COVER SHEET FOR GRANT PROPOSALS

State Board of Education

SBOE PROPOSAL NUMBER: (to be assigned by SBOE)	AMOUNT REQUESTED: $50,000

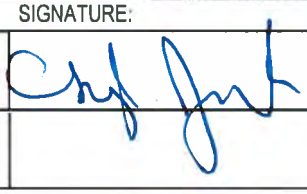
TITLE OF PROPOSED PROJECT:

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.

PROJECT START DATE: 7/1/14	PROJECT END DATE: 6/30/15
NAME OF INSTITUTION: Boise State University	DEPARTMENT: Office of Sponsored Programs
ADDRESS: 1910 University Dr., Boise, ID 83725-1135	
E-MAIL ADDRESS: osp@boisestate.edu	PHONE NUMBER: 208-426-4420

	NAME:	TITLE:	SIGNATURE:
PROJECT DIRECTOR/PRINCIPAL INVESTIGATOR	Dr. Cheryl Jorcyk	Professor	
CO-PRINCIPAL INVESTIGATOR			

NAME OF PARTNERING COMPANY:	COMPANY REPRESENTATIVE NAME:

	NAME:	SIGNATURE:
Authorized Organizational Representative	Karen Henry	

Boise State University

Cheryl Jorcyk, PI; Don Warner, Collaborator

Small Molecule Inhibitors for the Reduction of Cancer Metastasis

This technology has not been proposed and/or awarded an Incubation Fund Award in the past.

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[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.

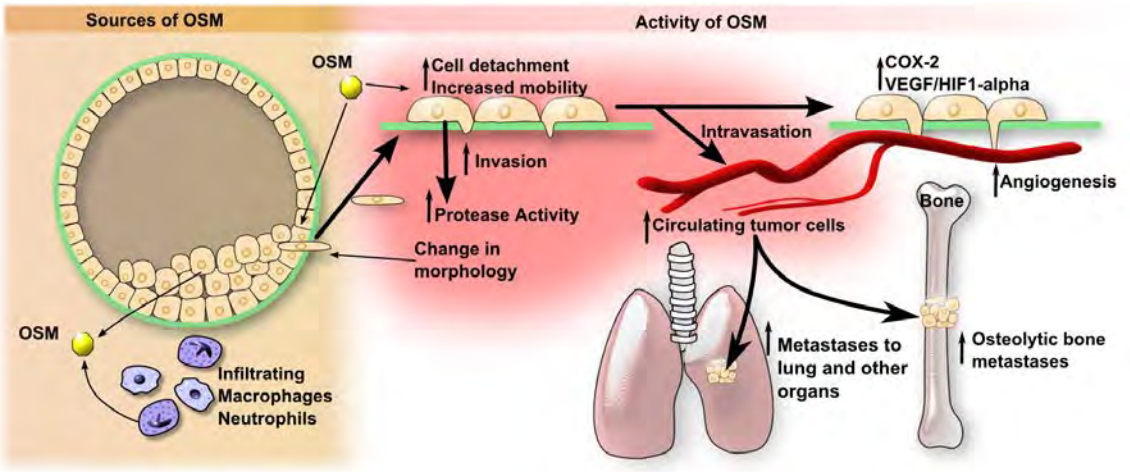


Figure 1. OSM promotes tumor metastasis. OSM, produced by tumor cells and infiltrating immune cells such as macrophages and neutrophils, promotes changes in cell morphology, tumor cell detachment, mobility, protease expression, and invasive potential *in vitro*. OSM also increases expression of pro-metastatic genes such as VEGF, HIF1α, and COX2. During *in vivo* animal studies, OSM promotes an increase in circulating tumor cell numbers and metastases to the lung, bone, and other organs.

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 1	Breast	Prostate
Forecasted new cases in 2014	232,670.00	233,000.00
Percentage of cases localized	61%	81%
Percentage of cases regional	32%	12%
Percentage of cases distant	50%	40%
Yearly Demand Projection	216,383.10	216,690.00
Cost per round of treatment	$ 20,000.00	$ 20,000.00
Market potential	$ 4,327,662,000.00	$ 4,333,800,000.00

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 billon 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.

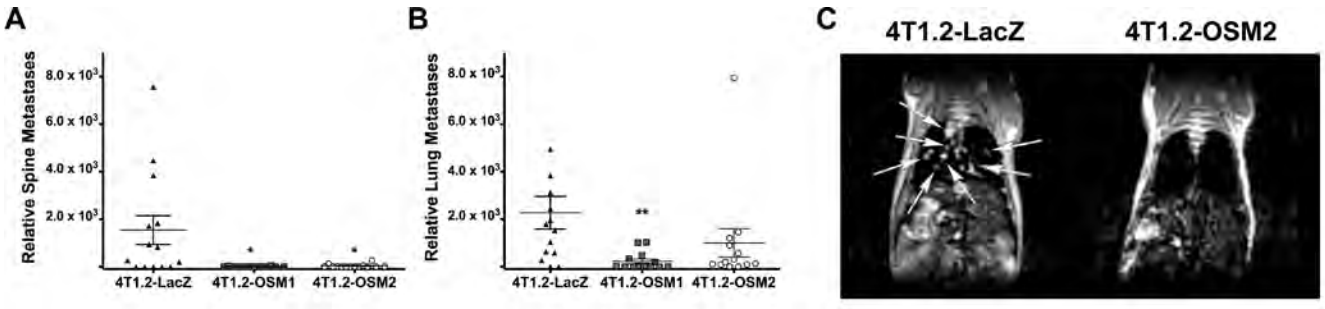


Figure 2. Breast tumor cells with reduced levels of OSM are less metastatic to bone and lung. Breast tumor cells engineered to reduce OSM expression (4T1.2-OSM1 and 4T1.2-OSM2 cells) were injected into the mammary tissue of female mice and compared to control tumor cells that express a large amount of OSM (4T1.2-LacZ cells) for tumor metastasis to bone and lung. **A,** Tumor cells with little OSM expression have decrease 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.

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

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 *in vivo* screening will be leveraged to attract a commercialization partner.

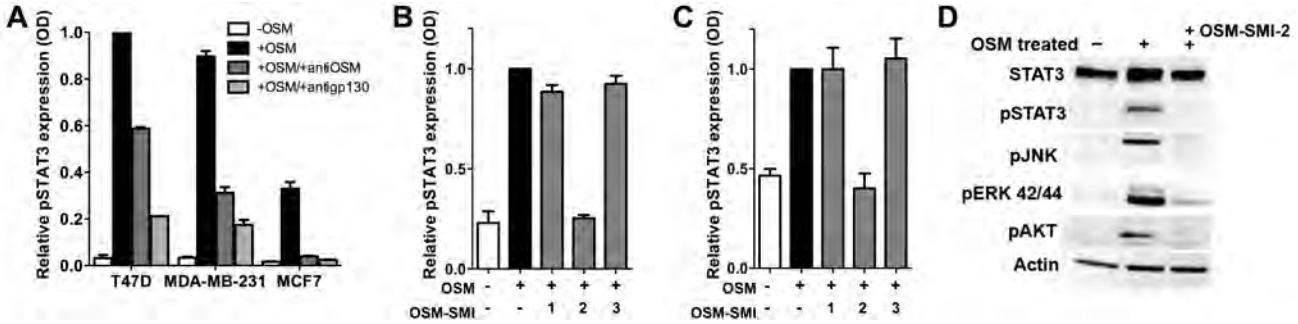


Figure 3. OSM-induced signaling pathways are blocked by OSM-SMI-2. **A**, Human breast cancer cells treated with OSM induce a signal that can be measured (pSTAT3). Neutralizing antibodies to OSM or part of its receptor called gp130 can be used as positive controls to attenuate pSTAT3 levels. This method can be used for *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.

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 *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

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 *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 *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 *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.

Timeline (months 1-12)	**Milestone**
Month 1	**Milestone #1:** Construct a bank of theoretical OSM-SMI-2 analogs.
Month 2	**Milestone #2:** Identify top 3 OSM-SMI-2 analogs based on *in silico* screening and pharmacological properties.
Months 3-5	**Milestone #3**: Synthesize top 3 OSM-SMI-2 analogs.
Months 6-7	**Milestone #4:** Examine analogs for inhibition of OSM signaling.
Months 8-12	**Milestone #5:** Assess compounds for inhibition of metastatic potential

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

1. http://seer.cancer.gov/statfacts/html/breast.html

2. http://seer.cancer.gov/statfacts/html/prost.html

3. Global BioPharmaceutical Royalty Rates & Deal Terms Survey. LES USA/Canada, December 2012.

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^{o}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 Axiovert 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 NI2 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; FisherScientic 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

INSTITUTION AND LOCATION	DEGREE	YEAR(s)	FIELD OF STUDY
Pennsylvania State University, St. College, PA	B.S.	1979-1983	Biology
The Johns Hopkins University, Baltimore, MD	Ph.D.	1984-1991	Biology
National Cancer Institute, FCRF, Frederick, MD	Fellow	1992-1997	Mol Bio of Cancer

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	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)

1. Holzer, R.G., Tommack, M., Schlekeway, E., Ryan, R.E, and Jorcyk, C.L: Oncostatin M induces the detachment of reservoir of invasive mammary carcinoma cells: the role of cyclooxygenase-2. Clinical and Experimental Metastasis 21:167-176, 2004. PMID: 15168734
2. Queen, M.M., Ryan, R.E., Holzer, R.G., Keller-Peck, C.R., and Jorcyk, C.L.: Breast cancer cells stimulate neutrophils to produce Oncostatin M: potential implications for tumor progression. Cancer Research 65: 8896-8904, 2005. PMID: 16204061
3. Jorcyk, C.L., Holzer, R.G., and Ryan, R.E.: Oncostatin M induces detachment and enhanced metastatic capacity in T47D human breast carcinoma cells. Cytokine 33:323-336, 2006. PMID: 16713283
4. Bolin, C.*, Sutherland, C.*, Tawara, K., and Jorcyk, C.L. Novel mouse mammary cell lines for in vivo bioluminescence imaging (BLI) of bone metastasis. Biol Proced 14, 6-12, 2012. PMID: 22510147.
5. Bolin, C*, Tawara, K*, Sutherland, C, Redshaw, J, Aranda, P, Moselhy, J Anderson, R, and Jorcyk C.L. Oncostatin M promotes mammary tumor metastasis to bone and osteolytic bone degradation. Gene Cancer 3, 117-30, 2012. PMID: 23050044

Current Support

Sponsor	Project Title	Amount	Project Period	Months Committed
Mountain States Tumor Institute	Oncostatin M synergizes with general inflammation to increase breast cancer metastasis	$7,500	7/1/13-6/30/15	.5 month
NIH/ITHS	Development of breast cancer therapeutics to inhibit OSM-mediated metastasis	$13,900	7/1/13-6/30/15	.5 month
W. M. Keck Foundation	Synthetic DNA reactions for low-cost diagnosis and treatment of disease	$69,000	8/1/11-7/31/16	.5 month
NASA	Molecular Mechanisms of Cellular Mechanoreception in Bone	$131,682	9/1/10-8/31/14	.5 month
Susan G. Komen for the Cure	Analysis of oncostatin M in breast cancer metastasis to bone for the purpose of inhibiting disease progression	$600,000	6/21/10-6/20/14	2 months
NASA EPSCoR	Molecular Mechanisms of Inflammatory Cytokines in Bone Health	$29,000	1/1/14-12/31/14	.94 months
American Cancer Society	Breast cancer metastasis to the bone: the role of oncostatin M	$720,000	7/01/09-12/30/14	2 months
UNLV/NIH	Association of serum OSM levels with metastatic breast cancer and therapeutic options	$55,000	1/1/14-6/30/14	1 month
Murdock Trust	Is There a Role for Oncostatin M in Prostate Cancer?	$15,000	2/27/14-2/26/16	0 months

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
(208) 331-1174

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.
2006-2007	Cancer Research UK. Ad-hoc Reviewer.
2006	Veterans Administration (VA) Merit Grant Program. Ad-hoc Reviewer.

Patents and Patent Disclosures:

2013	Boise State University Provisional Patent Application "Inhibition of oncostatin M (OSM) with small molecule inhibitors fro breast cancer intervention". 083956-0025 12/12/2013.
2013	Boise State University Provisional Patent Application "Inhibition of oncostatin M (OSM) with small molecule inhibitors fro prostate cancer intervention". 083956-0033 12/12/2013.
2009	Boise State University Invention Disclosure "Simple Agarose Gel for Analyzing RNA Quality". BSTU.006P 10/14/2009.

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 (formally 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.

1999-2003 Project Director, J.A. & Kathryn Albertson Foundation grant. Student Research Fellowships and Hands-On Science Education Reform for Vallivue and Kuna School Districts.

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.

1985-1991 Doctoral Student with Dr. Takis Papas, mentored by Dr. Denise Watson at NCI-Frederick, The Johns Hopkins University, Baltimore, MD. Doctoral Dissertation: "The Human *Ets1* Gene: Genomic Structure, Promoter Characterization and Alternative Splicing."

Publications:

1. Lautenberger, J. A., Seth, A., Jorcyk, C. and Papas, T. S.: Useful modifications of the Escherichia coli expression plasmid pJL6. Gene Anal. Tech. 1: 63-66, 1984.

2. Samuel, K. P., Lautenberger, J. A., Jorcyk, C. L., Josephs, S., Wong-Staal, F. and Papas, T. S.: Diagnostic potential for human malignancies of bacterially produced HTLV-I envelope protein. Science 226: 1094-1097, 1984.

3. Sisk, W. P., Chirikjian, J. G., Lautenberger, J. A., Jorcyk, C., Papas, T. S., Berman, M. L., Zagursky, R. and Court, D. L.: A plasmid vector for cloning and expression of gene segments: expression of an HTLV-I envelope gene segment. Gene 48: 183-193, 1986.

4. Schweinfest, C. W., Jorcyk, C. L., Fujiwara, S. and Papas, T. S.: A heat shock inducible eukaryotic expression vector. Gene 71: 207-210, 1988.

5. Koizumi, S., Fisher, R. J., Fujiwara, S., Jorcyk, C. L., Bhat, N. K., Seth, A. and Papas, T. S.: Isoforms of the human ets-1 protein: Generation by alternative splicing and differential phosphorylation. Oncogene 5: 675-681, 1990.

6. Schweinfest, C. W., Jorcyk, C. L. and Papas, T. S.: Efficient inducible expression of HIV-1 tat cDNA in transfected T-cells. In Streilein, J.W., Ahmad, F., Bialy, H., Black, S., Blomberg, B., Chin, Y.H., Lopez, D., Malek, T., Podack, E.R., Rabin, M.B., Stein-Streilein, J., Van Brunt, J. and Whelan, W.J. (Eds.): Advances in Gene Technology: The Molecular Biology of Immune Diseases and the Immune Response, Oxford, IRL Press, 1990, p. 31.

7. Papas, T. S., Blair, D. G., Watson, D. K., Yuan, C. C., Ruscetti, S. K., Fujiwara, S., Seth, A. K., Fisher, R. J., Bhat, N. K., Mavrothalassitis, G., Koizumi, S., Jorcyk, C. L., Schweinfest, C. W. and Ascione, R.: The ETS family of genes: Structural analysis, gene projects, and involvement in neoplasia and other pathologies. In Patterson, D. and Epstein, C.J. (Eds.): Molecular Genetics of Chromosome 21 and Down Syndrome. New York, Wiley-Liss, 1990, pp. 137-168.

8. Papas, T. S., Watson, D. K., Sacchi, N., Fujiwara, S., Seth, A. K., Fisher, R. J., Bhat, N. K., Mavrothalassitis, G., Koizumi, S., Jorcyk, C. L., Schweinfest, C. W., Kottaridis, S. D. and Ascione, R.: The ETS family of genes in leukemia and Down syndrome. Am. J. Med. Genet. (Suppl.) 7: 251-261, 1990.

9. Watson, D. K., Mavrothalassitis, G. J., Jorcyk, C. L., Smyth, F. E. and Papas, T. S.: Molecular organization and differential polyadenylation sites of the human ETS2 gene. Oncogene 5: 1521-1527, 1990.

10. Papas, T. S., Blair, D. G., Watson, D. K., Yuan, C.-C., Ruscetti, S. K., Fujiwara, S., Seth, A. K., Fisher, R. J., Bhat, N. K., Mavrothalassitis, G., Koizumi, S., Jorcyk, C. L., Schweinfest, C. W. and Ascione, R.: The ETS family of genes: Structural analysis, gene products, and involvement in neoplasia and other pathologies. Prog. Clin. Biol. Res. 360: 137-168, 1990.

11. Jorcyk, C. L., Watson, D. K., Mavrothalassitis, G. J. and Papas, T. S.: The human ETS1 gene: Genomic structure, promoter characterization and alternative splicing. Oncogene 6: 523-534, 1991.

12. Jorcyk, C. L., Watson, D. K., Mavrothalassitis, G. J. and Papas, T. S.: Regulation and processing of the human ETS1 gene. Miami Short Rep. 1: 78, 1991.

13. Shibata, M.-A., Maroulakou, I. G., Jorcyk, C. L., Gold, L. G., Ward, J. M. and Green, J. E.: p53-independent apoptosis during mammary tumor progression in C3(1)/SV40 large T antigen transgenic mice: suppression of apoptosis during the transition from preneoplasia to carcinoma. Cancer Res. 56: 2998-3003, 1996.

14. Wigginton, J. M., Komschlies, K. L., Green, J. E., Cox, G. W., Jorcyk, C. L., Back, T. C., Franco, J. L., Brunda, M. J. and Wiltrout, R. H.: Evaluation of the antitumor activity of the interleukin-12/pulse interleukin-2 combination. Ann. N.Y. Acad. Sci. 795: 434-439, 1996.

15. Jorcyk, C. L., Garrett, L. J., Watson, D. K., Maroulakou, I. G. and Green, J. E.: Multiple regulatory regions control the expression of the Ets-1 protooncogene in the developing mouse: vascular expression conferred by intron I. Cellular and Molecular Biology 42: 211-225, 1997.

16. Jorcyk, C. L., Liu, M.-L., Maroulakou, I. G., Shibata, M.-A., Komschlies, K. L., McPhaul, M. J.,
Resau, J. H. and Green, J. E.: Development and characterization of a mouse prostate adenocarcinoma cell line: ductal formation determined by extracellular matrix. The Prostate 34: 10-22, 1998.

17. Maroulakou, I. G., Shibata, M.-A., Jorcyk, C. L., Chen, A., Ward, J. M. and Green, J. E.: Loss of p53 expression is associated with mammary tumor metastases in C3(1)/TAG transgenic mice. Molecular Carcinogenesis 19: 168-174, 1997.

18. Ward, J., Konishi, N., Ohshima, M., Lamb, P.L., Jorcyk, C. and Barrett, J.: Kai1 expression in paraffin embedded sections of prostate cell lines and normal, hyperplastic and neoplastic human prostate. Pathology International 48: 87-92, 1998.

19. Shibata, M.-A., Jorcyk, C. L., Devor, D., Yoshidome, K., Rulong, S., Resau, J., Roche, N., Roberts, A., Ward, J., and Green, J. E.: Altered expression of transforming growth factor during urethral and bulbourethral gland tumor progression in transgenic mice carrying the androgen-responsive C3(1) 5' flanking region fused to SV40 large T antigen. Carcinogenesis 19: 195-205, 1998.

20. Shibata, M.-A., Jorcyk, C. L., Liu, M.-L., Yoshidome, K., Gold, L., Green, J. E.: The C3(1)/SV40 T antigen transgenic mouse model of prostate and mammary cancer. Toxicologic Pathology 26: 177-182, 1998.

21. Yoshidome, K., Shibata, M.-A., Maroulakou, I. G., Liu, M.-L., Jorcyk, C. L., Gold, L. G., Welch, V. N., and Green, J. E.: Genetic alterations in the development of mammary and prostate cancer in the C(3)1/Tag transgenic mouse model (Review). International Journal of Oncology 12: 449-453, 1998.

22. Liu, M.-L., Von Lintig, F. C., Liyange, M., Shibata, M.-A., Jorcyk, C. L., Ried, T., Boss, G. R. and Green, J. E.: Amplification of Ki-ras and elevation of MAP kinase activity during mammary tumor progression in C3(1)/SV40 tag transgenic mice. Oncogene 18: 2403-2411, 1998.

23. Maroulakou, I. G., Shibata, M.-A., Anver, M., Jorcyk, C. L., Liu, M.-L., Roche, N., Roberts, A. B., Tsarfaty, I., Reseau, J., Ward, J., and Green, J. E.: Heterotopic endochondrial ossification with mixed tumor formation in C3(1)/Tag transgenic mice is associated with elevated TGF-beta1 and BMP-2 expression. Oncogene 18: 5435-5447, 1999.

24. Shibata, M.-A., Yoshidome, K., Shibata, E., Jorcyk, C.L. and Green, J.E.: Suppression of mammary carcinoma growth in vitro and in vivo by inducible expression of the Cdk inhibitor p21. Cancer Gene Therapy 1: 1-10, 2000.

25. Green, J.E., Shibata, M.A., Yoshidome, K., Kiu, M.L., Jorcyk, C., Anver, M.R., Wigginton, J., Wiltrout, R., Shibata, E., Kaczmarczyk, S., Wang, W., Liu, Z.Y., Calvo, A. and Couldrey, C.: The C3(1)/SV40 T-antigen transgenic mouse model of mammary cancer: ductal epithelial cell targeting with multistage progression to carcinoma. Oncogene 19: 1020-1027, 2000.

26. Wigginton, J.M., Park, J.W., Gruys, M.E., Young, H.A., Jorcyk, C.L., Back, T.C., Brunda, M.J., Strieter, R.M., Ward, J., Green, J.E. and Wiltrout, R.H.: Complete regression of established spontaneous mammary carcinoma and the therapeutic prevention of genetically programmed neoplastic transition by IL-12/pulse IL-2: induction of local T cell infiltration, fas/fas ligand gene expression, and mammary epithelial apoptosis. J. Immunol. 166: 1156-1168, 2001.

27. Calvo, A., Xiao, N., Simon, R., Kang, J., Best, C., Emmert-Buck, M., Jorcyk, C.L., and Green, J.E.: Identification of genes in prostate tumor progression by cDNA microarray analysis in an in vitro model derived from C3(1)/T-antigen transgenic mice: down-regulation of selenoprotein-P in mouse and human prostate cancer. Cancer Research 62: 5325-35, 2002.

28. Soares, C., Shibata, M.-A., Green, J.E. and Jorcyk, C.L.: Development of PIN and prostate adenocarcinoma cell lines: a model system for multistage tumor progression. Neoplasia 4: 112-120, 2002.

29. Holzer, R.G., MacDougall, C., Atwood, C., Green, J.E., and Jorcyk, C.L.: Development and characterization of a progressive series of hormone-responsive mammary adenocarcinoma cell lines derived from the C3(1)/SV40 Large T-antigen transgenic mouse model. Breast Cancer Research and Treatment 77: 65-76, 2003.

30. Holzer, R.G., Tommack, M., Schlekeway, E., Ryan, R.E, and Jorcyk, C.L: Oncostatin M induces the detachment of a reservoir of invasive mammary carcinoma cells: the role of cyclooxygenase-2. Clinical and Experimental Metastasis 21:167-176, 2004.

31. MacDougall, C.A., Ide, A., Soares, C., Vargas, M., Holzer, R.G., and Jorcyk, C.L.: Involvement of the hepatocyte growth factor-met receptor signaling loop with the classical "3M" pathways in tumor progression of mouse prostate adenocarcinoma cells. The Prostate 64: 139-149, 2005.

32. Queen, M.M., Ryan, R.E., Holzer, R.G., Keller-Peck, C.R., and Jorcyk, C.L.: Breast cancer cells stimulate neutrophils to produce Oncostatin M: potential implications for tumor progression. Cancer Research 65: 8896-8904, 2005.

33. Jorcyk, C.L., Holzer, R.G., and Ryan, R.E.: Oncostatin M induces detachment and enhanced metastatic capacity in T-47D human breast carcinoma cells. Cytokine 33:323-336, 2006.

34. Halsted, KC, Bowen, KB, Bond, L, Jorcyk, CL, Fyffe, WE, Kronz, JD, Oxford, JT. Collagen alpha1(XI) in normal and malignant breast tissue. Modern Pathology 21:1246-54, 2008.

35. Jackiewicz, Z., Jorcyk, C.L., Kolev, M., and Zubik-Kowal, B. Correlation between animal and mathematical models for prostate cancer progression. Computation and Mathematical Methods in Medicine iFirst article, 1-12, 2009.

36. Graugnard, E., Cox, A., Lee, J., Jorcyk, C.L., Yurke, B., and Hughes, W.L. Kinetics of DNA and RNA hybridization in serum and serum-SDS. IEEE Transactions on Nanotechnology 9, 603, 2010. PMID: 20967137

37. Graugnard, E., Cox, A., Lee, J., Jorcyk, C.L., Yurke, B., and Hughes, W.L. Operation of a DNA-based autocatalytic network in serum. Lecture Notes in Computer Science, 6518, 83, 2011.

38. Zubik-Kowal, B., Jorcyk, C.L., and Kolev, M. Numerical experiments for mammary adenocarcinoma cell progression. Integral Methods in Science and Engineering, Springer, 2011, book chapter.

39. Tawara, K. and Jorcyk, C.L. Clinical significance of interleukin-6 (IL-6) in cancer metastasis to bone: potential of anti-IL-6 therapies. Cancer Management and Research 3, 177-89, 2011. PMID: 21625400

40. Aranda P.S., LaJoie D.M., Jorcyk C.L. Bleach gel: a simple agarose gel for analyzing RNA quality. Electrophoresis 33, 366-9, 2012. PMID: 22222980; http://f1000.com/prime/717961052?bd=1

41. Jorcyk, C.L., Kolev, M., Tawara, K., and Zubik-Kowal, B. Experimental versus numerical data for breast cancer progression. Journal of Nonlinear Analysis: Real World Applications 13, 78-84, 2012.

42. Bolin, C.*, Sutherland, C.*, Tawara, K., and Jorcyk, C.L. Novel mouse mammary cell lines for
in vivo bioluminescence imaging (BLI) of bone metastasis. Biol Proced 14, 6-12, 2012. PMID: 22510147.

43. Bolin, C*, Tawara, K*, Sutherland, C, Redshaw, J, Aranda, P, Moselhy, J Anderson, R, and Jorcyk C.L. Oncostatin M promotes mammary tumor metastasis to bone and osteolytic bone degradation. Genes Cancer 3, 117-30, 2012. PMID: 23050044.

44. Nadelson, L, Jorcyk, C, Yang, D, Smith, J, Matson, S, Cornell, K, and Husting, V. "I Just Don't Trust Them: The Development and Validation of an Assessment Instrument to Measure Trust in Science and Scientists". School Science and Mathematics, 114(2), 76-86, 2014.

45. Mikelonis D, Jorcyk, CL, Tawara, K, Oxford JT. Stuve-Wiedemann syndrome: LIFR and associated cytokines in clinical course and etiology. Orphanet J Rare Dis. 9, 1-11, 2014. PMID:
24618404.

46. Cannon B, Hiremath M, Jorcyk C, and Joshi A. CoVE: Colony visualization system for animal pedigrees. Visual Information Communication an Interaction (VINCI). In press.

Manuscripts Submitted or in Preparation:

1. Ryan, R, Mellor, L, Martin, B, Jacob, R, McDougal, O, Jorcyk, CL*, and Oxford, JT*. Oncostatin M binds to extracellular matrix in a bioactive conformation: implications for inflammation and metastasis. Submitted to *Cytokine.*

2. Sara Goltry, Natalya Hallstrom, Tyler Clark, Wan Kuang, Jeunghoon Lee, Cheryl Jorcyk, William B. Knowlton, Bernard Yurke, William L. Hughes, and Elton Graugnard. Operation of a DNA-Based Nanomachine in Human Blood and Serum. Submitted to Nature Nanotechnology.

3. Celeste Bolin, Jordan Koncinsky, Ken Tawara, Danielle Hedeen, Sujatha Kadaba, Joe Kronz, Randy Ryan, Joel Garbow, and Cheryl L Jorcyk. Oncostatin M promotes breast cancer metastasis to lung by affecting initial stages of metastasis. In Preparation for *Cancer Research.*

4. Ken Tawara, Madhuri Nandakumar, Ryan Fox, David Chang, Alex Ide, Andrew Oler, Dollie LaJoie, Randy Ryan, and Cheryl L Jorcyk. Differential expression of VEGF in breast cancer cells induced by IL-6 cytokines. In Preparation for *PLOS ONE.*

5. Nadelson, L, Jorcyk, C, Yang, D, Smith, J, Matson, S, Cornell, K, and Husting, V. What good is it for me? The Development and Validation of the Individual Science Usefulness Survey – the *ISUS.* 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 $211,500
HIF1 -mediated.

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
Col11a1 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 Col11a1: 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):

Breast cancer: a role for Oncostatin M? Albertson's College, Caldwell, ID. November 17th, 2003. ***Regional.***

Breast cancer: a role for Oncostatin M? College of Engineering, Boise State University, Boise, ID. November 21st, 2003. ***Regional.***

Oncostatin M: promoting the phenotype of metastatic breast cancer, University of Texas at San Antonio, San Antonio, TX, April 16th, 2004. ***National.***

Oncostatin M induces VEGF in human breast carcinoma cells: stimulation of angiogenesis *in vitro* and *in vivo*, 3rd Annual BRIN Conference, Idaho State University, Pocatello, ID, August 9th-11th, 2004. ***Regional.***

Neutrophil-derived oncostatin M: potential implications for breast cancer progression, 2nd Annual INBRE Conference, Northwest Nazarene University, Nampa, ID, August 8th, 2005. ***Regional..***

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

Neutrophil-derived oncostatin M: potential implications for breast cancer progression, AACR (American Association for Cancer Research) Special Conference on Cancer, Proteases, and Tumor Microenvironment, Bonita Springs, FL, December 1st, 2005. ***International.***

Breast cancer: the design of targeted therapies. Idaho Society of Radiological Technology Conference, Boise, ID. April 29th, 2006. ***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 induces vascular endothelial growth factor in human breast cancer cells and promotes angiogenesis. 3rd Annual INBRE Conference, Northern Idaho College, Coeur d'Alene, ID, August 8th, 2006. ***Regional.***

Neutrophil-derived oncostatin M: potential implications for breast cancer progression. 11th World Congress on Advances in Oncology, Crete, Greece. October 13th, 2006. ***International***.

Neutrophil-derived Oncostatin M: potential implications for breast cancer progression. University of Nevada at Reno. Reno, NV, May 1st, 2007. ***Regional.***

Oncostatin M is a potential target for inhibiting breast tumor progression. American Association for the Advancement of Science (AAAS) Pacific Division Annual Conference. Boise, ID, June 20th, 2007. ***Regional.***

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

The role of oncostatin M in breast cancer. CAMBR (Center for Advanced Microelectronics and Biomolecular Research) Symposium. Post Falls, WA, October 12th, 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 as a potential target for inhibiting breast tumor progression. College of Idaho, Caldwell, ID, May 16th, 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***.

A role for oncostatin M in osteoclastogenesis and breast cancer metastasis to bone? 5th Annual INBRE Conference, Boise State University, Boise, ID, August 4th – 6th, 2008. ***Regional.***

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.***

Oncostatin M: potential target for inhibiting breast cancer metastasis to bone. American Association for the Advancement of Science (AAAS) Pacific Division Annual Conference, University of San Diego, San Diego, CA. June 12th-15th, 2011. ***Regional.***

Cross-talk between bone metastatic mammary tumor cells and bone microenvironment. International Bone and Mineral Society Workshop (IBMS), Sun Valley, ID. July 30th - August 3rd, 2011. ***International.***

Breast cancer innovative research and treatment. 1st Annual Susan G. Komen Moving Through Breast Cancer Symposium, September 17th, 2011. ***Regional.***

Breast cancer and oncostatin M: research and treatment. Department of Chemistry and Biochemistry. Boise State University, Boise, ID. October 21st, 2011. ***Regional.***

Understanding breast cancer genetics and targeted therapies. Annual Breast Care Services Conference. St. Luke's Regional Medical Center Mountain States Tumor Institute, Meridian, ID. November 12th, 2011. ***Regional.***

Why support cancer research? American Cancer Society Team Captain Summit Conference, Boise, ID, February 11, 2012. ***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.***

Metastatic breast cancer: development of targeted therapies. Idaho Society for Radiology Technicians, Boise, ID, April 21, 2012. ***Regional.***

Breast cancer metastasis: a role for the inflammatory cytokine oncostatin M. AAAS Pacific Division Annual Conference, June 24, 2012. ***Regional.***

Why support cancer research? Ada County American Cancer Society Relay for Life, Boise, ID, July 13, 2012. ***Regional.***

Why support cancer research? Tampa American Cancer Society Laureate Society, Tampa, FL, October 10, 2012. ***National.***

Why support cancer research? American Cancer Society Great West Summit, Sun Valley, ID, October 27, 2012. ***Regional.***

Why support cancer research? Boise State University 1st Annual American Cancer Society Relay for Life, Boise, ID, April 20, 2013. ***Regional.***

Mechanisms of OSM-induced tumor progression and cancer therapy. Cheryl L. Jorcyk. AAAS Pacific Division Annual Conference, Las Vegas, NV, June 18, 2013. ***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.***

Breast cancer metastasis to bone and new therapeutics. Cheryl L. Jorcyk, ACS Business Breakfast, St. Luke's Regional Medical Center, Boise, ID, January 31, 2014. ***Regional.***

Development of breast cancer therapies. Cheryl L. Jorcyk, Boise Saturday Fortnightly, Boise, ID, February 8, 2014. ***Regional.***

OSM and breast cancer metastasis: a novel targeted therapeutic. Cheryl L. Jorcyk, Oncology Group, St. Alphonsus Regional Medical Center, March 7, 2014. ***Regional.***

OSM and breast cancer metastasis: a novel targeted therapeutic. Cheryl L. Jorcyk, Boise State University Foundation Board, April 23, 2014. ***Regional.***

Promoting breast cancer metastasis: a role for the inflammatory cytokine oncostatin M. Cheryl L. Jorcyk, Annual American Association for the Advancement of Science (AAAS) Pacific Division Conference, UC Riverside, Riverside, CA, June 19, 2014. ***Regional.***

Correlating serum OSM levels with metastatic breast cancer and therapeutic options. Cheryl L. Jorcyk, Annual Meeting of the Mountain West CTR-IN, Las Vegas, NV, June 23, 2014. ***Regional.***

The inflammatory cytokine OSM induces breast cancer metastasis by promoting early stages of metastasis. Cheryl L. Jorcyk, Biennial Metastasis Research Society Congress, Heidelberg, Germany, June 27, 2014. ***International.***

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)

Microarray analysis comparing the PIN cell line, Pr-111, and the prostate adenocarcinoma cell line, Pr-14_2. Amy Ambrosier, Colin R. Soares, Peter S. Nelson, and Cheryl L. Jorcyk. Murdock Charitable Trust's Partners in Science Meeting, San Diego, CA, January 16-18, 2003. *Regional.*

Oncostatin M induces cyclooxygenase (Cox)-2, and stimulates Cox-2-mediated detachment of a reservoir of invasive cells in mammary carcinoma. Ryan Holzer, Eric Schlekeway, Randy Ryan and Cheryl Jorcyk. 94th Annual Meeting for the American Association for Cancer Research (AACR), Washington, DC, July 11-14, 2003. *National.*

The Effects of OSM-induced VEGF on HUVECs: An *in-vitro* Angiogenesis Assay. Kencee K. Amyx, Alexander E. Ide, Ryan G. Holzer and Cheryl L. Jorcyk, 2nd Annual BRIN Conference, Boise, ID, August 11-13, 2003. *Regional.*

Oncostatin M Promotes *in vitro* Angiogenesis Through Induction of Vascular Endothelial Growth Factor in Mammary Carcinoma. (Oral Presentation), Alex Ide and Cheryl L. Jorcyk, 2nd Annual BRIN Conference, Boise, ID, August 11-13, 2003. *Regional.*

Oncostatin M (OSM) stimulates the detachment of a reservoir of invasive mammary carcinoma cells: the role of cyclooxygenase-2. (Oral Presentation), Ryan G. Holzer and Cheryl L. Jorcyk, 2nd Annual BRIN Conference, Boise, ID, August 11-13, 2003. *Regional.*

Effects of Neutrophil-derived Oncostatin M (OSM) on Breast Cancer Cells. (Oral Presentation), Marisa Queen and Cheryl L. Jorcyk, 2nd Annual BRIN Conference, Boise, ID, August 11-13, 2003. *Regional.*

Oncostatin M Induces Cell Detachment and Enhances the Metastatic Capacity of T-47D Human Breast Carcinoma Cells. Cheryl L. Jorcyk, Ryan G. Holzer, and Randall E. Ryan. AACR Special Conference on Breast Cancer, Huntington Beach, CA, Oct. 9-12, 2003. *National.*

Development of a Tool To Study Breast Cancer Metastasis: MDA-MB-231 Cells Designed to Overexpress Oncostatin M. Brooke McCuskey, Marisa Queen, and Cheryl L. Jorcyk. Idaho Academy of Sciences Conference, March 25th -27th, 2004. (Awarded 2nd place for Graduate Student Poster Presentations.) *Regional.*

The Effects of OSM-induced VEGF on Endothelial Cell Tube Formation. Kencee K. Amyx, Alexander E. Ide, Ryan G. Holzer and Cheryl L. Jorcyk. Idaho Academy of Sciences Conference, March 25th -27th, 2004. *Regional.*

Oncostatin M Induces Detachment and Enhances the Metastatic Capacity of T-47D Human Breast Carcinoma Cells. Cheryl L. Jorcyk, Ryan G. Holzer, and Randall E. Ryan. 95th Annual Meeting for the American Association for Cancer Research (AACR), Orlando, FL, March 27th-31st, 2004. *National.*

Breast Cancer Cells Co-cultured with Neutrophils Express Endogenous Oncostatin M (OSM). Marisa Queen, Alexander Ide, Kencee Amyx, Barbara Smith[1], Randy

Ryan, and Cheryl Jorcyk. 95th Annual Meeting for the American Association for Cancer Research (AACR), Orlando, FL, March 27th-31st, 2004. *National.*

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.*

Neutrophils Co-Cultured with Breast Cancer Cells Express Endogenous Oncostatin M (OSM). (Oral Presentation) Marisa Queen, Alexander Ide, Kencee Amyx, Barbara Smith, Randy Ryan, and Cheryl Jorcyk. 3rd Annual BRIN Conference, Idaho State University, Pocatello, ID, August 9th-11th, 2004. *Regional.*

OSM and Breast Cancer Metastasis to the Bone. Andrew Oler and Cheryl L. Jorcyk. 3rd Annual BRIN Conference, Idaho State University, Pocatello, ID, August 9th-11th, 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.*

Oncostatin M Induction of Vascular Endothelial Growth Factor in Human Breast Cancer Cells Promotes Angiogenesis. Alexander Ide, Ryan Holzer, Kencee Amyx and Cheryl Jorcyk. 4th Annual Northwest Cancer Conference (NWCC), Spokane, WA, November 11th-13th, 2004. *Regional.*

Development of Tools to Study Breast Cancer Metastasis: MDA-MB-231 Cells Designed to Overexpress Oncostatin M. Amanda J. Bruesch, Tshering Sherpa, Brooke McCuskey, and Cheryl Jorcyk. 4th Annual Northwest Cancer Conference (NWCC), Spokane, WA, November 11th-13th, 2004. *Regional.*

Evaluation of OSM-Receptor In Normal Human Breast Tissue, Breast Carcinoma, and Metastatic Carcinoma. Byrne B, Queen M, Jorcyk C. 4th Annual Northwest Cancer Conference (NWCC), Spokane, WA, November 11th-13th, 2004. *Regional.*

The Role of Oncostatin M in Human Microvascular Endothelial Cell Proliferation. Lee O. Rooney, Alexander E. Ide, and Cheryl L. Jorcyk. 4th Annual Northwest Cancer Conference (NWCC), Spokane, WA, November 11th-13th, 2004. *Regional.*

Neutrophils Co-cultured with Human Breast Cancer Cells Express Endogenous Oncostatin M (OSM). Marisa Queen, Alexander Ide, Lee Rooney, Randy Ryan, and Cheryl Jorcyk. 4th Annual Northwest Cancer Conference (NWCC), Spokane, WA, November 11th-13th, 2004. *Regional.*

Determination of the Receptor Utilized by Oncostatin M (OSM) to Promote Metastatic Characteristics in MDA-MB-231 Human Breast Cancer Cells. Heidi Pluska and Cheryl L. Jorcyk. MJ Murdock Charitable Trust's Partners in Science Meeting, San Diego, CA, January 13th-15th, 2005. *Regional.*

Breast cancer cells stimulate neutrophils to produce oncostatin M: potential implications for tumor progression. Marisa M. Queen, Alexander E. Ide, Ryan G. Holzer, Randall E. Ryan, and Cheryl L. Jorcyk. Keystone Symposium on Microenvironment of the Tumor, Banff, British Columbia, Canada, February 5th-10th, 2005. *International.*

Oncostatin M Induction of Vascular Endothelial Growth Factor in Human Breast Cancer Cells Promotes Angiogenesis. Alexander Ide, Ryan Holzer, Kencee Amyx, and Cheryl Jorcyk. 96th Annual Meeting for the American Association for Cancer Research (AACR), Anaheim, CA, April 16th-20th, 2005. *National.*

Neutrophils Co-cultured with Human Breast Cancer Cells Express Endogenous Oncostatin M (OSM). Marisa Queen, Alexander Ide, Lee Rooney, Randy Ryan, and Cheryl Jorcyk. 96th Annual Meeting for the American Association for Cancer Research (AACR), Anaheim, CA, April 16th-20th, 2005. *National.*

Evaluation of OSM-Receptor In Normal Human Breast Tissue, Breast Carcinoma, and Metastatic Carcinoma. Stear J, Byrne B, Queen M, Jorcyk C. 2nd Annual Boise State University Undergraduate Research Day, Boise State University, Boise, ID, April 11th 2005. *Regional.*

Initiating Oncostatin M in vivo Studies. (Oral Presentation) Amanda J. Bruesch and Cheryl L. Jorcyk. 2nd Annual INBRE Conference, Northwest Nazarene University, Nampa, ID, August 7th-10th, 2005. *Regional.*

The Role of Oncostatin M in Prostate Cancer. David H. Chang and Cheryl L. Jorcyk. 2n 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.*

Breast cancer cells stimulate neutrophils to produce oncostatin M: potential implications for tumor progression. Marisa M. Queen, Alexander E. Ide, Ryan G. Holzer, Randall E. Ryan, and Cheryl L. Jorcyk. AACR Special Conference on Cancer, Proteases, and Tumor Microenvironment, Bonita Springs, FL, November 30th-December 4th, 2005. *National.*

Determination of the Receptor Utilized by Oncostatin M (OSM) to Promote Metastatic Characteristics in MDA-MB-231 Human Breast Cancer Cells. Heidi Pluska and Cheryl L. Jorcyk. MJ Murdock Charitable Trust's Partners in Science Meeting, San Diego, CA, January 12th-14th, 2006. *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.*

Oncostatin M Induction of Vascular Endothelial Growth Factor in Human Breast Cancer Cells Promotes Angiogenesis. Alexander Ide, Ryan Holzer, Marisa Queen, Andrew Oler, Amanda Bruesch, Kencee Amyx, Randy Ryan, 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. 3rdAnnual Boise State University Undergraduate Research Day, Boise State University, Boise, ID, April 17th 2006. *Regional.*

In vivo oncostatin M studies—in progress. (Oral Presentation). Amanda Bruesch, Dan Henbest, and Cheryl Jorcyk. 3rd Annual INBRE Conference, Northern Idaho College, Coeur d'Alene, ID, August 6[8h]-8th, 2006. *Regional.*

Knocking down oncostatin M receptor beta expression in tumor cells utilizing RNA interference. (Oral Presentation). Patrick Aranda and Cheryl Jorcyk. 3rd Annual INBRE Conference, Northern Idaho College, Coeur d'Alene, ID, August 6[8h]-8th, 2006. *Regional.*

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

Does Oncostatin M play a role in colorectal cancer? Tyrell Simkins and Cheryl L. Jorcyk. 4th Annual Boise State University Undergraduate Research Day, Boise State University, Boise, ID, April 16, 2007. *Regional.*

The clinical significance of Oncostatin M and its receptors in breast cancer. AAAS (American Association for the Advancement of Science) Pacific Division Annual Conference. (Oral Presentation) Sujatha Kadaba, Karen Halsted, Kara Bowen, Laura Bond, William Fyffe, Joseph Kronz, and Cheryl L. Jorcyk. Boise, ID. June 20, 2007. *Regional*.

Oncostatin M induces VEGF through HIF1alpha. (Oral Presentation) AAAS (American Association for the Advancement of Science) Pacific Division Annual Conference. David Chang and Cheryl L. Jorcyk. June 20, 2007. Boise, ID. *Regional*.

Breast cancer stimulation of osteoclast differentiation: the role of Oncostatin M. (Oral Presentation) AAAS (American Association for the Advancement of Science) Pacific Division Annual Conference. Ken Tawara, Patrick Aranda, Sujatha Kadaba, Andrew Oler, and Cheryl L. Jorcyk. June 20, 2007. Boise, ID. *Regional*.

Breast cancer: confirming oncostatin's role in tumor progression *in vivo*. AAAS (American Association for the Advancement of Science) Pacific Division Annual Conference. Amanda Bruesch and Cheryl L. Jorcyk. June 20, 2007. Boise, ID. *Regional*.

Knocking down Oncostatin M Receptor beta expression in tumor cells: utilizing RNAi for selective mRNA cleavage. AAAS (American Association for the Advancement of Science) Pacific Division Annual Conference. Patrick Aranda and Cheryl L. Jorcyk. June 20, 2007. Boise, ID. *Regional*.

Oncostatin M's role in breast tumor progression *in vivo*. 4th Annual INBRE Conference. Amanda Bruesch and Cheryl L. Jorcyk. August 6, 2007, University of Idaho, Moscow, ID. *Regional.*

Knocking down Oncostatin M receptor beta expression in tumor cells. 4th Annual INBRE Conference. Patrick Aranda and Cheryl L. Jorcyk. August 6, 2007, University of Idaho, Moscow, ID. *Regional.*

Breast cancer stimulation of osteoclast differentiation: the role of Oncostatin M. 4th Annual INBRE Conference. Ken Tawara, Andrew Oler, Sujatha Kadaba, and Cheryl L. Jorcyk. August 6, 2007, University of Idaho, Moscow, ID. *Regional.*

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

INBRE Conference. Bengt Phung, Arthur Ayers, and Cheryl L. Jorcyk. August 6, 2007, University of Idaho, Moscow, ID. *Regional.*

The effect of Oncostatin M on integrin expression in human breast cancer cells. 4th Annual INBRE Conference. Mary Lewis and Cheryl L. Jorcyk. August 6, 2007, University of Idaho, Moscow, ID. *Regional.*

Oncostatin M induces VEGF through HIF1a in human breast cancer cells. AACR (American Association for Cancer Research) Special Conference on Breast Cancer. Cheryl L. Jorcyk. October 18, 2007. San Diego, CA. *National.*

OSM elevates RUNX2 mRNA expression in human breast cancer cells. Bengt Phung, Cheryl L. Jorcyk, and Sara Heggland. 16th Annual Murdock College Science Research Program Conference. November, 2, 2007, Portland, OR. *National.*

OSM elevates RUNX2 mRNA expression in human breast cancer cells. Bengt Phung, Cheryl L. Jorcyk, Sara J. Heggland. 99th Annual Meeting for the American Association for Cancer (AACR), San Diego, April 12-16th, 2008. *National.*

Breast cancer cell stimulation of osteoclast differentiation and activity: the role of oncostatin M. Ken Tawara, Sujatha Kadaba, Andrew Oler, Cheryl L. Jorcyk 99th Annual Meeting for the American Association for Cancer (AACR), San Diego, April 12-16th, 2008. *National.*

Oncostatin M receptor knockdown in mammary carcinoma cells: the role of OSM signaling in tumor progression and metastasis. Patrick S. Aranda, Ken Tawara, Cheryl L. Jorcyk. 99th Annual Meeting for the American Association for Cancer (AACR), San Diego, April 12-16th, 2008. *National.*

OSM induces VEGF through regulation of HIF1a. David H. Chang, Sujatha Kadaba, Bengt Phung, Alexander Ide, and Cheryl L. Jorcyk. 99th Annual Meeting for the American Association for Cancer (AACR), San Diego, April 12-16th, 2008. *National.*

Using siRNA to modify the expression of OSM in mammary cancer cells in vitro. Jeff Redshaw, Patrick Aranda, Kelly Katula, and Cheryl L. Jorcyk. 5thAnnual 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.

Jeff Redshaw, Patrick Aranda, Kelly Katula, and Cheryl L. Jorcyk. Idaho Academy of Sciences Annual Conference, Boise, ID, March 27-29, 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. Idaho Academy of Sciences Annual Conference, Boise, ID, March 27-29, 2008. *Regional.*

A Tetracycline-inducible plasmid construct for controlling oncostatin M expression in breast cancer cell lines. Jeffrey C. Walker and Cheryl L. Jorcyk. The American Federation for Medical Research Western Regional Meeting, Carmel, CA, January 31-February 2, 2008. *Regional.*

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.*

Oncostatin M: the role of mammary cancer progression in an orthotopic In vivo mouse model. Ken Tawara, Sujatha Kadaba, 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.*

Investigations on the effects of HIF1a inhibitors on the metastatic potential of human breast cancer cells. Ryan K. Fox, Amanda J. Bruesch, 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.*

Investigating the role of carbonyl reductase in anthracycline drug resistance. Ryan Morton, Christopher Ewing, Cheryl L. Jorcyk, and Henry Charlier. 237th American Chemical Society National Meeting, Salt Lake City, UT, March 22nd – 26th, 2009. *National.*

Breast cancer cell stimulation of osteoclast differentiation and activity: the role of oncostatin M. Ken Tawara, Sujatha Kadaba, Andrew Oler, and Cheryl L. Jorcyk. 100th Annual Meeting for the American Cancer Society, Denver, CO, April 18th – 22nd, 2009. *National.*

Development of bioluminescent mammary cancer cells with knocked down expression of OSM for detection of bone metastasis *in vivo.* Caleb Sutherland, Jeff Redshaw, Ken Tawara, and Cheryl L. Jorcyk. 6thAnnual Boise State University Undergraduate Research Conference, Boise State University, Boise, ID, April 20th, 2009. *Regional.*

The role of OSM in breast cancer cell-promoted osteoclastogenesis. Farhad Mangal, Ken Tawara, and Cheryl L. Jorcyk. 6thAnnual Boise State University Undergraduate Research Conference, Boise State University, Boise, ID, April 20th, 2009. *Regional.*

The role of oncostatin M in breast cancer metastasis to bone. Ken Tawara and Cheryl L. Jorcyk. International Bone and Mineral Society (IBMS) Workshop on Musculoskeletal Biology in Sun Valley, ID August 8th-12th, 2009. *International.*

OSM-induced RunX2 in human breast cancer cells (not exact title). The Endocrine Society's 91st Annual Meeting, Washington, D.C., June 10th – 13th, 2009. *National.*

Point-of-contact, DNA-based amplifier for detecting cancer-related micro-RNAs in blood serum. (Oral presentation) Elton Graugnard, Amber Cox, William L. Hughes, Jeunghoon Lee, Cheryl L. Jorcyk, William B. Knowlton, and Bernard Yurke. 2009 Nanoelectronic Devices for Defense Security (Nano-DDS), Fort Lauderdale, FL, September 28th – October 2nd, 2009. *National.*

Point-of-contact, DNA-based Amplifier for Detecting Cancer-Related Micro-RNAs in Blood Serum. Graugnard, E., Cox, A., Lee, J., Jorcyk, C.L., Yurke, B., and Hughes, W.L. Oral & Paper Presentation, Nanoelectronic Devices for Defense & Security Conference, Fort Lauderdale, FL, Sept. 28-Oct. 2, 2009. *National.*

A role for oncostatin M in breast cancer metastasis. Ken Tawara, Caleb Sutherland, Rachael Anderson, and Cheryl L. Jorcyk. Keystone Symposium on Cancer and Inflammation in Keystone, CO February 7th-12th, 2010. *National.*

Breast cancer cell regulation of osteoclast differentiation and activity: the role of oncostatin M. Ken Tawara, Andrew Oler, and Cheryl L. Jorcyk. Miami 2010 Winter Symposium on Targeting Cancer Invasion and Metastasis in Miami Beach, FL, February 21st-24th, 2010. *National.*

Point-of-Contact, DNA-Based Amplifier for Detecting Cancer-Related Micro-RNA in Blood Serum. Graugnard, E., Cox, A., Lee, J., Jorcyk, C.L., Yurke, B., and Hughes, W.L. Abstract & Poster Presentation, 7th Annual Conference on Foundations of Nanoscience, Snowbird, UT, April 27-30, 2010. *National.*

Reaction Kinetics of a DNA-Based Amplifier for use in Detection of Cancer-Related miRNA. Cox, A., Graugnard, E., Hughes, W.L., Lee, J., Jorcyk, C.L., and Yurke, B. Abstract & Poster Presentation, 7th Annual Conference on Foundations of Nanoscience, Snowbird, UT, April 27-30, 2010. *National.*

Operation of a DNA-based autocatalytic amplifier in human serum. Graugnard, E., Cox, A., Lee, J., Jorcyk, C.L., Yurke, B., and Hughes, W.L. 16th International Conference on DNA Computing and Molecular Programming, Hong Kong, China. June 14-17, 2010. *International.*

Effects of oncostatin M on breast cancer metastatic potential. Caleb Sutherland, Ken Tawara, and Cheryl L Jorcyk. 7th Annual INBRE Conference, August 2-4, 2010, University of Idaho, Moscow, 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.*

Will exogenous oncostatin M induce production of oncostatin M? Jordan Koncinsky and Cheryl L. Jorcyk. 7th Annual INBRE Conference, August 2-4, 2010, University of Idaho, Moscow, ID. *Regional.*

Development of 66c14 murine mammary carcinoma cells having constitutive expression of truncation oncostatin M. Rachael Anderson, Dollie LaJoie, Ken Tawara, and Cheryl L. Jorcyk. 7th Annual INBRE Conference, August 2-4, 2010, University of Idaho, Moscow, ID. *Regional.*

The role of oncostatin M (OSM) in osteoclast differentiation and activity in an in vitro model of breast cancer metastasis to bone. (*Oral Presentation*) Celeste Bolin 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.*

Synergistic Role of Oncostatin M and IL-1B in an Arthritic Induced Cell Culture Model System. Liliana Mellor, Julie Oxford, and Cheryl L. Jorcyk. Orthopaedic Research Society (ORS) Annual Conference, January 13th-16th, 2011, Long Beach, CA. *International.*

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.*

The effect of oncostatin M (OSM) on regulating RAB11a and TEF-1 gene expression in human breast cancer. Nicole Ankenbrandt and Cheryl Jorcyk. Idaho Academy of Sciences Annual Conference, Boise, ID, March 31st –April 1st, 2011. *Regional.*

Models for evaluating mechanisms of breast cancer metastasis to bone regulated by Oncostatin M (OSM). Celeste Bolin, Ken Tawara, Caleb Sutherland, Robin Anderson, and Cheryl L. Jorcyk. (*Oral Presentation*) Idaho Academy of Sciences Annual Conference, Boise, ID, March 31st –April 1st, 2011. *Regional.*

DNA reaction networks operated in serum and blood for cancer detection. Elton Graugnard, Amber Cox, Jessica Minick, Jeunghoon Lee, Cheryl Jorcyk, Bernard Yurke, and William L. Hughes. (*Oral Presentation*) Idaho Academy of Sciences Annual Conference, Boise, ID, March 31st –April 1st, 2011. *Regional.*

Quantitative analysis of mammary carcinoma cell metastasis to bone. Jim Moselhy, Ken Tawara, Jeff Redshaw, Celeste Bolin, Robin Anderson, and Cheryl L. Jorcyk. Idaho Academy of Sciences Annual Conference, Boise, ID, March 31st –April 1st, 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. Idaho Academy of Sciences Annual Conference, Boise, ID, March 31st –April 1st, 2011. *Regional.*

Mechanisms of oncostatin M (OSM)-mediated breast cancer metastasis to bone: evidence for a role in osteoclastogenesis. Celeste Bolin, Ken Tawara, Caleb Sutherland, Robin Anderson, and Cheryl Jorcyk. 102nd American Association for Cancer Research (AACR), Orlando, FL, April 2nd – 6th, 2011. *National.*

Molecular mechanisms of OSM-induced VEGF in Breast cancer. Madhuri Nandakumar, Ryan Fox, and Cheryl Jorcyk. 102nd American Association for Cancer Research (AACR), Orlando, FL, April 2nd – 6th, 2011. *National.*

The effect of oncostatin M (OSM) on regulating RAB11a and TEF-1 gene expression in human breast cancer. Nicole Ankenbrandt and Cheryl Jorcyk. 8thAnnual Boise State University Undergraduate Research Conference, Boise State University, Boise, ID, April 11th, 2011. *Regional.*

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

Operation of a DNA-based nanomachine in human blood. Jessica Minick, Elton Graugnard, Jeunghoon Lee, Cheryl L. Jorcyk, Bernard Yurke1, and William L. Hughes. IEEE Nano 2011 Conference, Portland, OR. August 15th-19th, 2011. *International*.

Novel mouse mammary cell lines for *in vivo* bioluminescence imaging (BLI) of bone metastasis. Celeste Bolin, Caleb Sutherland, Ken Tawara, Jim Moselhy, Robin Anderson, and Cheryl L. Jorcyk. (Oral Presentation) International Bone and Mineral Society Workshop (IBMS), Sun Valley, ID. July 30th - August 3rd, 2011. *International.*

The role of oncostatin M (OSM) in regulating osteogenesis in vitro. Maryam Sabetian, Jake Goyden, Celeste Bolin, and Cheryl L. Jorcyk. 8th Annual INBRE Conference, August 1-3, 2011, University of Idaho, Moscow, ID. *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.*

Cross-talk between bone metastatic mammary tumor cells and bone microenvironment. Celeste Bolin and Cheryl L. Jorcyk. (Oral Presentation) 8th Annual INBRE Conference, August 1-3, 2011, University of Idaho, Moscow, ID. *Regional.*

Synthetic DNA Reactions for Low-cost Diagnosis of Cancer. Elton Graugnard, Jessica Minick, Natalya Hallstrom, Jeunghoon Lee, Cheryl Jorcyk, Bernard Yurke, and William L. Hughes. NIH-Frederick Cancer Detection and Diagnostics Technologies for Global Health Conference, August 22nd-23rd, 2011, Frederick, MD. *National.*

The novel role of oncostatin M and IL-1b in articular Cartilage Degradation. Liliana Mellor, Cheryl L. Jorcyk, and Julie Oxford. American Society for Bone and Mineral Research (ASBMR) Annual Conference, September 16-20th, 2011, San Diego, CA. *International.*

A novel potential target for inhibiting breast cancer metastasis to bone. Cheryl L. Jorcyk, Henry & Elsa Jiler American Cancer Society Professors Meeting, October 30th to November 2nd, 2011, Brazelton, GA. *National.*

An important role for the IL-6 cytokine oncostatin M in breast cancer metastasis to bone. Celeste Bolin, Ken Tawara, Jeff Redshaw, Caleb Sutherland, Joel Garbow, Robin Anderson, and Cheryl Jorcyk. International Bone and Mineral Society Cancer-Induced Bone Disease Conference, November 30th to December 3rd, 2011, Chicago, IL. *International.*

Extracellular matrix regulates bioavailability of proinflammatory cytokines influencing bone formation. J. R. T. Oxford, R. Ryan, L. Mellor, C. J. Jorcyk, T. T. Rohn, K. A. Mitchell. NASA Human Research Program Investigators' Workshop,
February 16, 2012. Houston, TX. *National.*

Synergistic role of oncostatin M and IL-1beta in an arthritic-induced cell culture model system. Liliana Mellor, Julie Oxford, and Cheryl L Jorcyk. Orthopedic Research Society, San Francisco, CA, February 1, 2012. *International.*

Do human Multiple Myeloma cells express OSM? Danielle Hedeen and Cheryl L. Jorcyk, Boise State University Undergraduate Research Conference, April 16, 2012. *Regional.*

Discovering novel anti-bacterial/anti-parasite/anti-cancer/carbonyl reductase cardiotoxicity therapeutics. Matthew Caylor, Daniela Olivas, Kate Jette, Andy Coombs, Ashley Magin, Kenneth Cornel, Henry A. Charlier, Cheryl L. Jorcyk, Rajesh Nagarajan, and Dong Xu, Boise State University Undergraduate Research Conference, April 16, 2012. *Regional.*

Does oncostatin M induce morphological changes in human breast cancer cells? Nicole Ankenbrandt, Hunter Covert, and Cheryl L. Jorcyk, Boise State University Undergraduate Research Conference, April 16, 2012. *Regional.*

Novel mouse mammary cell lines for in vivo bioluminescence imaging (BLI) of bone metastasis. Celeste Bolin, Caleb Sutherland, Ken Tawara, Jim Moselhy, and Cheryl L. Jorcyk, Boise VA Medical Center Research Building Grand Opening, April 27, 2012. *Regional.*

The inflammatory cytokine oncostatin M promotes mammary tumor metastasis to bone and osteolytic bone degradation. Celeste Bolin, Ken Tawara, Caleb Sutherland, Jeff Redshaw, Patrick Aranda, Jim Moselhy, Robin Anderson, and Cheryl L. Jorcyk, Keystone Symposium on Inflammation and Cancer, Dublin, Ireland, May 20, 2012. *International.*

Characterization of lung metastasis in an inflammatory cytokine model of breast cancer. (Oral Presentation). Celeste Bolin, Joel Garbow, Ken Tawara, Jeff Redshaw, Robin Anderson, and Cheryl Jorcyk. AAAS Pacific Division Annual Conference, June 24, 2012. *Regional.*

A role for inflammatory cytokines in breast cancer EMT (Oral Presentation). Hunter Covert, Nicole Ankenbrandt, Randy Ryan and Cheryl Jorcyk. AAAS Pacific Division Annual Conference, June 24, 2012. *Regional.*

Interactions of osteoblasts, inflammation, and the extracellular matrix in simulated free fall (Oral Presentation). Jake Goyden, Benjamin Davis, Julia Oxford, and Cheryl Jorcyk. AAAS Pacific Division Annual Conference, June 24, 2012. *Regional.*

Quantitative evaluation of the inductive effects of OSM-signaling on breast cancer metastasis to bone. (Oral Presentation). Jim Moselhy, Ken Tawara, Jeff Redshaw, Celeste Bolin, Robin Anderson, and Cheryl Jorcyk. AAAS Pacific Division Annual Conference, June 24, 2012. *Regional.*

A molecular mechanism for metastatic breast cancer-mediated bone destruction.. (Oral Presentation). Ken Tawara and Cheryl L. Jorcyk. AAAS Pacific Division Annual Conference, June 24, 2012. *Regional.*

Oncostatin M interacts with ECM components: implications for chronic inflammation and tumor metastasis (Oral Presentation). Randall Ryan, Bryan Martin, Liliana Mellor, Owen McDougal, Reed Jacob, Julia Oxford, and Cheryl L. Jorcyk. AAAS Pacific Division Annual Conference, June 24, 2012. *Regional.*

Do human multiple myeloma cells express OSM and inflammatory cytokines. Danielle Hedeen, Dollie LaJoie, and Cheryl L. Jorcyk. AAAS Pacific Division Annual Conference, June 24, 2012. *Regional.*

Tetracycline-inducible overexpression of human oncostatin M in breast cancer. Dollie LaJoie and Cheryl L. Jorcyk. AAAS Pacific Division Annual Conference, June 24, 2012. *Regional.*

In vitro investigation of cytokine-induced osteoclastogenesis by mammary tumor cells. Erik Stoll, Celeste Bolin, and Cheryl L. Jorcyk. AAAS Pacific Division Annual Conference, June 24, 2012. *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.*

Does oncostatin M induce morphological changes in human breast cancer cells? Nicole Ankenbrandt, Hunter Covert, and Cheryl L. Jorcyk. AAAS Pacific Division Annual Conference, June 24, 2012. *Regional.*

Inflammatory cytokines and drug resistance in breast cancer. Jamie Hicks, Cheryl L. Jorcyk, and Randall Ryan. Boise State University Summer Undergraduate Research Conference, July 27, 2012. *Regional.*

Human multiple myeloma cells and inflammatory cytokines. Danielle Hedeen and Cheryl L. Jorcyk. Annual Idaho INBRE Conference, August 6, 2012. *Regional.*

Inflammatory cytokines and drug resistance in breast cancer. Jamie Hicks, Cheryl L. Jorcyk, and Randall Ryan. Annual Idaho INBRE Conference, August 6, 2012. *Regional.*

Potential effects on breast cancer metastasis. Arn Allemand, Dallas Trople, Julia Oxford, and Cheryl L. Jorcyk, Murdock Charitable Trust Partners in Science Conference, Vancouver, WA, August 9, 2012. *National.*

Extracellular matrix protein binding to inflammatory cytokines: potential regulation of cancer metastasis. Dallas Trople, Arn Allemand, Julia Oxford, and Cheryl L. Jorcyk. Murdock Charitable Trust Partners in Science Conference, Vancouver, WA, August 9, 2012. *National.*

The inflammatory cytokine oncostatin M is a potent inducer of mammary tumor metastasis. Celeste Bolin, Ken Tawara, Jim Moselhy, Joel Garbow, Robin Anderson, and Cheryl L. Jorcyk, Metastasis Research Society Conference, Brisbane, Australia, September 9, 2012. *International.*

OSM-induced cathepsin D in breast cancer invasion and metastasis. Jordan B. Koncinsky, Randall Ryan, and Cheryl L. Jorcyk. AACR Special Conference on Tumor Invasion and Metastasis, San Diego, CA, January 20, 2013. *International.*

Evidence for the inflammatory cytokine oncostatin M promoting breast cancer metastasis to bone. Celeste Bolin, Ken Tawara, Jim Moselhy, Joel Garbow, Robin Anderson, and Cheryl L. Jorcyk. St. Luke's Regional Medical Center 1st Annual Research Symposium, Boise, ID, February 1, 2013. *Regional.*

The role of inflammatory cytokines in prostate cancer. Robert Navert, Danielle Hedeen, Erik Stoll, Randy E. Ryan, Stevan Pekovich, and Cheryl L. Jorcyk. Idaho Academy of Sciences Annual Conference, Pocatello, ID, March 21, 2013. *Regional.*

Oncostatin M is a proinflammatory cytokine capable of exerting long term biological effects via its binding to ECM components in a bioactive conformation. Randall Ryan, Bryan Martin, Liliana Mellor, Owen McDougal, Julia Oxford and Cheryl L. Jorcyk. AACR Annual Meeting, Washington DC, April 6, 2013. *International.*

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.*

The role of inflammatory cytokines in metastatic prostate cancer. Robert Navert, Danielle Hedeen, Erik Stoll, Randall E. Ryan, and Cheryl L. Jorcyk. Annual Undergraduate Research Conference, Boise State University, April 15, 2013. *Regional.*

Development of Novel Small Molecule Inhibitors of Cytokine Signaling. (Oral Presentation). Jim Moselhy and Cheryl L. Jorcyk. AAAS Pacific Division Annual Conference, Las Vegas, NV, June 18, 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.*

The role of inflammatory cytokines in metastatic prostate cancer. Robert Navert, Danielle Hedeen, Erik Stoll, Randall E. Ryan, and Cheryl L. Jorcyk. Boise State University Undergraduate Student Summer Research Conference, Boise, ID, August 2, 2013. *Regional.*

The *in vitro* characterization of the metastatic potential of mouse mammary tumor cells with reduced oncostatin M receptor expression. Iva Stojkovska, Celeste Bolin, and Cheryl L. Jorcyk. INBRE Annual Conference, Moscow, ID, August 5, 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,*

BMC Cancer, Clinical and Experimental Metastasis, the *International Journal of Biochemistry and Cell Biology,* the *American Journal of Pathology, Cytokine, Experimental Cell Research, the Archives of Biochemistry and Biophysics, Clinical and Experimental Metastasis, and FEBS.*

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

Member, Southern Idaho Science Collaborative (SISC). Nampa, ID, 1999-2005.

Community Scientist, Vallivue School District Hands-On Science Reform Program. Spring 2003.

Participant, St. Luke's Regional Medical Center's Mountain States Tumor Institute (MSTI) oncology seminar/dinner presentations, 2003-present.

Member, Washington State University Cancer Prevention and Research Center (CPRC) Conference Committee. Washington State University, Pullman, WA. Spring 2004.

Member, Discovery Center of Idaho (DCI) Education Committee. Boise, ID, 2004-2007.

Affiliate Member, BioIdaho. Boise, ID 2004-2007.

Member, BioIdaho Planning Committee, Hosted first BioBreak event at the Idaho State Laboratories, Boise, ID, 2004 the BioIdaho Legislature Dinner, Boise, ID, 2005, and the BioIdaho Legislative Luncheon, Boise, ID, 2007.

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

Member, Idaho Comprehensive Cancer Collaborative (ICCC) Cancer Prevention Subcommittee. Boise, ID, 2005-present.

CDC Grant participant, Idaho Comprehensive Cancer Collaborative (ICCC). Boise, ID. 2005.

Vice-President, Sigma Xi Honorary Science Society. Boise State University Chapter, 2005-2006.

Lobbyist, National Cancer Institute, NIH. Lobbied for cancer funding to Idaho Senators and Congressmen on Capital Hill, Washington DC, 2006.

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

President, Sigma Xi Honorary Research Society Chapter. Boise State University, Boise, ID, 2007-2008.

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.

Vice-President, Sigma Xi Honorary Science Society. Boise State University Chapter, 2005-2006.

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

President, Sigma Xi Honorary Research Society Chapter. Boise State University, Boise, ID, 2007-2008.

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):

Friendly Consultant, Canyon County Public Defender's Office (for Alexander B. Biggs, Attorney at Law), Boise, ID, 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.

Judge, Invent Idaho, Discovery Center, Boise, ID, 2004-2006.

Participant, Idaho State Legislative Luncheon, Boise, ID, January 14th, 2004.

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.

News Stories, CBS Channel 2, ABC Channel 6, Fox Channel 12, *The Idaho Statesman*, Boise State University *Focus Magazine*, and BioIdaho Magazine, 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, American Cancer Society, Boise, ID, 2008.

Meetings, St. Luke's Regional Medical Center and St. Alphonsus Regional Medical Center Meeting, Boise, ID 2008-present.

SUMMARY PROPOSAL BUDGET

Name of Institution: Boise State University

Name of Project Director: Dr. Cheryl Jorcyk

A. PERSONNEL COST (Faculty, Staff, Visiting Professors, Post-Doctoral Associates, Graduate/Undergraduate Students, Other)

Name/ Title	Salary/Rate of Pay	Fringe	Dollar Amount Requested
Dr. Cheryl Jorcyk, Professor, 1 month	$86,500 for 9 mos.	33%	$12,783
Graduate Research Assistant, Spring 2015 stipend	$10,000 for 5 mos.	4% academic year	$10,400
Graduate Research Assistant, Summer stipend	$5,000 for 3 mos.	10% summer	$5,500
Undergraduate Research Assistant, Summer, approximately 435 hours	$11-$12/hour for 3 mos.	10% summer	$5,500

% OF TOTAL BUDGET:	68%	SUBTOTAL:	$34,183

B. EQUIPMENT: (List each item with a cost in excess of $1000.00.)

Item/Description	Dollar Amount Requested
SUBTOTAL:	$0

G. 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:

	Dollar Amount Requested
1. Stipends	
4. Other	
SUBTOTAL:	$0

I. Other Direct Costs:

Dollar Amount Requested

1. Materials and Supplies	$8,150
2. Publication Costs/Page Charges	
3. Consultant Services (Include Travel Expenses)	$1,000
4. Computer Services	
5. Subcontracts	
6. Other (specify nature & breakdown if over $1000) Graduate Student Fee Remission; 50% of full tuition (Spring 2015)	$5,167
SUBTOTAL:	$14,317
J. Total Costs: (Add subtotals, sections A through I) **TOTAL:**	$50,000
K. Amount Requested: **TOTAL:**	$50,000
Project Director's Signature:	Date: 6/12/14

INSTITUTIONAL AND OTHER SECTOR SUPPORT
(add additional pages as necessary)

A. INSTITUTIONAL / OTHER SECTOR DOLLARS	
Source / Description	Amount

B. FACULTY / STAFF POSITIONS
Description

C. CAPITAL EQUIPMENT
Description

D. FACILITIES & INSTRUMENTATION (Description)
Fully equipped laboratories (see Appendix 1)