BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: **SUH, Nanjoo**

eRA COMMONS USER NAME: **nansuh**

POSITION TITLE: **Professor** of Chemical Biology, Ernest Mario School of Pharmacy, Rutgers University, NJ

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Ewha Woman's University, Seoul, Korea	B.S.	02/1987	Pharmacy
Seoul National University, Seoul, Korea	M.S.	02/1990	Pharmaceutical Sciences
University of Illinois at Chicago, Chicago, IL	Ph.D.	06/1995	Pharmacognosy
Dartmouth Medical School, Hanover, NH	Postdoctoral	08/1998	Pharmacology

A. Personal Statement

In this new R03 small project, I am interested in understanding the effects and mechanisms how widespread environmental factors or contaminants, such as endocrine disruptors, may contribute to promoting breast cancer development via targeting cancer stem cells and tumor metabolism signaling pathways. This is a new and exciting area for me since I have not worked with any environmental contaminants. As my major research interest focuses on how to prevent breast cancer, I have recently worked on estrogen-mediated mammary cancer models and found cancer stem cells possibly playing a key role in estrogen receptor (ER)-positive breast cancer development and progression. **This prompted me to ask questions whether endocrine disrupting chemicals may accelerate breast cancer development by a novel mechanism involving cancer stem cells and further altering cell metabolism.** As an introduction for my research experience, I have been interested in drug discovery and development with natural and synthetic agents for treatment and prevention of cancer. I have placed special importance on conducting cancer prevention studies with various components from natural/dietary sources as well as with synthetic compounds. As an independent faculty at Rutgers University since 2003, I have been continuously conducting preclinical cancer prevention program with naturally occurring and synthetic triterpenoids (CDDO, CDDO-Me, CDDO-Im and CDDO-EA, one of them is currently under clinical trials phase 3), vitamin D analogs, tocopherols and tocotrienols (vitamin E), NSAIDs (Aspirin and Sulindac), statins (Lipitor), COX-2 inhibitors, and stilbenoids (pterostilbene and resveratrol). My overall research goal has been to identify, characterize and develop novel therapeutic agents and to understand molecular mechanisms of action of drugs in the prevention and treatment of cancer. **In this new R03 project, I am excited to study how endocrine disruptors may contribute to promoting breast cancer development**. I will use cell culture and animal models of hormone dependent breast cancer and investigate these chemicals in controlling cancer stem cells and key transcription factors. This project may provide new important information how chronic exposure to widespread environmental contaminants could accelerate breast cancer development. The knowledge to be gained in this study will help to understand the role of environmental chemicals and to establish guidelines to improve human health. I have the expertise, leadership, training, expertise, and motivation necessary to successfully carry out the proposed research project.

Ongoing and recently completed projects that I would like to highlight include:

NIEHS/CEED Pilot Grant **Suh (PI)** **06/09/2020-03/31/2021**
Title: "Targeting bisphenol A link to cancer stem cells and intervention with tocopherols/tocotrienols in breast cancer"
This proposal is to investigate a new mechanism of an endocrine disruptor, bisphenol A in cancer stem cells in breast cancer and intervention with tocopherols and tocotrienols.

NIH/NCI 1 R03 CA259650-01A1 Suh (PI) 04/01/2022-03/31/2024
Title: "A novel strategy targeting TP63 for breast cancer prevention"
This application is to study the role of a key transcription factor TP63 in reprogramming cancer stem cells and to identify effective agents for cancer prevention.

Busch Biomedical Grant Suh (PI) 10/15/2018 – 10/14/2020 (NCE 10/14/2021)
Title: "Targeting cancer stem cells for breast cancer prevention"
This proposal is to investigate role of cancer stem cells in breast tumor progression and potential intervention with cancer stem cell targeting agents, vitamin D and Gemini compounds.

New Jersey Health Foundation Suh (PI) 02/17/2020 – 02/16/2021 (NCE 02/16/2022)
Title: "Reprogramming cancer stem cells in breast cancer"
This proposal is to investigate key transcription factors, Oct4 and TP63, in reprogramming cancer stem cells in breast cancer self-renewal and differentiation.

Citations:

a. Lee, H.J., Paul, S., Atalla, N., Thomas, P.E., Lin, J., Yang, I., Buckley, B.T., Lu, G., Zheng, X., Lou, Y.-R., Conney, A. H., Maehr, H., Adorini, L., Uskokovic, M., and **Suh, N**., Gemini vitamin D analogs inhibit estrogen receptor positive and estrogen receptor negative mammary tumorigenesis without hypercalcemic toxicity, *Cancer Prev. Res.,* **1**: 476-484, 2008. [PMCID: PMC2753526]
b. Shan, N., Minden, A., Furmanski, P., Bak, M., Cai, L., Wernyi, R., Sargsyan, D., Cheng, D., Wu, R., Kuo, H.C.D., Li, S.N., Fang, M., Maehr, H., Kong, A.N., and **Suh, N**., Analysis of the transcriptome: Regulation of cancer stemness in breast ductal carcinoma in situ by vitamin D compounds, *Cancer Prev. Res*., **13**: 673-686, 2020. [PMCID: PMC7415686]
c. Shan, N. L., Shin, Y., Yang, G., Furmanski, P., and Suh, N., Breast cancer stem cells: A review of their characteristics and the agents that affect them: In perspective, *Molecular Carcinogenesis*, **60**: 73-100, 2021 [PMCID: PMC7855917]

B. Positions, Scientific Appointments, and Honors

Positions and Employment

2014-present Professor, Dept. Chemical Biology, Ernest Mario School of Pharmacy, Rutgers University, NJ
2009-2014 Associate Professor, Dept. Chemical Biology, Ernest Mario School of Pharmacy, Rutgers, NJ
2003-2009 Assistant Professor, Dept. Chemical Biology, Ernest Mario School of Pharmacy, Rutgers, NJ
1999-2003 Research Asst. Professor, Dept. Pharmacology, Dartmouth Medical School, Hanover, NH
1998-1999 Research Asst. Professor, Dept. Pathology, Dartmouth Medical School, Hanover, NH
1995-1998 Research Associate, Dept. Pharmacology/Toxicology, Dartmouth Medical School, Hanover, NH

Graduate Programs and Cancer Institute Membership:

2010-present Graduate Faculty of Nutritional Sciences Graduate Program, Rutgers University
2008-present Graduate Faculty of Cellular and Molecular Pharmacology, Rutgers University
2003-present Member, The Cancer Institute of New Jersey
2003-present Graduate Faculty of Biochemistry, Rutgers University
2003-present Graduate Faculty of Microbiology and Molecular Genetics, Rutgers University
2003-present Graduate Faculty of Cell and Developmental Biology, Rutgers University
2003-present Graduate Faculty of Food Science, Rutgers University
2003-present Graduate Faculty of Toxicology, Rutgers University
2003-present Graduate Faculty of Pharmaceutical Sciences, Rutgers University

Other Experience and Selected Professional Memberships/Service

2021 NIH/NCI ZCA1 SRB-A (O2): NCI Clinical and Translational Exploratory/Developmental Studies
2021 Congressionally Directed Medical Research Programs (CDMRP), Breast Cancer Research Program, BCRP Breakthrough Award Reviewer
2020 NIH/NCI ZCA1 TCRB-V (M1) S SEP-4: NCI Clinical and Translational R21 and Omnibus R03
2020 Congressionally Directed Medical Research Programs (CDMRP), Breast Cancer Research Program, BCRP Breakthrough Award Reviewer

2019 Regular member, NIH/NCI CPSS Cancer prevention study section
2019 Congressionally Directed Medical Research Programs (CDMRP), Breast Cancer Research Program, BCRP Breakthrough Award Reviewer
2013-2018 Regular member, NIH/NCI CDP chemodietary prevention study section (CPSS)
2018 Congressionally Directed Medical Research Programs (CDMRP), Breast Cancer Research Program, BCRP Breakthrough Award Reviewer
2017 Congressionally Directed Medical Research Programs (CDMRP), Breast Cancer Research Program, BCRP Breakthrough Award Reviewer
2016 Congressionally Directed Medical Research Programs (CDMRP), Breast Cancer Research Program, BCRP Breakthrough Award Reviewer
2015-present Editorial board member for *Cancer Prevention Research*
2015 Congressionally Directed Medical Research Programs (CDMRP), Breast Cancer Research Program, BCRP Breakthrough Award Reviewer
2014 Congressionally Directed Medical Research Programs (CDMRP), Breast Cancer Research Program, BCRP Breakthrough Award Reviewer
2013 NIH/NCI ZRG1 OTC-K (03) M Dietary Chemoprevention, SEP reviewer
2013 NIH/NCI ZAT1 SM29 "Mechanistic Research on CAM Natural Products" reviewer
2012 Congressionally Directed Medical Research Programs (CDMRP), Breast Cancer Research Program, BCRP Idea Award Reviewer
2011-present Associate Editor for *Molecular Carcinogenesis*
2011 *Ad Hoc* Reviewer, NIH/NCI CDP chemodietary prevention study section
2011-present Review editorial board for *Frontiers in Molecular and Cellular Oncology*
2011-present Editorial board member for *Combinatorial Chemistry & High Throughput Screening*
2010 Reviewer, Italian Ministry of Health, "Young Italian Researchers Call"
2010-2012 Editorial board member for *Carcinogenesis*
2009 Reviewer for Post-doctoral Research Fellowships, Health Research Board, Ireland
2009 *Ad Hoc* Reviewer, NIH/NCI CDP chemodietary prevention study section
2008 Guest Editor for Special Issue in *Molecular Nutrition and Food Research*
2006-present *Ad Hoc* Reviewer, Congressionally Directed Medical Research Programs (CDMRP), Breast Cancer Research Program
1998-present Active Member of American Society for Pharmacognosy
1998-present Associate Member of American Society of Biochemistry and Molecular Biology
1997-present Active Member of American Association for Cancer Research

Honors and Awards

2018 Dartmouth Technology Transfer Innovation and Commercialization Award
2017 Rutgers Patent Award
2009 The Board of Trustees Fellowship for Scholarly Excellence, Rutgers
2003-2006 Career Development Award, NIH/NCI
1997 AACR Young Investigator Award
1994 Member of the Rho Chi Pharmacy Honor Society

Serving as a Reviewer For Scientific Journals:

Acta Pharmacologica Sinica, Biochemical Pharmacology, Cancer Biomarkers, Cancer Epidemiology, Cancer Letters, Cancer Prevention Research, Cancer Research, Cancer Chemotherapy and Pharmacology, Carcinogenesis, Cell Biology and Toxicology, Clinical Cancer Research, European Journal of Cancer, European Journal of Pharmacology, Food and Chemical Toxicology, Inflammatory Bowel Diseases, Journal of National Cancer Institute, Journal of Natural Products, Journal of Steroid Biochemistry and Molecular Biology, Molecular Cancer, Molecular Cancer Research, Molecular Cancer Therapeutics, Molecular Carcinogenesis, Molecular and Cellular Biochemistry, Molecular Nutrition and Food Research, Nutrition and Cancer, Oncotarget, Pharmaceutical Research, Plant Foods for Human Nutrition, Planta Medica, PLoS One, Pulmonary Pharmacology and Therapeutics, Tumor biology

C. Contribution to Science

1. Development of synthetic triterpenoids for chronic disease prevention: My original contribution in drug discovery and development of natural and synthetic triterpenoids for use as anti-inflammation and prevention and treatment of chronic diseases is significant. Based on my contribution, synthetic triterpenoids are now recognized as potent anti-inflammation modulators (AIMs) and being developed for numerous chronic degenerative and inflammation related diseases.*

a. **Suh, N**., Honda, T., Finlay, H.J., Barchowsky, A., Williams, C., Benoit, N.E., Xie, Q.W., Nathan, C., Gribble, G.W. and Sporn, M.B. Novel triterpenoids suppress inducible nitric oxide synthase (iNOS) and inducible cyclooxygenase (COX-2) in mouse macrophages, *Cancer Res,* **58**, 717-723, 1998.
b. **Suh, N**., Wang, Y., Honda, T., Gribble, G.W., Dmitrovsky, E., Hickey, W.F., Maue, R.A., Place, A.E., Porter, D.M., Spinella, M.J., Williams, C.R., Wu, G., Dannenberg, A.J., Flanders, K.C., Letterio, J.J., Mangelsdorf, D.J., Nguyen, L., Porter, W.W., Ren, R.F., Roberts, A.B., Roche, N.S., Subbaramaiah, K., and Sporn, M.B. A novel synthetic oleanane triterpenoid, 2-cyano-3,12-dioxoolean-1,9-dien-28-oic acid (CDDO), with potent differentiating, anti-proliferative, and anti-inflammatory activity, *Cancer Res,*. **59**: 336-341, 1999.
c. Dinkova-Kostova, A., Liby, K.T., Stephenson, K.K., Holtzclaw, W.D., Gao, X., **Suh, N**., Williams, C., Risingsong, R., Honda, T., Gribble, G.W., Sporn, M.B., and Talalay, P., Extremely potent triterpenoid inducers of the phase 2 response: correlations of protection against oxidant and inflammatory stress, *Proc. Natl. Acad. Sci.,* **102**: 4584-4589, 2005.
d. So, J.Y., Lin, J.J., Wahler, J., Liby, K.T., Sporn, M. B., and **Suh, N**., A synthetic triterpenoid CDDO-Im inhibits tumorsphere formation by regulating stem cell signaling pathways in triple-negative breast cancer, *PLoS One*, **9**:e107616, 2014. [PMCID: PMC4167992]

*Since 2001 to present, I have received 12 US patents and 3 international patents related to the work from triterpenoid drug discovery. These synthetic triterpenoids are currently being evaluated under clinical trials for treatment of multiple chronic diseases including chronic kidney diseases and Alport syndrome.

2. Development of vitamin D super-agonists for cancer prevention: My work has demonstrated the chemopreventive role of vitamin D and related compounds in estrogen receptor positive breast cancer as well as for Her-2 driven breast carcinogenesis, which provide the platform of new drug development with vitamin D superagonists.

a. Lee, H.J., Paul, S., Atalla, N., Thomas, P.E., Lin, J., Yang, I., Buckley, B.T., Lu, G., Zheng, X., Lou, Y.-R., Conney, A. H., Maehr, H., Adorini, L., Uskokovic, M., and **Suh, N**., Gemini vitamin D analogs inhibit estrogen receptor positive and estrogen receptor negative mammary tumorigenesis without hypercalcemic toxicity, *Cancer Prev. Res.,* **1**: 476-484, 2008. [PMCID: PMC2753526]
b. So, J.Y., Wahler, J., Yoon, T., Smolarek, A. K., Lin, Y., Shih, W.J., Maehr, H., Uskokovic, M., Liby, K., T., Sporn, M.B., and **Suh, N**., Oral administration of a Gemini vitamin D analog, a triterpenoid and the combination prevents mammary tumorigenesis driven by ErbB2 overexpression, *Cancer Prev. Res*., **6**: 959-970, 2013. [PMCID: PMC3767182].
c. Wahler, J., So, J.Y., Kim, Y.C., Liu, F., Maehr, H., Uskokovic, M., and **Suh, N**., Inhibition of the transition of ductal carcinoma in situ to invasive ductal carcinoma by a Gemini vitamin D analog. *Cancer Prev. Res*., **7**: 617-626, 2014. [PMCID: PMC4047145].
d. Shan, N., Minden, A., Furmanski, P., Bak, M., Cai, L., Wernyi, R., Sargsyan, D., Cheng, D., Wu, R., Kuo, H.C.D., Li, S.N., Fang, M., Maehr, H., Kong, A.N., and **Suh, N**., Analysis of the transcriptome: Regulation of cancer stemness in breast ductal carcinoma in situ by vitamin D compounds, *Cancer Prev. Res*., **13**: 673-686, 2020. [PMCID: PMC7415686]

3. Targeting cancer stem cells for cancer prevention: Understanding the role of cancer stem cells in cancer prevention is important as a new strategy. My laboratory has been investigating effects and mechanisms of action of chemopreventive agents, such as vitamin D compounds, triterpenoids and stilbenoids, in cancer prevention with a mechanistic focus on targeting cancer stem cells.

a. So, J.Y., Lee, H.J., Smolarek, A.K., Paul, S., Wang, C.X., Maehr, H., Uskokovic, M., Zheng, X., Conney, A.H., Cai, L., Liu, F., and **Suh, N**., A novel Gemini vitamin D represses the expression of a stem cell marker CD44 in breast cancer, *Mol. Pharmacol.,* **79**: 360-367, 2011. [PMCID: PMC3061370]

b. So, J.Y., Smolarek, A. K., Maehr, H., Uskokovic, M., Liu, F., and **Suh, N**., Repression of CD44 is a key molecular effect of the novel Gemini vitamin D analog BXL0124 that leads to inhibition of breast cancer cell invasion, *PLoS One*, **8**: e54020, 2013. [PMCID: PMC3543376]
c. Wahler, J., So, J.Y., Cheng, L.C., Maehr, H., Uskokovic, M., and **Suh, N**. Vitamin D compounds reduce mammosphere formation and decrease expression of putative stem cell markers in breast cancer, *J. Steroid. Biochem. Mol. Biol.* **148**: 148-155, 2015. [PMCID: PMC4361333]
d. So, J.Y., Wahler, J., Das Gupta, S., Salerno, D.M., Maehr, H., Uskokovic, M., and **Suh, N**., HES1-mediated inhibition of Notch1 signaling by a Gemini vitamin D analog leads to decreased $CD44^{+}/CD24^{-/low}$ tumor-initiating subpopulation in basal-like breast cancer, *J. Steroid. Biochem. Mol. Biol,*, **148**: 111-121, 2015. [PMCID: PMC4361253]

4. Anti-inflammatory agents for colon cancer prevention: I have been interested in use of anti-inflammatory agents alone or in combination to prevent colon cancer. We have investigated blueberry stilbenes, non-steroid anti-inflammatory drugs (NSAIDs) and statins for the prevention of colon carcinogenesis. My work is significant in contributing to the basis of potential translational work in colon cancer prevention with anti-inflammatory agents*.

a. **Suh, N**., Paul, S., Hao X., Simi, B., Xiao, H., Rimando, A.M., and Reddy, B.S., Pterostilbene, an active constituent of blueberries, suppresses aberrant crypt foci formation in the azoxymethane-induced colon carcinogenesis model in rats, *Clin. Cancer Res*, **13**: 350-355, 2007.
b. Paul, S., Rimando, A.M., Lee, H.J., Ji, Y., Reddy, B.S., and **Suh, N**., Anti-inflammatory action of pterostilbene is mediated through the p38 mitogen-activated protein kinase pathway in colon cancer cells, *Cancer Prev. Res.,* **2**: 650-657, 2009. [PMCID: PMC2753521]
c. Paul, S., DeCastro, A., Lee, H.J., Smolarek, A.K., So, J.Y., Simi, B., Wang, C.X., Zhou, R., Rimando, A.M., and **Suh, N**., Dietary intake of pterostilbene, a constituent of blueberries, inhibits the β-catenin/p65 downstream signaling pathway and colon carcinogenesis in rats, *Carcinogenesis*, **31**: 1272-1278, 2010. [PMCID: PMC2899944]
d. **Suh, N**., Reddy, B.S., DeCastro, A., Paul, S., Lee, H.J., Smolarek, A.K., So, J.Y., Simi, B., Wang, C.X., Janakiram, N.B., Steele, V. and Rao, C.V., Combination of atorvastatin with sulindac or naproxen profoundly inhibits colonic adenocarcinomas by suppressing the p65/β-catenin/cyclin D1 signaling pathway in rats, *Cancer Prev. Res.,* **4**: 1895-1902, 2011. [PMCID: PMC3208056]

**Based on the above colon cancer prevention studies with stilbenoids, I have received U.S. Patent "Prevention and Treatment of Colon Cancer" (US 8,426,369), April 23, 2013.*

5. Development of gamma tocopherol as chemopreventive agents in estrogen-induced mammary tumorigenesis: My research on natural dietary tocopherols for breast cancer prevention has contributed to better understanding of different effectiveness of each form of tocopherols in several subtypes of breast cancer. Our study demonstrated gamma-tocopherol to be a safe and effective agent in estrogen-mediated breast cancer.

a. Lee, H.J., Ju, J., Paul, S., So, J.Y., DeCastro, A., Smolarek, A.K., Lee, M.-J., Yang, C.S., Newmark, H.L., and **Suh, N**., Mixed tocopherols prevent mammary tumorigenesis by inhibiting estrogen action and activating PPAR-γ, *Clin. Can. Res.,* **15:** 4242-4249, 2009.
b. Das Gupta, S., Sae-tan, S., Wahler, J., So, J., Cheng, L.C., Bak, M., Lee, M-J., Lin, Y., Shih, W., Shull, J., Safe, S., Yang, C.S., and **Suh. N**., Dietary γ-Tocopherol Rich Mixture Inhibits Estrogen-Induced Mammary Tumorigenesis by Modulating Estrogen Metabolism, Antioxidant Response and PPARγ, *Cancer Prev. Res*., **8**: 807-816, 2015. [PMCID: PMC4560648].
c. Bak, M.J., Furmanski, P., Shan, N. L., Lee, H.J., Bao, C., Lin, Y., Shih, W. J., Yang, C.S., and **Suh, N**., Tocopherols inhibit estrogen-induced cancer stemness and Oct4 signaling in breast cancer, *Carcinogenesis*, **39**: 1045-1055, 2018 [PMCID: PMC6067126].
d. Yang, C.S., Luo, P., Zeng, Z., Wang H., Malafa, M., and **Suh, N**. Vitamin E and cancer prevention: Studies with different forms of tocopherols and tocotrienols. *Mol Carcinog*. **59**:365-389, 2020. [PMCID: PMC7255062].

Complete List of Published Work in MyBibliography:
http://www.ncbi.nlm.nih.gov/sites/myncbi/nanjoo.suh.1/bibliograpahy/40522969/public/?sort=date&direction=ascending