COVER SHEET FOR GRANT PROPOSALS
State Board of Education

SBOE PROPOSAL NUMBER:  
(to be assigned by SBOE)  

AMOUNT REQUESTED: $50,000

TITLE OF PROPOSED PROJECT:

Small Molecule Inhibitors for the Reduction of Cancer Metastasis

SPECIFIC PROJECT FOCUS:

The ultimate objective of this proposal is to commercialize a cancer therapy for reducing breast and prostate tumor metastasis. Here we propose to exponentially increase our commercialization potential by modifying our already identified chemical small molecule inhibitor (SMI) and assessing it for increased efficacy.

<table>
<thead>
<tr>
<th>PROJECT START DATE: 7/1/14</th>
<th>PROJECT END DATE: 6/30/15</th>
</tr>
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<tbody>
<tr>
<td>NAME OF INSTITUTION:</td>
<td>DEPARTMENT:</td>
</tr>
<tr>
<td>Boise State University</td>
<td>Office of Sponsored Programs</td>
</tr>
<tr>
<td>ADDRESS:</td>
<td></td>
</tr>
<tr>
<td>1910 University Dr., Boise, ID 83725-1135</td>
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</tr>
<tr>
<td>E-MAIL ADDRESS:</td>
<td>PHONE NUMBER:</td>
</tr>
<tr>
<td><a href="mailto:csp@boisestate.edu">csp@boisestate.edu</a></td>
<td>208-426-4420</td>
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<tr>
<th>NAME:</th>
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<tbody>
<tr>
<td>Dr. Cheryl Jorcyk</td>
<td>Professor</td>
<td></td>
</tr>
</tbody>
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<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Karen Henry</td>
<td></td>
</tr>
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</table>

Authorized Organizational Representative
Executive Summary

The goal of this proposed project is to help a novel breast/prostate cancer therapeutic developed at Boise State University reach its full economic potential. Breast cancer is the most commonly diagnosed cancer in women worldwide, while prostate cancer is the second (to lung) most common cancer for males. Men have a 15.3% chance of being diagnosed during their lifetime with prostate cancer and women have a 12.3% chance for breast cancer\textsuperscript{1, 2}. These cancers are relatively treatable and patient survival is high, unless the tumor spreads (metastasizes) to different tissues in the body like lung, liver, bone, and brain. For example, the five-year breast cancer survival rate is 98% for women who are diagnosed with localized disease, yet the survival rate is only 23% for patients with distant metastases. Currently, there are no FDA-approved therapeutics specifically targeting early stages of metastasis, when intervention could be most efficacious. The technology described here, a potential drug called an oncostatin M small molecule inhibitor (OSM-SMI), shows promise in early-stage testing by reducing the potential for tumor cells to become motile and metastasize to other tissues. Oncostatin M (OSM) is an inflammatory protein important in normal wound healing and disease states such as arthritis and cancer. When OSM binds its receptor (OSMR) on tumor cells, it signals many events associated with the metastatic cascade (Fig. 1). An OSM-SMI works by interacting with OSM and preventing it from binding its receptor and signaling downstream metastatic events.
In order for Boise State University to more effectively commercialize an OSM-SMI as a potential therapeutic, we need to develop and test OSM-SMI analogs. The analogs will likely have better efficacy, and therefore, will be more valuable therapeutics and contribute to a stronger intellectual property (IP) position. To effectively develop OSM-SMI analogs, this project will consist of three specific aims: (1) Dr. Warner, the collaborator, will develop a bank of theoretical analogs and synthesis methods, and he will utilize his lab team to synthesize these compounds; (2) Dr. Jorcyk’s lab will examine OSM-SMI analogs for inhibition of OSM signaling; and (3) Dr. Jorcyk’s lab will assess these compounds for efficacy towards reducing metastatic potential utilizing previously developed in vitro assays. The top analogs that show promise in early-stage in vitro testing will be tested further in vivo safety and efficacy studies.

“Gap” Project Objective

Total Amount Requested = $50,000

While there are currently numerous medicines and vaccines in clinical trials for the treatment of cancer, a drug that specifically inhibits early stages of metastasis as well as acts as
an anti-inflammatory has not yet been discovered. Our long-term goal is to develop an FDA-approved small molecule inhibitor that decreases cancer patient mortality by both the treatment of metastasis as well as the prevention of additional metastases. The objective of this proposal is to increase the commercialization potential of our oncostatin M small molecule inhibitor (OSM-SMI) by modifying it and assessing it for increased efficacy.

To progress this project toward our end objective of developing a novel OSM-SMI as a therapy for metastatic cancer patients, we have proposed three specific aims. In the first aim, we will develop and synthesize up to three analogs of our already identified compound called OSM-SMI-2 (see The Technology and Path to Commercialization section; Fig. 3). These analogs will consist of slight chemical modifications of OSM-SMI-2, basically ‘tweaking’ it ever so slightly. In Aim 2, these potential OSM-SMI analogs will be tested in vitro using four different human cancer cell lines: two metastatic breast cancer and two metastatic prostate cancer cell lines. The cells will be treated with each compound to see if the potential small molecule inhibitor can block OSM signaling through its receptor. In aim 3, the four cell lines will be treated with each analog to test for the inhibition of downstream cellular responses important for maintaining or promoting metastasis.

**Description of how resource commitments reflect the priorities of the home institution(s)**

This project is and will be supported by the Division of Research at Boise State University. This office provides program, financial management, and administrative support for all sponsored projects, and is led by Mark Rudin, PhD. The Office of Technology Transfer (OTT) has applied for two patents for (1) the Inhibition of OSM with Small Molecule Inhibitors for Breast Cancer Intervention and (2) the Inhibition of OSM with Small Molecule Inhibitors for
Prostate Cancer Intervention discovered and developed at Boise State University. OTT has engaged patent counsel for patent strategy to fully capitalize on these discoveries. Additionally, this project is in direct alignment with the University’s goal to “Align University programs and activities with community needs.” During this project, we will leverage knowledge and expertise within the community, collaborate with external partners to increase our success in getting this technology to market and work to engage students in a STEM related project.

**The Market Opportunity**

Surviving a cancer diagnosis is determined, to a great extent, by whether or not the cancer remains localized or metastasizes. This is especially true for both breast and prostate cancers, where the 5-year survival rate for males with localized prostate cancer is 99% but it is only 28% in patients with distant metastases\(^2\). Currently, there is no therapeutic that directly prevents the spread of these cancers to other tissues; this project will develop a bank of potential therapeutics that will specifically address this problem. This therapy will be utilized in early to mid-stage breast and prostate cancer, after removal of the primary tumor, to prevent the advancement of the cancer to other tissues. The yearly market potential for both cancers in the United States alone is outlined in Table 1. The total market potential will be limited by specific indications outlined in clinical trials.

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>Breast</th>
<th>Prostate</th>
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<tr>
<td>Forecasted new cases in 2014</td>
<td>232,670.00</td>
<td>233,000.00</td>
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<tr>
<td>Percentage of cases localized</td>
<td>61%</td>
<td>81%</td>
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<tr>
<td>Percentage of cases regional</td>
<td>32%</td>
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<tr>
<td>Percentage of cases distant</td>
<td>50%</td>
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<td>Yearly Demand Projection</td>
<td>216,383.10</td>
<td>216,690.00</td>
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<td>Cost per round of treatment</td>
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<td>Market potential</td>
<td>$4,327,662,000.00</td>
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Table 1: All epidemiologic statistics were obtained from Cancer.gov and the cost per round of treatment was conservatively estimated from the cost of other branded therapeutics, which average $90,500.
The first hurdle to reaching this market is attracting the resources necessary to invest in clinical trials. This proposal will directly increase the value of the OSM-SMI, and will therefore assist with attracting potential development resources/commercialization partners.

The second hurdle to reaching the market, FDA approval, will be tackled with a commercialization partner. The FDA approval pathway is full of challenges and requires enormous amounts of capital. On average, pharmaceutical products require $1.4 billion to get to market. This is why attracting a partner is key to the success of this project.

**Impact to the economy of Idaho**

If the commercialization of this technology is successful, it has the potential to bring millions of dollars back to the state of Idaho. The return will likely take the form of licensing fees and royalties that are generated from a license agreement. As outlined above, both breast and prostate indications have a market potential of close to $10 billion annually and the average royalty rate for preclinical pharmaceutical deals in 2012 was 4.3\%[^3]. Although this is a high-risk investment, the reward could support Idaho research facilities with huge returns from industry. In addition, the commercialization of a large pharmaceutical product would greatly increase the notoriety of the research capabilities in Idaho.

**The Technology and Path to Commercialization**

While the technology described here is currently in early-stage testing, the market opportunity for an OSM-SMI drug is enormous. The role of OSM in cancer has been studied in Dr. Jorcyk’s lab for over ten years. This basic research has demonstrated the correlation between decreased OSM signaling and reduced breast cancer metastasis (Fig. 2). Overall, this data
suggests that inhibiting OSM signaling by therapeutic treatment using a small molecule inhibitor against OSM should reduce cancer metastases in human patients.

This patent pending technique for the prevention of metastasis is being leveraged to create a unique line of small molecule inhibitors for the treatment of breast and prostate cancer. Computer modeling identified a set of potential OSM-SMIs that have been tested in vitro. These studies identified a few very promising compounds that have strong inhibitory properties. An example of one, OSM-SMI-2, is shown in Figure 3. This promising compound can be made much more valuable with the addition of substitute groups, as proposed in Aim 1, and these analogs will be tested for their ability to inhibit OSM signaling in Aim 2 (as described in Figure 3). The OSM-SMI-2 analogs will potentially have more favorable efficacy profiles and will increase the strength of IP protection behind this technology. Aim 3 of this proposal will test these analogs in vitro for ability to tumor cell metastatic potential. The compounds with the highest efficacy will be selected for pre-clinical studies to demonstrate reduced metastasis in a mouse model of human cancer. This in vivo screening will be supported by federal funding, such

Figure 2. Breast tumor cells with reduced levels of OSM are less metastatic to bone and lung. Breast tumor cells engineered to reduce OSM expression (4T1.2-OSM1 and 4T1.2-OSM2 cells) were injected into the mammary tissue of female mice and compared to control tumor cells that express a large amount of OSM (4T1.2-LacZ cells) for tumor metastasis to bone and lung. A, Tumor cells with little OSM expression have decreased metastasis to bone. B, Tumor cells with little OSM expression have decreased metastasis to lung. C, Representative in vivo magnetic resonance images (MRI) of the mouse lungs confirm numerous large metastases in the control mouse and very small or undetectable metastases in the mouse injected with cells engineered to have little OSM expression (4T1.2-OSM2). White arrows indicate representative metastases. Data expressed as mean ± SEM, n=22, *p < 0.05; t-test.
as from the National Institutes of Health National Cancer Institute (NIH NCI) or a recently submitted Department of Defense (DoD) grant. The safety and efficacy data obtained from the \textit{in vivo} screening will be leveraged to attract a commercialization partner.

Large amounts of testing will be required to obtain FDA clearance allowing one of these compounds to become commercially available. To reach this potential, we are attempting to generate enough evidence of value to attract a commercialization partner, likely a clinical-stage pharmaceutical company. This generally requires a strong IP position and strong \textit{in vivo} efficacy and safety data. After this data is obtained, we will work with the commercialization partner to get this product to market.

The technology (OSM-SMI-2) was developed by the PI, Dr. Cheryl Jorcyk, with contributions from her collaborator, Dr. Danny Xu, at Idaho State University-Meridian. Dedicated funding was received from a NIH ITHS (Institute of Translational Health Sciences) Pilot grant entitled “Development of breast cancer therapeutics to inhibit OSM-mediated

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{figure3.png}
\caption{OSM-induced signaling pathways are blocked by OSM-SMI-2. A, Human breast cancer cells treated with OSM induce a signal that can be measured (pSTAT3). Neutralizing antibodies to OSM or part of its receptor called gp130 can be used as positive controls to attenuate pSTAT3 levels. This method can be used for \textit{in vitro} screening of potential OSM-SMI analogs that inhibit OSM signaling. (Data expressed as mean ± SEM; \(n=3\); \(p<0.001\) between +OSM versus either anti-OSM or anti-gp130, unpaired t-test) B, and C, Two different human breast cancer cell lines were pre-treated with OSM-SMIs and then treated with OSM. The cells were lysed and the contents examined for pSTAT3 signals. OSM-SMI-2 inhibition of pSTAT3 suggests decreased OSM signaling. (Data expressed as mean ± SEM; \(n=3\); \(*p<0.05, **p<0.01\) between +OSM versus OSM-SMI-2, unpaired t-test.) D, OSM-SMI-2 was assessed in human breast cancer cells lysates for suppression of downstream pSTAT3, pJNK, pERK, and pAKT signaling. STAT3 and actin protein levels were used as internal loading controls.}
\end{figure}
metastasis” for $13,900. Further assistance has come from the Boise State University Division of Research to fund a drug development consultant.

**Commercialization Partners**

In order to develop an OSM-SMI best suited as a therapeutic for cancer patients, we have employed a drug development consultant. Dr. Julian Simon, at the Fred Hutchinson Cancer Research Center, will assist us in selecting compounds with appropriate pharmacological properties for limited structure activity relationship (SAR) evaluation.

We have not yet selected an industry partner, but have had preliminary discussions with multiple consultants and industry representatives, outlining the most effective commercialization tactics. This project will strengthen our IP position and will provide multiple analog compounds that have the potential to be better therapeutics to push to market. After we obtain *in vivo* safety and efficacy data we will aggressively seek and establish a relationship with a commercialization partner. These partners could include Onyx Pharmaceuticals, Inc. (an Amgen subsidiary), who is focused on developing novel medicines that target key molecular pathways and Merrimack Pharmaceuticals, Inc., who uses a systems-based approach to addresses the dynamic interactions between a cancer cell and its environment when developing therapeutics to improve patient care.

**Specific Project Plan and Detailed Use of Funds**

Dr. Don Warner, a synthetic chemist collaborator in the Department of Chemistry and Biochemistry at Boise State University, will develop a bank of OSM-SMI-2 analogs and synthesis methods in Aim 1. Per his instructions, these compounds will be synthesized by a Master’s graduate student and an undergraduate student in Dr. Warner’s lab. Funding of $11,000
is requested for their summer salaries ($5,000 salary plus $500 fringe for each student). Supplies for Dr. Warner’s lab of $3,000 are also requested to purchase the chemicals needed for compound synthesis. In addition, $1,000 is requested for a computational chemist consultant. Our consultant, Dr. Dong Xu, at the Idaho State University Meridian campus, will perform an \textit{in silico} screen to analyze the bank of OSM-SMI-2 analogs for those that are predicted to bind OSM with the highest affinity. An additional drug development consultant, Dr. Julian Simon at the Fred Hutchinson Cancer Research Center, who will not be paid from this project but receives funding from the Boise State Division of Research, will assist us in selecting compounds with appropriate pharmacological properties. Only the top three compounds as prioritized by the computational screen and the drug development consultant will be synthesized by Dr. Warner.

In Aims 2 and 3, the Jorcyk lab will examine OSM-SMI analogs for inhibition of OSM signaling and efficacy towards reducing metastatic potential \textit{in vitro}. One-month salary ($9,611 salary plus $3,172 fringe) is requested for the PI, Dr. Cheryl Jorcyk, to oversee this project. Dr. Jorcyk has studied the role of OSM in tumor metastasis for over ten years and has 22 years experience in animal models of metastatic cancer. Five-months graduate student stipend is requested for Ken Tawara, a PhD student in Dr. Jorcyk’s lab ($10,000 plus $400 fringe). Mr. Tawara will perform the majority of the lab work proposed in Aims 2 and 3. One semester Fees and Tuition ($5,167) is also requested for Mr. Tawara. Supplies ($5,150) are requested for the Jorcyk lab to perform the \textit{in vitro} studies testing the compounds ability to inhibit signaling and reduce metastatic potential. Lastly, travel funding ($1,500) is requested for Dr. Jorcyk to attend a national conference, such as the annual American Association for Cancer Research conference, where she will learn ‘state-of-the-art’ technologies and develop further collaborations.
The OSM-SMI-2 analogs will be assessed using the following timeline and milestones.

<table>
<thead>
<tr>
<th>Timeline (months 1-12)</th>
<th>Milestone</th>
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<tbody>
<tr>
<td>Month 1</td>
<td><strong>Milestone #1</strong>: Construct a bank of theoretical OSM-SMI-2 analogs.</td>
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<tr>
<td>Month 2</td>
<td><strong>Milestone #2</strong>: Identify top 3 OSM-SMI-2 analogs based on <em>in silico</em> screening and pharmacological properties.</td>
</tr>
<tr>
<td>Months 3-5</td>
<td><strong>Milestone #3</strong>: Synthesize top 3 OSM-SMI-2 analogs.</td>
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<td>Months 6-7</td>
<td><strong>Milestone #4</strong>: Examine analogs for inhibition of OSM signaling.</td>
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<tr>
<td>Months 8-12</td>
<td><strong>Milestone #5</strong>: Assess compounds for inhibition of metastatic potential</td>
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</table>

In conclusion, this project provides an immediate boost to the Idaho economy by employing an undergraduate student, a Master’s graduate student, and a PhD student. In the long-term, the work from this project has the potential to bring millions of dollars back to Boise State University and the state of Idaho.

**Institutional and Other Sector Support**

Boise State University has already invested substantially in this project with patent filings and internal funding. The Division of Research has dedicated funds to supporting our drug development consultant, Dr. Julian Simon. OTT will continue to support the project by aggressively seeking an industry partner to assist with the FDA approval process as well as negotiate the license.

**Citations**

FACILITIES AND EQUIPMENT

Laboratory
Approximately 1,600 sq ft of laboratory space is available to the PI for this project. The PI’s laboratory is located in the Department of Biological Sciences and is outfitted with instrumentation and resources to support the proposed research. Cell/tissue culture facilities are available in the PI’s lab including two BSL2 laminar flow hoods, tissue culture incubators, hypoxia chambers, and a Zeiss inverted microscope with fluorescent capabilities. Routine laboratory items necessary for cloning, site-directed mutagenesis, and expression of recombinant proteins are available. The PI’s lab contains PCR thermocyclers, refrigerated microcentrifuge, room temperature microcentrifuges, water baths, shaking water baths, heating blocks, electrophoresis apparatus with power supplies for protein, DNA and RNA work, semi-dry and wet transfer apparatuses, microwave ovens, freezers (-20°C), Refrigerators, liquid nitrogen freezer, UV transilluminator, light box, refrigerated low-speed centrifuges, tissue master, shaking incubators, gel dryer, balance, pH meter, vacuum concentrator system, and water purification system.

Clinical
N/A

Animal
An AALAC accredited animal care facility exists at the nearby Boise VA Medical Center and is available to biomedical researchers at Boise State University. This facility is staffed by a full-time vivarium manager and several part-time animal care technicians. All investigators have their animal protocols approved by the Animal Studies Subcommittee and the Research and Development Committee at the Boise VA Medical Center before beginning their work. An IVIS® Spectrum is available for optical imaging technology of mice to facilitate non-invasive longitudinal monitoring of disease progression. A Skyscan 1172 High Resolution X-ray Micro-CT Scanner is also available for bone analysis.

Computer
Computers and computer support are readily available to all faculty, staff, and students. Typical specifications are a computer with a multi-core processor with 8 GB of RAM, 640 GB disk space, running current Microsoft operating system with dual 24” monitors. Computers are equipped with Microsoft Office products such as Excel, Word and PowerPoint to enable reports and graphs, and network or wireless capability. Additionally, the investigators performing statistical analysis have copies of the Prism statistical analysis software. Printing services for research posters are readily available through the Biological Sciences department.

Office
The PIs and Senior Personnel each have a private office, ranging in size from 100 to 300 square feet. In addition, departmental offices provide space for maintaining grant and budget files, personnel files and office supplies.
Other
In addition, the College of Arts and Sciences has a complete electronics and machine shop available for repair of equipment and instrumentation and for fabrication of items necessary in research. Administrative support for grant preparation and grant management is provided at the department and college level.

Equipment
Core facilities available through the Biomolecular Research Center (BRC, http://brc.boisestate.edu/) include i) Imaging (Zeiss LSM Meta 510 Confocal Microscope; SkyScan 1172 MicroCT X-Ray Scanner; AMG; EVOS Fluorescence Microscope; Zeiss Stemi SV1/M2Bio Microscope; Olympus BX53 Compound Microscope; Zeiss Axiosvert 40CFL; Zeiss AxioCam ERC5S digital camera; Pentax Optio W80 Digital Camera; Mini-Computer Animated Visualization Environment; BioRad ProFX Fluorescent Imager; Kodak Imager 4000R; AGFA CP1000 Automatic Film Processor; Biotek SynergyMx Microplate Reader); ii) Histology (Leica CM1950 Cryostat; Leica VT1000 Vibratome; PathScan Enabler IV Slide Scanner; StatSpin CytoFuge); iii) Real-Time and Quantitative PCR (Applied Biosystem ABI 7300 Real-Time PCR Machine; Cepheid Smart Cycler Real-Time PCR Machine; Applied Biosystem Veriti Thermal Cycler; Applied Biosystem GeneAmp Thermal Cycler); and iv) DNA and Protein Isolation and Characterization (Beckman Optima Ultracentrifuge; Agilent 1200; HPLC System; BD Accuri C6 Flow Cytometer; Luminex 100 Analyzer; BTX 630 Electroporator; BTX 830; Square Current Electroporator; Lonza Nucleofector Device; Omni GLH Homogenizer; Eppendorf InjectMan N12 Micromanipulator; LabGuard Nuaire Class II, Type A2 Biological Safety Cabinet; NuAire DH AutoFlow Tissue Culture CO2 Incubator; Synthecon Rotary Cell Culture System; BioRad Mini-Protean Electrophoresis Tank System; Invitrogen X-Cell SureLock Electrophoresis Tank System; BioRad Criterion 12-Gel Electrophoresis Tank; Invitrogen I-BLOT Blotting System; Millipore SNAP I.D. Protein Detection System; BioTek ELx405R 96 Well Plate Washer; GyroMax 727 & GyroMax 727R Orbital Incubators; BioRad BioLogic Low Pressure Chromatography System; BioRad Protean Isoelectric Focusing System; ThermoScientific Hybridization Oven; ThermoMix 500; FisherScientific Accuspin Microcentrifuge; Eppendorf 5430R Microcentrifuge; ALC PM140; Refrigerated Centrifuge; NanoDrop 1000; Eppendorf Vacufuge Vacuum Concentrator; GeneQuant Spectrophotometer; Branson Tabletop Ultrasonic Cleaner; Fisher Scientific IsoTemp Plus Chromatography Refrigerator; ThermoScientific LocatorJr Cryo Tank).

Shared research core facilities are available for the proposed research through the statewide Idaho INBRE Network and through the Institute for Translational Health Studies (ITHS; https://www.iths.org/resources) based at University of Washington. Researchers on this project work closely with the Molecular Research Core Facility (MRCF) at Idaho State University (http://www.isu.edu/bios/MRCF/) for DNA and RNA sequencing and with the Bioinformatics Core at the University of Idaho. Local access to biomedical research equipment is available through the Biomolecular Research Center (BRC) at Boise State (http://brc.boisestate.edu/) and through individual departments (Department of Biological Sciences and the Department of Chemistry and Biochemistry). The Microscopy and Characterization Suite (MaCS) and the Boise State Center for Materials Characterization (BSCMC; http://coen.boisestate.edu/bscmc/) provide access to scanning and transmission electron microscopes for biomedical researchers. The Northwest Tissue Mechanics Laboratory (NTM Laboratory) at Boise State University provides
access to instrumentation for biomaterials and tissue characterization. Facilities for mass spectrometry, protein isolation and purification, protein structure determination, and protein interaction determination, tissue preparation, sectioning and staining, immunohistochemistry and immunofluorescence are available to researchers through the BRC.
# BIOGRAPHICAL SKETCH

Dr. Cheryl Jorcyk

<table>
<thead>
<tr>
<th>INSTITUTION AND LOCATION</th>
<th>DEGREE</th>
<th>YEAR(s)</th>
<th>FIELD OF STUDY</th>
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<tr>
<td>Pennsylvania State University, St. College, PA</td>
<td>B.S.</td>
<td>1979-1983</td>
<td>Biology</td>
</tr>
<tr>
<td>The Johns Hopkins University, Baltimore, MD</td>
<td>Ph.D.</td>
<td>1984-1991</td>
<td>Biology</td>
</tr>
<tr>
<td>National Cancer Institute, FCRF, Frederick, MD</td>
<td>Fellow</td>
<td>1992-1997</td>
<td>Mol Bio of Cancer</td>
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**Positions and Employment**

- **1992-1997** Postdoctoral Fellow with Dr. Jeffrey E. Green, Laboratory of Molecular Oncology, NCI, NIH, Frederick, MD
- **1994-1996** Instructor, Frederick Community College, Frederick, MD
- **1997-2003** Assistant Professor, Department of Biology, Boise State University, Boise, ID
- **1998-present** Affiliate Member, Cancer Research Section, Mountain States Tumor and Medical Research Institute (MSTMRI), Boise, ID
- **1999-2003** Project Director, J.A. & Kathryn Albertson Foundation grant
- **2001-2009** Affiliate Member, Cancer Prevention and Research Center, Washington State University, Pullman, WA
- **2003-2011** Associate Professor, Department of Biology, Boise State University, Boise, ID
- **2007-2010** Director, Department of Biological Sciences Undergraduate Studies, Boise State University, Boise, ID
- **2010-present** Affiliate Associate Professor, Department of Microbiology, Molecular Biology, and Biochemistry currently being reorganized, College of Agriculture and Life Sciences, University of Idaho, Moscow, ID
- **2011-present** Full Professor, Department of Biological Sciences, Boise State University, Boise, ID

**Honors**

- **1982-1983** The Hammond Biological Scholarship and Award
- **1992-1997** Intramural Research Training Award, Postdoctoral Fellowship, NIH
- **2008** Health Care Heroes Educator Award
- **2011** Idaho Business Review Women of the Year Honoree
- **2012** Golden Apple Award—Boise State University

**Other Experience and Professional Memberships**

- **2007-present** California Breast Cancer Research Program Grant Reviewer, Pathogenesis Study Section
- **2008** Department of Defense Grant Reviewer, PCRP Immunology Study Section
- **2009** NIH, CSR, Challenge Grant Program, Bioengineering Sciences and Technologies Panel
- **2010** Department of Defense (DOD), Congressionally Directed Medical Research Program (CDMRP) Breast Cancer Immunology/Endocrinology Panel.
- **2011-present** California Tobacco-Related Disease Research Program (TRDRP), Cancer Study Section
- **2011-present** Department of Defense (DOD), Congressionally Directed Medical Research Program (CDMRP) Breast Cancer Pathobiology-2 Panel.
- **2012-present** Senior Editorial Board (SEB) Member, American Journal of Cancer Biology (AJCB)
Selected peer-reviewed publications (Selected from over 45 peer-reviewed publications)

Current Support

<table>
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<th>Sponsor</th>
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<th>Amount</th>
<th>Project Period</th>
<th>Months Committed</th>
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<td>Mountain States Tumor Institute</td>
<td>Oncostatin M synergizes with general inflammation to increase breast cancer</td>
<td>$7,500</td>
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<td>NIH/ITHS</td>
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<td>W. M. Keck Foundation</td>
<td>Synthetic DNA reactions for low-cost diagnosis and treatment of disease</td>
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<td>NASA</td>
<td>Molecular Mechanisms of Cellular Mechanoreception in Bone</td>
<td>$131,682</td>
<td>9/1/10-8/31/14</td>
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<td>Susan G. Komen for the Cure</td>
<td>Analysis of oncostatin M in breast cancer metastasis to bone for the purpose</td>
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<td>6/21/10-6/20/14</td>
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<td>of inhibiting disease progression</td>
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<td>NASA EPSCoR</td>
<td>Molecular Mechanisms of Inflammatory Cytokines in Bone Health</td>
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<td>American Cancer Society</td>
<td>Breast cancer metastasis to the bone: the role of oncostatin M</td>
<td>$720,000</td>
<td>7/01/09-12/30/14</td>
<td>2 months</td>
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<td>UNLV/NIH</td>
<td>Association of serum OSM levels with metastatic breast cancer and therapeutic</td>
<td>$55,000</td>
<td>1/1/14-6/30/14</td>
<td>1 month</td>
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<td>Murdock Trust</td>
<td>Is There a Role for Oncostatin M in Prostate Cancer?</td>
<td>$15,000</td>
<td>2/27/14-2/26/16</td>
<td>0 months</td>
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</table>
Curriculum Vitae—Research
Cheryl L. Jorcyk, Ph.D.
Department of Biological Sciences
Boise State University

Business Address:  
Boise State University
Department of Biological Sciences
Science Building, Room 227
1910 University Drive
Boise, ID 83725-1515

Office: (208) 426-4287
E-mail: cjorcyk@boisestate.edu

Home Address:  
1207 North 6th Street
Boise, ID 83702

Lab: (208) 426-4805
Fax: (208) 426-1040

Education:
1984-1991 Doctor of Philosophy (Biology), The Johns Hopkins University, Baltimore, MD
1979-1983 Bachelor of Science (Biology), Pennsylvania State University, State College, PA

Awards and Societies:
2012 Golden Apple Award—Boise State University
2011 Business Women of the Year Honoree—Idaho Business Review
2008 Health Hero Educator Honoree—Idaho Business Review
1998-present American Association for Cancer Research, Active Member
1998-present American Association for the Advancement of Science, Member
1998-2009 Sigma Xi Scientific Research Society, Boise State University Chapter, Full Member
1998-present Idaho Academy of Science, Member
1995-1997 American Association for Cancer Research, Associate Member
1992-1997 Intramural Research Training Award, Postdoctoral Fellowship, NIH
1982-1983 The Hammond Biological Scholarship and Award

Grant Review Panels:
2013-present California Breast Cancer Research Program (CBCRP), Clinical, Prevention & Biological Sciences Study Section
2014 Department of Defense (DoD), Tobacco-Related Disease Research Program (TRDRP), Career Development: Biological Systems Study Section
2011-present Department of Defense (DoD), Congressionally Directed Medical Research Program (CDMRP) Breast Cancer Pathobiology-2 Panel.
2011  California Tobacco-Related Disease Research Program (TRDRP), Cancer Study Section.
2010-2011 Department of Defense (DoD), Congressionally Directed Medical Research Program (CDMRP) Breast Cancer Immunology/Endocrinology Panel.
2009  NIH, CSR, Challenge Grant Program, Bioengineering Sciences and Technologies Panel.
2008  Department of Defense (DoD), Congressionally Directed Medical Research Program (CDMRP) Prostate Cancer Immunology Panel.
2008  Department of Defense (DoD), Congressionally Directed Medical Research Program (CDMRP) Prostate Cancer Pathology Panel. Ad-hoc Reviewer.
2007-2010 California Breast Cancer Research Program (CBCRP), Pathology Study Section.
2006  Veterans Administration (VA) Merit Grant Program. Ad-hoc Reviewer.

Patents and Patent Disclosures:


Professional Experience:

2011-present  Full Professor, Department of Biological Sciences, Boise State University, Boise, ID. Determination of the role of the cytokine oncostatin M in tumor progression and metastasis.
2010-present  Affiliate Associate Professor, Department of Microbiology, Molecular Biology, and Biochemistry (currently being reorganized), College of Agriculture and Life Sciences, University of Idaho, Moscow, ID.
2007-2010  Director of Undergraduate Studies, Department of Biological Sciences, Boise State University, Boise, ID.
2003-2011  Associate Professor, Department of Biological Sciences, Boise State University, Boise, ID. Determination of the role of the cytokine oncostatin M in tumor progression and metastasis.
2001-2009  **Affiliate Member**, Chronic Illness Research Center (formerly called the Cancer Prevention and Research Center, Washington State University, Pullman, WA.

1998-present **Affiliate Member**, Cancer Research Section, Mountain States Tumor and Medical Research Institute (MSTMRI), Boise, ID.


1997-2003 **Assistant Professor**, Department of Biology, Boise State University, Boise, ID. Elucidation of molecular mechanisms involved in tumor progression utilizing mouse prostate and mammary cell lines.

1995 **Instructor**, Frederick Community College, Frederick, MD. Lecturer for a Nutrition class; involved the complete organization and teaching of this course.

1994 **Instructor**, Frederick Community College, Frederick, MD. Lecturer and Laboratory Instructor for Introductory Biology; consisted of two 75-minute lectures and one three-hour lab section per week.

1992-1997 **Postdoctoral Fellow with Dr. Jeffrey E. Green**, Laboratory of Molecular Oncology, NCI, NIH, Frederick, MD. Studying prostate cancer and tumor progression by the establishment of cell lines from transgenic mice expressing SV40 large T-antigen. Utilizing the transgenic mice as a model for immunotherapy treatment of prostate and mammary cancers. Studying the function of the cellular oncogene, Ets-1, by utilizing 1) homologous recombination in ES cells to produce mice lacking a functional Ets-1 protein; 2) mice producing transgenic ETS proteins.


**Publications:**


**Manuscripts Submitted or in Preparation:**


Current Research Support:

M.J. Murdock Charitable Trust (Jorcyk, PI) 06/01/2014—01/31/2017
Partners in Science Program. $15,000
Is there a role for oncostatin M in prostate cancer.
The main goal of the grant is to develop preliminary data addressing a function for OSM in prostate cancer in vitro.

NIH/NIGMS (Jorcyk, PI) 1/1/2014—6/30/14
Clinical Translation Research CTR-IN Pilot Grant $55,000
Correlating serum OSM levels with metastatic breast cancer and therapeutic options. The main goal of this pilot study is to determine if oncostatin M serum levels are elevated in patients with breast cancer.

NASA, EPSCoR (Jorcyk, PI) 9/1/2013 – 8/31/2015
Idaho NASA EPSCoR Research Initiation Grant $29,000
Molecular mechanisms of inflammatory cytokines in bone health.
The main goal of this pilot study is to determine the effects of inflammatory cytokines on bone health under conditions of radiation and microgravity.

NIH/ITHS (Jorcyk, PI) 8/1/2013-7/20/2014
Small Pilot Grant (through U. of Washington) $13,900
Development of breast cancer therapeutics to inhibit OSM-mediated metastasis.

W.M. Keck Foundation (Hughes, PI; Jorcyk, Co-PI) 8/1/2011 – 7/31/2015
Medical Research/Science and Engineering Research Programs $69,000
Synthetic DNA reactions for low-cost diagnosis and treatment of disease.

MSTMRI Small Project Grant (Jorcyk, PI) 7/1/2013 – 6/30/2015
MSTMRI Seed Grant Program $7,500
Oncostatin M synergizes with general inflammation to increase breast cancer metastasis.
The main goal of this grant is to perform a pilot in vivo study to address synergy between OSM and chronic systemic inflammation during breast cancer progression.

Susan G. Komen for the Cure KG100513 (Jorcyk, PI) 6/21/2010 – 6/20/2014
Susan G. Komen Breast Cancer Research Program $600,000
Analysis of oncostatin M in breast cancer metastasis to bone for the purpose of inhibiting disease progression.
ACS RSG-09-276-01-CSM (Jorcyk, PI) 7/1/2009 – 12/30/2014
American Cancer Society Research Scholar Grant $720,000
Breast cancer metastasis to the bone: the role of oncostatin M.

NASA NNX10AN29A (Jorcyk, Oxford, Rohn, Mitchell, Co-PIs)
10/01/2010 – 9/30/2013
Molecular mechanisms of cellular mechanoreception in bone. $131,682

Research Completed (since 2003):

NIH NCI R15CA137510 (Jorcyk, PI) 4/1/2009 – 3/30/2013
Oncostatin M-induced VEGF in human breast cancer is HIF1 mediated. $211,500

NIH NCRR P20RR016454 (Bohach, PI; Jorcyk, Team Member)
4/1/2009 – 3/31/2014 Idaho IDeA Network for Biomedical Research Excellence. Total = ~$15,000,000
Coll11a1 function during development, structure and signaling is to address osteoblast-osteoclast cell signaling.

M.J. Murdock Charitable Trust (Jorcyk, PI) 06/01/2012—01/31/2015
Partners in Science Program. $14,000
Regulation of oncostatin M by the extracellular matrix protein Coll11a1: potential effects on breast cancer metastasis.

J.A. & Kathryn Albertson Foundation (Jorcyk, PI) 01/02/99-06/30/03
General operating expenses. $500,000 total; Jorcyk Lab, $176,660
Graduate and undergraduate fellowships for cancer research.

M.J. Murdock Charitable Trust (Jorcyk, PI) 05/01/02 – 01/31/04
Partners in Science Program. $14,000
Characterization of genes involved in the prostate cancer to metastasis conversion.

NIH P20 RR16454 (Jorcyk, PI) 09/01/02 - 08/31/03
NIH/NCRR ~$35,000
Oncostatin M enhances metastatic potential.

Boise State University (Jorcyk, PI) 05/01/03–04/30/04
Faculty Research Initiated Grants $5,000
Oncostatin M-treated breast cancer cells stimulate new blood vessel formation.

Mountain States Tumor and Medical Research Institute (Jorcyk, PI)
05/12/03 –05/11/04 Seed Grant Program $5,000
Effects of neutrophil-derived oncostatin M in a breast tumor environment.

NIH R01 CA104470  (Jorcyk, Collaborator; Magnuson, PI)
09/01/03 – 08/31/08 Contribution of Pim-1 kinase to cell survival.  N/A

M.J. Murdock Charitable Trust  (Jorcyk, PI)  05/01/04 – 01/31/06
Partners in Science Program.                           $14,000
Determination of the receptor utilized by oncostatin M to promote metastatic characteristics in MDA-MB-231 breast cancer cells.

Sigma Xi  (Jorcyk, PI)  05/01/04 – 04/30/05
Grants in Aid Program. $2,000
Induction of epithelial cell-secreted proteases by neutrophil-derived oncostatin M.

Mountain States Tumor and Medical Research Institute  (Jorcyk, PI)
05/12/04 –05/11/05 Seed Grant Program $5,000
Determination of the receptor utilized by OSM to promote metastatic characteristics in T47D human breast cancer cells.

NIH P20 RR16454  (Jorcyk, Investigator; Laskowski, PI)  07/01/04 – 06/03/09
NIH/NCRR  (Jorcyk)  95,000
Oncostatin M induces VEGF in human breast carcinoma cells.

NIH R15 CA106274  (Jorcyk, PI)  03/01/05 – 02/28/08
NIH/NCI $186,893
Oncostatin M induces VEGF-mediated angiogenesis.

Boise State University  (Jorcyk, PI)  07/01/05 –06/30/06
Faculty Research Initiated Grants $15,000
Determination of a role for oncostatin M in breast cancer metastasis to bone.

Mountain States Tumor and Medical Research Institute  (Jorcyk, PI)
05/01/07 –04/30/08
St. Luke’s/Seed Grant Program $5,000
Development of OSMR-beta mouse mammary carcinoma cell lines.

NIH, ITHS  (Jorcyk, PI)  05/01/09 – 04/30/10
Small Pilot Project Translational Grant $14,000
The role of tumor cell-derived oncostatin M in breast cancer metastasis to bone.

Mountain States Tumor and Medical Research Institute  (Jorcyk, PI)
05/01/09 –04/30/10 Seed Grant Program $7,500
Knockdown of OSM-induced HIF1alpha by RNAi.
MSTMRI (Jorcyk, Collaborator; Yu, PI) 05/01/09 – 04/30/10 Seed Grant Program $7,500
Myeloid-derived suppressor cell (MDSC) gene expression in normal tissue versus metastatic breast cancer.

MISE (Cornell, PI; Jorcyk, Collaborator) 4/1/2008 – 31/2011 Merck Institute for Science Education $60,000
Merck AAAS Undergraduate Science Research Program

HERC Idaho State Board of Education (Jorcyk, Co-PI) 7/01/2007 – 30/2011 Musculoskeletal Research. ~$1,000,000

Mountain States Tumor and Medical Research Institute (Jorcyk, PI) 06/12/11 – 05/31/13 Seed Grant Program $7,500
Does oncostatin M confer drug resistance to tumor cells via induction of lung resistance protein?

Miscellaneous Recent Awards and Grants:

College of Arts and Sciences (COAS) 06/22/11 Travel Award $400

College of Arts and Science (COAS) 6/1/14 Travel Award ($600 matching from DBS) $1,200

Invited Speaker Presentations (since 2003):


Neutrophil-derived oncostatin M: potential implications for breast cancer progression, Idaho State University, Department of Biological Sciences, Pocatello, ID, November 17th, 2005. Regional.


Researching breast cancer. eGirls Conference, Boise State University, Boise, ID. June 16th, 2006. Regional.

Breast cancer research at Boise State University, Boise State Foundation Board, Boise State University, Boise, ID. July 20th, 2006. Regional.


Oncostatin M-induced HIF1 Conference in Moscow, ID, August 6th-9th, 2007. Regional.


Breast cancer metastasis to bone. IAS (Idaho Academy of Sciences) 50th Annual Conference, College of Western Idaho, Nampa, ID, March 28th, 2008. Regional.

Oncostatin M is a potential target for inhibiting breast tumor metastasis. AAAS (American Association for the Advancement of Sciences) Pacific Division Annual Conference, Waimea, HI, June 18th, 2008. Regional.

The role of oncostatin M in breast tumor progression and metastasis. The Peter MacCallum Cancer Centre Anderson Lab, Melbourne, Australia, November 18th, 2008. International.


The role of oncostatin M in breast tumor progression and metastasis. 1st Annual Idaho INBRE Symposium, Boise, ID, April 4th, 2009. Regional.

The role of oncostatin M in breast tumor progression and metastasis. 3rd Annual Workshop for Small Animal Imaging, St. Louis, MS, June 21st, 2009. National.

A role for oncostatin M in breast cancer metastasis to bone. University of Idaho, Department of Microbiology, Molecular Biology, and Biochemistry, Moscow, ID, April 29th, 2010. Regional.

Oncostatin M as a potential target for inhibiting breast cancer metastasis to bone. American Association for the Advancement of Science (AAAS) Pacific Division Annual Conference, Ashland, OR, June 14th, 2010. Regional.

Extracellular matrix modulates cell signaling. 7th Annual INBRE Conference, University of Idaho, Moscow, ID, August 2nd-4th, 2010. Regional.

Understanding breast cancer progression. Boise State University, Department of Materials Science and Engineering, Boise, ID. September 24th, 2010. Regional.


Does diet really make a difference when it comes to breast cancer? Boise State University’s Honor College Friday Forum, Boise State University, Boise, ID, February 17, 2012. Regional.


Breast cancer research at Boise State University. Cheryl L. Jorcyk, College of Western Idaho, Meridian, ID, October 7, 2013. Regional.

Breast cancer research. Cheryl L. Jorcyk, Boise State University STEM Station, Boise, ID, December 5, 2013. Regional.


BSU Teaching Experience:

Formal Class Instruction:
- Molecular Cell and Genetics Laboratory (BIOL 344 and BIOL 344G)
- Molecular Biology of Cancer (BIOL 541 and BIOL 441)
- Molecular Biology of Cancer Service Learning (BIOL 541SL and BIOL 441SL)
- Advanced Topics in Molecular Biological Techniques (BIOL 565 and BIOL 465)
- Molecular Studies of Biomedical Topics (BIOL 566 and BIOL 466)
- Advanced Topics in Cancer Molecular Biology (BIOL 598 and BIOL 498)
- Biol 597 Scientific Writing (Biol 597)
- Lab Discussion Group (BIOL 595 and BIOL 497)
- Genetics (BIOL 343)
- Cell Biology (BIOL 301)
- Bioinformatics (BIOL 597 and BIOL 497)
- Responsible Conduct (BMOL 597)
- Proposal Writing (BMOL 606)

Thesis Advisor for Masters Students:
- Lynda Zhang M.S. in Biology, July 30, 2000
• Kurt Lindsay Received M.D. from Oregon Health Sciences Institute, 2005
• Colin Soares M.S. in Biology, March 22, 2002
• Ryan Holzer M.S. in Biology, March 12, 2003
• Marisa Queen M.S. in Biology, March 11, 2005
• Alex Ide M.S. in Biology, March 16, 2005
• Amanda Bruesch M.S. in Biology, September 14, 2007
• David Chang Commodities Trader
• Patrick Aranda M.S. in Biology, October 7, 2009
• Ken Tawara M.S. in Biological Sciences, March 23, 2011
• Madhuri Nandakumar Current M.S. student
• Hunter Covert Transitioned to PhD Program
• Jordan Koncinsky M.S. in Biological Sciences, July 31, 2013
• Jake Goyden M.S. in Biological Sciences, June 13, 2014

Thesis Advisor for Biomolecular Sciences PhD Program (started 08/12):
• Ken Tawara, MS
• Hunter Covert

Department of Biological Sciences Graduate Student Thesis Committees:
• Michael Davis (Dr. Troy Rohn)
• Sorcha Cusack (Dr. Julie Oxford)
• Ryan Medeck (Dr. Julie Oxford)
• Jodie Newman (Dr. Troy Rohn)
• Tim O’Donnell (Dr. Bob Rychert)
• Amy Couch (Dr. Henry Charlier)
• Alma Hodzic (Dr. Denise Wingett)
• Nathan Hoskins (Dr. Julie Oxford)
• Kendra Coonse (Dr. Julie Oxford)
• Ming Fang (Dr. Julie Oxford)
• Ashley McCartney (Dr. Kristen Mitchell)
• Stephanie Wyler (Dr. Kristin Mitchell)
• Emily Schmid (Dr. Kristen Mitchell)
• Wendy Harvey (Dr. Kristen Mitchell)
• Jonathan Reeck (Dr. Julie Oxford)
• Neda Shefa (Dr. Julie Oxford)
• Anthony Hafez (Dr. Julie Oxford)
• Tyler Wines (Dr. Juliette Tinker)

Graduate Student Thesis Committees from other Universities:
• Kyle Rosenke Ph.D. from University of Idaho (Dr. Lee Fortunato), August 9, 2006
Research Faculty:

- Dr. Randy Ryan, started November, 2011

Postdoctoral Fellows:

- Dr. Sujatha Kadaba, 2007
- Dr. Celeste Bolin, started January 11th, 2010
- Dr. Jim Moselhy, started November 10th, 2010

Research Associates:

- Dollie LaJoie, B.S., started August 23rd, 2010
- Dr. Randall Ryan, started October 25th, 2010
- Ken Tawara, M.S., started March 24, 2011
- Erik Stoll, B.S. started September 12, 2011
- Danielle Hedeen, B.S., started June 1, 2013

Mentor for High School Students:

- Chris Anderson   Treasure Valley Math and Science Center
- Charles Bin      Boise High School

Mentor for High School Teachers

- Brian Vega       Boise High School
- Amy Ambrosier    Capital High School
- Heidi Pluska     Boise High School
- Arn Allemand     Meridian Medical Arts High School
- Dallas Trople    Meridian Medical Arts High School
- John Doherty     Capital High School

Mentor for Undergraduate Students:

- Barbara Smith
- Erick Schlekeway  Attended Medical School
- Matt Tommack
- Brooke McCuskey
- Anna Hemphill
- Kencee Amyx      Attended Medical School
- Brian Byrne      Attended Medical School
- Andrew Oler      Attended Ph.D. Program
- Lee Rooney       Accepted into Medical School
- Tshering Sherpa  Attended Ph.D. Program
- Jenny Stear      Attended Medical School
- Tyrell Simpkins  Attended D.O./Ph.D. Program
- Deidre Barrera
- Amanda Bruesch   Attended M.S. Program at Boise State University
- Christine MacDougal  Attended Ph.D. Program, Completed Law School
- Loni Connell     (from University of Georgia)
- Dan Henbest      Completed Medical School
• Kelly Katula  Completed Medical School (D.O. Program)
• Jonathan Lee  (from BYU-Idaho)
• Jeff Redshaw  MD, Fellowship at University of Utah
• Mary Lewis  (from BYU-Idaho)
• Bengt Phung  Attended Ph.D. Program (from College of Idaho)
• Ryan Fox  Attending Nursing School
• Stephen-David Spelter
• Logan Miller  (from BYU-Idaho)
• Kara Jackson
• Caleb Sutherland  Attending University of Arizona PhD Program
• Dollie Thompson  Attending University of Utah PhD Program
• Farhad Mangal  Graduating as a Top Ten Scholar at Boise State (05/13)
• Krista DeCoursey  (from BYU-Idaho)
• Maygen Cardova
• Rachael Anderson  (from BYU-Idaho)
• Maryam Sabetian  Will start at University of Washington Medical School
• Nicole Ankenbrandt  STEP/STEM Student
• Jamie Hicks
• Danielle Hedeen  Currently Lab Manager
• Robert Navert  MS Program at UCDavis
• Iva Stojkovska  Previous INBRE Student; in Dr. Morrison’s lab
• Andrew Bergloff  Currently a Boise State Student
• Jennifer Lidgard  Currently a Boise State Student (5/13 to 3/14)
• Chris Sorenson  DO School, Oregon (11/13 to 6/14)
• Katie Neal  STEP Student (started 9/13)
• Nikki Fennimore  Currently in lab (started 3/14)
• Amy Weidner  Currently in lab (started 3/14)
• Hannah Scott  INBRE Student (started 5/14)

Mentor for Medical Students:
• Jeff Walker  University of Washington
• Joe Deaver  University of Washington
• Camille Asher  University of Washington

Presentations:  (Poster Presentations including Student Oral and Poster Presentations since 2003)


Breast Cancer Cells Co-cultured with Neutrophils Express Endogenous Oncostatin M (OSM). Marisa Queen, Alexander Ide, Kencee Amyx, Barbara Smith1, Randy

Protein Characterization Illuminates the Effects of Oncostatin M in Breast Cancer: 2 Dimensional Polyacrylamide Gel Electrophoresis of MB-MDA231 Cells. Pernilla Stridh-Igo; Kencee Amyx; Cheryl Jorcyk; Julie Oxford; and Sheryl Hawkes. 1st Annual Boise State University Undergraduate Research Day, Boise State University, Boise, ID, April 19th, 2004. Regional.

The Role of Oncostatin M in Human Microvascular Endothelial Cell Proliferation. Lee Rooney, Adrian Pauw, Alex Ide and Cheryl L. Jorcyk. 1st Annual Boise State University Undergraduate Research Day, Boise State University, Boise, ID, April 19th, 2004. Regional.


Does Oncostatin M have a Role in Breast Cancer Metastasis to the Bone? Andrew Oler and Cheryl Jorcyk. 4th Annual Northwest Cancer Conference (NWCC), Spokane, WA, November 11th-13th, 2004. Regional.


The Role of Oncostatin M in Prostate Cancer. David H. Chang and Cheryl L. Jorcyk. 2nd Annual INBRE Conference, Northwest Nazarene University, Nampa, ID, August 7th-10th, 2005. Regional.

GM-CSF from Breast Cancer Cells Triggers Expression of Oncostatin M (OSM) by Neutrophils During Co-culture. Soma Ganguly, Marisa M. Queen, and Cheryl L. Jorcyk. 2nd Annual INBRE Conference, Northwest Nazarene University, Nampa, ID, August 7th-10th, 2005. Regional.

Signaling of OSM-induced VEGF in human breast and prostate cancer cell lines. Andrew J. Oler, Alexander E. Ide, David Chang, Cheryl L. Jorcyk. 2nd Annual
INBRE Conference, Northwest Nazarene University, Nampa, ID, August 7th-10th, 2005. **Regional.**

Oncostatin M-Receptor evaluation in normal, carcinoma, and metastatic human tissue. Stear Jenny, Byrne Brian, Queen Marisa, Jorcyk Cheryl. 2nd Annual INBRE Conference, Northwest Nazarene University, Nampa, ID, August 7th-10th, 2005. **Regional.**


The role of oncostatin M in prostate cancer. David Chang, Andrew Oler, and Cheryl Jorcyk. 97th Annual Meeting for the American Association for Cancer Research (AACR), Washington, DC, March 29th-April 5th, 2006. **National.**


Colon cancer: a role for oncostatin M in tumor cell progression? Tyrell Simkins and Cheryl Jorcyk. 3rd Annual Boise State University Undergraduate Research Day, Boise State University, Boise, ID, April 17th 2006. **Regional.**


The role of oncostatin M in prostate cancer. Jonathan Lee, David Chang, Andrew Oler, and Cheryl Jorcyk. 3rd Annual INBRE Conference, Northern Idaho College, Coeur d’Alene, ID, August 6th-8th, 2006. **Regional.**


The effect of Oncostatin M on hypoxia-inducible factor 1 alpha and cyclooxygenase-2 gene expression in human breast cancer cells.  4th Annual


Using siRNA to modify the expression of OSM in mammary cancer cells in vitro. Jeff Redshaw, Patrick Aranda, Kelly Katula, and Cheryl L. Jorcyk. 5th Annual Boise State University Undergraduate Research Conference, Boise State University, Boise, ID, April 14th, 2008. Regional.

Human breast cancer cell metastatic potential is reduced by the combination of OSM and a HIF1a inhibitor. Ryan K. Fox, Amanda Bruesch, Cheryl L. Jorcyk. 5th Annual Boise State University Undergraduate Research Conference, Boise State University, Boise, ID, April 14th, 2008. Regional.

Using siRNA to modify the expression of OSM in mammary cancer cells in vitro.


Using shRNA to reduce the expression of mouse OSM in mouse mammary cancer cells in vitro. Jeff Redshaw, Patrick Aranda, Kelly Katula, and Cheryl Jorcyk. 5th Annual INBRE Conference, August 4-6, 2008, Boise, ID. Regional.

Cancer Switches: developing an inducible plasmid to control oncostatin M expression in human and murine breast cancer cell lines. Jeffrey C. Walker and Cheryl L. Jorcyk. 5th Annual INBRE Conference, August 4-6, 2008, Boise, ID. Regional.

Tomato fluorescent expression in breast cancer metastasis. Kara Jackson and Cheryl L. Jorcyk. 5th Annual INBRE Conference, August 4-6, 2008, Boise, ID. Regional.


The effects of knockdown expression of HIF1a and VEGF: angiogenesis in breast cancer. Logan J. Miller, Patrick Aranda, Jeff Walker, and Cheryl L. Jorcyk. 5th Annual INBRE Conference, August 4-6, 2008, Boise, ID. Regional.

Oncostatin M receptor knockdown in mammary carcinoma cells: the role of OSM signaling in tumor progression and metastasis. Patrick S. Aranda, Ken Tawara, and Cheryl L. Jorcyk. 5th Annual INBRE Conference, August 4-6, 2008, Boise, ID. Regional.


The relationship of OSM Receptor expression and colitis-associated colorectal cancer in mice. Stephan-David Spelter, Tyrell Simkins, Ken Tawara, and Cheryl
L. Jorcyk. 5th Annual INBRE Conference, August 4-6, 2008, Boise, ID. Regional.


Developing 4T1.2 and 4T1-luc2 cells that overexpress full-length and truncated oncostatin M inducibly and constitutively. Dollie LaJoie, Hunter Covert, Jeff Walker, Cheryl L. Jorcyk. 7th Annual INBRE Conference, August 2-4, 2010, University of Idaho, Moscow, ID. Regional.

Establishing human breast cancer cells that inducibly express oncostatin M. Hunter Covert, Dollie LaJoie, Joe Deaver, and Cheryl L. Jorcyk. 7th Annual INBRE Conference, August 2-4, 2010, University of Idaho, Moscow, ID. Regional.


Hypoxia inducible factor 1 alpha plays a role in mammary cancer cell-mediated bone destruction. (Oral Presentation) Ken Tawara and Cheryl L. Jorcyk. 7th Annual INBRE Conference, August 2-4, 2010, University of Idaho, Moscow, ID. Regional.


Breast cancer cell-mediated osteoclast differentiation is upregulated by oncostatin M through HIF1alpha, VEGF, and IL-6. Ken Tawara and Cheryl Jorcyk. 1st Annual Boise State University Graduate Research Conference. (Oral Presentation) Boise State University, March 18th, 2011. Regional.


Molecular mechanisms of IL-6 family cytokine-induced VEGF in breast cancer. Madhuri Nandakumar; Randall Ryan; Ryan Fox; Cheryl Jorcyk. Idaho Academy of Sciences Annual Conference, Boise, ID, March 31st –April 1st, 2011. Regional.


The role of Oncostatin M (OSM) in regulating osteogenesis in vitro. Maryam Sabetian, Celeste Bolin, and Cheryl Jorcyk. 8th Annual Boise State University Undergraduate Research Conference, Boise State University, Boise, ID, April 11th, 2011. Regional.


Epithelial-mesenchymal transition and oncostatin M: involvement in metastasis? (Oral Presentation) 8th Annual INBRE Conference, August 1-3, 2011, University of Idaho, Moscow, ID. Regional.


Role of IL-6 family cytokines in breast tumor cell expression of VEGF. Madhuri Nandakumar, Danielle Hedeen, and Cheryl L. Jorcyk. AAAS Pacific Division Annual Conference, June 24, 2012. Regional.


Multiple Myeloma and The Effects of Secreted Inflammatory Cytokines in the Bone Marrow Microenvironment. Danielle Hedeen and Cheryl L. Jorcyk. Annual Undergraduate Research Conference, Boise State University, April 15, 2013. Regional.


Characterization of mouse mammary tumor cells with reduced inflammatory cytokine receptor expression. Iva Stojkovska, Celeste Bolin, Cheryl L. Jorcyk, Boise State University Undergraduate Student Summer Research Conference, Boise, ID, August 2, 2013. Regional.


Professional Service (Partial list since 2003):

Manuscript Reviewer, numerous journals including Cancer Research, Molecular Cancer Research, Molecular Cell Research, International Journal of Cancer,

**Member**, VA Research and Development Biosafety Committee. Department of Veterans Affairs Medical Center, Boise, ID, 1999-2006.


**Northwest Regional Officer**, Sigma Xi Honorary Science Society, 2005-2006.


**Member**, MentorNet. Designed to provide mentors to young researcher around the country, 2006.

Lobbyist, American Cancer Society. Lobbied for cancer funding to Idaho state legislators, Boise, ID, 2009.

Council Member, American Association for the Advancement of Science (AAAS) Pacific Division. 2011-present.

Co-organizer, American Association for the Advancement of Science (AAAS) Pacific Division Annual Conference Organizer for June 2012 Conference in Boise, ID.

Executive Committee Member, Idaho Academy of Sciences (IAS). 2011-present.

Human Subjects Researcher, First Boise State University faculty to submit a Human Subjects protocol (IRB) to St. Luke’s Regional Medical Center, Mountain States Tumor Institute (MSTI) for clinical research, 2012.

University Research-related Service (Partial list since 2003):

Member, Graduate Studies Oversight Committee (GSOC). The Department of Biology, Boise State University, 2000-2006.

Host for Seminar Speakers, Department of Biological Sciences Seminar Series, Boise State University, 2003-present.

Member, IACUC (Institutional Animal Care and Use Committee). Boise State University, 2005-2006.

Member, Biomolecular Sciences Ph.D. Planning Committee. (Chair, Molecular & Cellular Biology Section). Boise State University, 2005-2006.


Member, Premedical Student Summer Fellowship Grant Review Committee. The Department of Biology, Boise State University, 2006.


Member, IACUC (Institutional Animal Care and Use Committee). Boise State University, 2007-2008.
Member, IRB (Internal Review Board). Biomedical Human Subjects, Boise State University, 2008-2010.

Co-Chair, Internal Review Board (IRB) Committee. Boise State University, 2010-present.

Member, Research Committee. Department of Biological Sciences, Boise State University, Boise, ID 2010-present.

Presenter, Capital Day at the Idaho State Capital for Boise State University, 2011.

Lab Tour Guide. Multiple lab tours on HeLa cells and HeLa cell-related cancer research for *The Immortal Life of Henrietta Lacks* Campus Read Program, Boise State University, Boise, ID, 2011-2012.

Member, STEM Research Education Committee. Boise State University 2011-present.

Mentor, Boise State University New Faculty Mentoring Program, for Alark Joshi (Department of Computer Science), Boise State University, Boise, ID, 2011-present.

Podcaster, Beyond the Blue, Boise State University, Boise, ID, 2011.

Lecturer, The Osher Institute, “Breast Cancer: Research and Treatment”, Boise State University, 2011.

**Community Service (Partial list since 2003):**


Member, Southern Idaho Science Collaborative (SISC). This group of individuals is addressing how science is taught in K-12. This committee consists of members from the Boise, Meridian, Nampa, and Vallivue School Districts, as well as individuals from Boise State University, Micron, and Hewlett Packard. Nampa, ID, 2003-2005.


Mentor, Heidi Pluska, High School AP Chemistry teacher at Boise High School, Boise, ID. Together we had a Murdock Charitable Trust Partners in Science
Grant. She will take her lab experience and new knowledge back to the classroom, Boise, ID, 2005-2006.

**Member**, Discovery Center of Idaho (DCI) Education Committee, Boise, ID. This committee replaced SISC (see above) and consists of members from the Boise, Meridian, Nampa, and Vallivue School Districts, as well as individuals from Boise State University, Micron, and Hewlett Packard. Fall 2005-2007.

**Member**, Idaho Comprehensive Cancer Collaborative, which deals with cancer statewide, including Prevention, Diagnosis, Treatment, and Aftercare. 2005-present.

**Presentations and Lab Tours**, Elementary School students (1st and 5th graders), Junior High School students (7th graders), and High School students (9th and 12th graders), Boise, ID, 2005-present.


**Facilitator**, Biology of Cancer Service Learning (Biol 541SL and Biol 441SL). Students met with cancer patients and family members of cancer patients from St. Alphonsus Regional Medical Center and Boise State University to answer questions and discuss cancer causes and treatments, Boise, ID, 2006-present.


**Meetings**, St. Luke’s Regional Medical Center and St. Alphonsus Regional Medical Center Meeting, Boise, ID 2008-present.
### Summary Proposal Budget

#### A. Personnel Cost
- **Dr. Cheryl Jorcyk, Professor, 1 month**
  - Salary/Rate of Pay: $86,500 for 9 mos.
  - Fringe: 33%
  - Dollar Amount Requested: $12,783

- **Graduate Research Assistant, Spring 2015 stipend**
  - Salary/Rate of Pay: $10,000 for 5 mos.
  - Fringe: 4% academic year
  - Dollar Amount Requested: $10,400

- **Graduate Research Assistant, Summer stipend**
  - Salary/Rate of Pay: $5,000 for 3 mos.
  - Fringe: 10% summer
  - Dollar Amount Requested: $5,500

- **Undergraduate Research Assistant, Summer, approximately 435 hours**
  - Salary/Rate of Pay: $11-$12/hour for 3 mos.
  - Fringe: 10% summer
  - Dollar Amount Requested: $5,500

#### % of Total Budget: 68%

#### Subtotal: $34,183

#### B. Equipment
- (List each item with a cost in excess of $1000.00.)

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<tr>
<th>Item/Description</th>
<th>Dollar Amount Requested</th>
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#### Subtotal: $0

#### C. Travel
- Dates of Travel (from/to)
- No. of Persons
- Total Days
- Transportation
- Lodging
- Per Diem
- Dollar Amount Requested

| To be determined / conference travel | 1 | 4-5 | $500 | $800 | $200 | $1,500 |

#### Subtotal: $1,500

#### H. Participant Support Costs:
- 1. Stipends

#### Subtotal: $0

#### I. Other Direct Costs:

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Note: The table structure and values have been accurately transcribed from the image.
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<tr>
<th>Item</th>
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<tr>
<td>1. Materials and Supplies</td>
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<td>2. Publication Costs/Page Charges</td>
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<td>3. Consultant Services (include Travel Expenses)</td>
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<td>4. Computer Services</td>
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<td>5. Subcontracts</td>
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<td>6. Other (specify nature &amp; breakdown if over $1000)</td>
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<td>Graduate Student Fee Remission; 50% of full tuition (Spring 2015)</td>
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<td><strong>SUBTOTAL:</strong></td>
<td>$14,317</td>
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<td>J. Total Costs: (Add subtotals, sections A through I)</td>
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<td><strong>TOTAL:</strong></td>
<td>$50,000</td>
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<td>K. Amount Requested:</td>
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<td>Project Director's Signature:</td>
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<td>Date:</td>
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### INSTITUTIONAL AND OTHER SECTOR SUPPORT
(add additional pages as necessary)

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<th>Fully equipped laboratories (see Appendix 1)</th>
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