow the faculty member to concentrate on specific aims of his or her projects.

Many faculty members expend inordinate periods of time competing for grant funding which significantly detracts from research objectives.

Annual income from this research professorship will pay a significant amount of a new faculty member's salary. The faculty member would hold this professorship for a maximum of six years or until he or she attained the rank of full professor.



Specific Needs

\$ 1.0 million gift to endow the associate professorship

Assistant Professorship in Basic Science Research

Rationale:

The establishment of an assistant professorship will allow a **new faculty member** sufficient time to **begin his or her research career**. The faculty member would be able to spend significantly more time performing his or her research.

Annual income from this research professorship will pay a significant amount of a new faculty member's salary. The faculty member would hold this professorship for a maximum of six years or until he or she attained the rank of associate professor.



Specific Needs

\$ 1.0 million gift to endow the assistant professorship

Gifts in the form of checks may be made out to "The Johns Hopkins Orthopaedic Oncology Fund" and sent to Dr. Frank Frassica, 601 North Caroline Street, 5215 JHOC, Baltimore, MD, 21287-0765.

You may also make a donation through our website at: <http://www.hopkinsmedicine.org/orthopedicsurgery/gift.html>

All of our clinical, teaching and research professionals thank you for your partnership.

Research Personnel

Postdoctoral Fellow Training Grants

Rationale:

In order to train competent scientists in the field of cancer biology to specifically study bone metastasis, these grants would allow the selection of individuals to spend approximately 3 years in the laboratory learning relevant techniques and developing an independent research career.

Metastatic Bone Disease

The focus of this individual's work will be **to identify and characterize membrane proteins regulating breast cancer metastasis to the bone**. In addition, the individual filling this position will develop an *in vitro* model of bone metastasis as an alternative to the use of animal models. This system will allow rapid and cost effective identification of factors affecting the ability of tumor cells to grow in the bone.

Sarcoma

The focus of this individual's work will be **to develop a mouse model of sarcoma mimicking the human condition as closely as possible**. This model will subsequently be used to determine the effectiveness of a novel drug, 3-bromopyruvate, in sarcoma treatment. This drug prevents cells from generating energy (ATP) and may selectively destroy cancer cells since they require more energy than normal cells.



Specific Needs

\$ 125,000 per gift to provide 3 years of funding for training

Senior Laboratory Technician

Rationale:

The senior laboratory technician is vital to the success of the program. The current Senior Technician runs the day-to-day workings of the lab, is skilled in a wide variety of molecular techniques relevant to our projects, and functions at the level of a postdoctoral fellow. The focus of this individual's work will be **to generate data sufficient for a manuscript** which will serve as preliminary data for a grant submission to the NIH. The technician will assist with manuscript & grant preparation, & present this work to the American Society of Bone and Mineral Research national conference.



Summer Student Training / Cancer Biology Related to the Musculoskeletal System

Rationale:

Our laboratory provides an opportunity for summer students (college, graduate or medical) **to develop skills in molecular biology techniques and to learn how to answer basic cancer-related research questions**. Often, this experience is instrumental in stimulating a continued career in scientific investigation.

Specific Needs

\$ 50,000 for 1 year of technical support

Specific Needs

\$ 5,000 per student for training & supplies for one summer

Research Equipment

Laboratory Equipment for Current Projects

Rationale:

Maintaining a modern, state-of-the-art molecular biology laboratory devoted to cancer research involves up to date equipment.

Our laboratory is well-equipped with basic instruments, but technology is constantly changing. **The use of state-of-the-art technology will allow us to increase our pace of discovery as well as to answer more sophisticated questions.**

The following list would bring our work to the forefront of molecular research of cancers involving the musculoskeletal system.

Specific Needs



Nucleofector \$12,000

This new device **provides the ability to alter gene expression in cancer cells**, allowing the role of specific genes in cancer to be determined by increasing or blocking their function. It is 50%-70% more efficient than traditional transfection techniques and is successful in 99% of all cases, thus greatly accelerating scientific research.

Coulter Counter \$30,000

The use of this automated cell counter **would elevate the accuracy of all laboratory experiments involving cancer cells** and **save 80% of time** compared to the current method of counting by hand.

Fluorescent Plate Reader \$35,000

This device allows the measurement of all wavelengths of fluorescent light in as many as **96 samples simultaneously**, versus one sample as measured routinely by microscope. Thus, this device **allows the performance of high-throughput experiments, allowing rapid discovery and time savings.**

Luminometer \$6,000

This machine **measures a single wavelength of fluorescent light** commonly used in a "luciferase assay." This assay is used **to directly study gene activity within cells**, an activity that cannot be performed without this instrument.

Nanodrop Spectrophotometer \$10,000

This device can be used to **measure the amount of DNA, RNA, or protein in a sample**. Since this device allows the direct use of an extremely small sample size (1 microliter), it **saves both time and precious research materials.**

X-Ray Developer \$10,000

Our laboratory uses film processing on a daily basis and would greatly benefit from a developer within our space. **This would allow unlimited, anytime use.** Our laboratory space is already outfitted with a dark room for this purpose.

Real-Time PCR Machine \$60,000

PCR (**the amplification of DNA**) is routinely performed in the laboratory. This state-of-the-art machine amplifies DNA and **simultaneously quantifies the amount generated.** This **allows comparisons to be made between the precise amount of a gene in one sample versus another** (ex: normal cells vs tumor cells).