



GARTH TORMOEN

Oregon Health and Science University, Biomedical Engineering

Degrees:

B.S. in Materials Science and Engineering, Michigan Technological University
M.S. in Materials Science and Engineering, Michigan Technological University

Scholar Award Donors:

Larry and Caron Ogg
Joan Foley and Per Jarnberg
Dick and Diane Alexander

About the Scholar:

Garth is investigating the formation of blood clots in cancer, which account for the second leading cause of cancer deaths. By utilizing fundamental principles of engineering, a better understanding of the interactions between blood coagulation proteins and cancer cells can be gained. The ultimate goal of this research is to develop biomarkers for the early identification of patients at risk to develop blood clots, allowing the rational administration of anti-clotting medications that prevent blood clots from forming. Garth enjoys backpacking in the Pacific Northwest with his wife, two-year old son and dog Emma.

Benefits to Society:

Metastatic disease accounts for the vast majority of deaths in cancer. For a cancer to metastasize, it must survive the blood circulation. By studying the fundamental interactions between cancer cells and blood, Garth aims to identify intrinsic weaknesses of cancer cells in the circulation, with the goal of enhancing natural anti-metastatic properties of the circulation to inhibit the spread of cancer through the bloodstream. The first step of his approach is to study the activation of blood clotting by cancer cells in the circulation.

Awards and Honors:

AHA Joel Drillings Award for Cardiovascular Research
ISTH New Investigator Award
Institute of Materials, Minerals and Mining Guy Bengough Award
R&D 100 Award
TMS Materials Processing & Manufacturing Division Design Contest Winner
ASM International William P. Woodside Scholar

Publications and Posters:

McCarty OJ, Conley RB, Shentu W, **Tormoen GW**, Zha D, Xie A, Qi Y, Zhao Y, Carr C, Belcik T, Keene DR, de Groot PG, Lindner JR. "Molecular imaging of activated von Willebrand factor to detect high-risk atherosclerotic phenotype". *JACC Cardiovasc Imaging*. 2010; 3: 947-55. PMID: PMC3204804.
Berny-Lang MA, Aslan JE, **Tormoen GW**, Patel IA, Bock PE, Gruber A, McCarty OJ, "Promotion of experimental thrombus formation by the procoagulant activity of breast cancer cells". *Phys Biol*. 2011; 8(1) 015014 (1-7). PMID: PMC3209705.
Aslan JE, **Tormoen GW**, Loren CP, Pang J, McCarty OJ, "S6K1 and mTOR regulate Rac1-driven platelet activation and aggregation". *Blood*, 2011; 118(11): 3129-36. PMID: PMC3175787.
Tormoen GW, Rugonyi S, Gruber A, McCarty OJ, "Role of carrier number on the procoagulant activity of tissue factor in blood and plasma". *Phys Biol*, 2011; 8: 066005(1-7). PMID: PMC3529913.

Lee AM, **Tormoen GW**, Kanso E, McCarty OJ and Newton PK (2012) Modeling and simulation of procoagulant circulating tumor cells in flow. *Front. Oncol.* 2012; 2: 108(1-9). PMID: PMC3442195.

Tormoen GW, Cianchetti FA, Bock PE and McCarty OJ (2012) Development of coagulation factor probes for the identification of procoagulant circulating tumor cells. *Front. Oncol.* 2012; 2: 110(1-12). PMID: PMC3434442.

Larson MK, **Tormoen GW**, Patel IA, Hjelman CE, Ensz NM, McComas LS, McCarty OJ. Exogenous modification of platelet membranes with the omega-3 fatty acids EPA and DHA reduces platelet procoagulant activity and thrombus formation. *American Journal of Physiology: Cell Physiology*: 2013 Feb; 304(3):C273-9. PMID: PMC3566437.

Liu Y, Davidson BP, Yue Q, Belcik T, Xie A, Inaba Y, McCarty OJ, **Tormoen GW**, Zhao Y, Ruggeri ZM, Kaufmann BA, Lindner JR. Molecular imaging of inflammation and platelet adhesion in advanced atherosclerosis effects of antioxidant therapy with NADPH oxidase inhibition. *Circ. Cardiovasc. Imaging*. 2013 Jan 1; 6(1): 74-82. PMID:PMC3575135.

PS-OC Cell-Line Project Team and the PS-OC Network. A physical sciences network characterization of nonmalignant and metastatic cells. *Sci. Rep.* 3, 1449; DOI:10.1038/srep01449 (2013).

Tormoen GW, Khader A, Gruber A, and McCarty OJ. Physiological levels of blood coagulation factors IX and X control coagulation kinetics in an *in vitro* model of circulating tissue factor. *Phys Biol.* 2013 Apr 15;10(3):036003.

Aslan JE, Itakura A, Haley KM, **Tormoen GW**, Loren CP, Baker SM, Pang J, Chernoff J, McCarty OJ. p21-activated kinase (PAK) signaling coordinates GPVI-mediated platelet aggregation, lamellipodia formation and aggregate stability under shear. *Arterioscler Thromb & Vasc Biol.* 2013; 33: 1544-51.

Reviews, Editorials and Book Chapters

Tormoen GW, Haley KM, Levine RL, **McCarty OJ**. Do circulating tumor cells play a role in coagulation and thrombosis? *Frontiers in Oncology* 2012; 2: 115(1-5). PMID: PMC3437466.

Colace TV, **Tormoen GW**, McCarty OJ, Diamond SL. Microfluidics and coagulation biology. *Annual Review of Biomedical Engineering* 2013; 15: 283-303.

Selected Abstracts

Tormoen GW, Cianchetti F, McCarty OJ, "Development of Coagulation Factor Probes for the Identification of Procoagulant Cancer Cells", Physical Sciences Oncology Center site visit, La Jolla, CA (OCT, 2012).

Tormoen GW and McCarty OJ, "Characterizing the role for coagulation factor concentrations on susceptibility to CTC-induced coagulation, 3rd Annual National Cancer Institute Physical Sciences – Oncology Center Conference, Tampa, FL (APR, 2012).

Tormoen GW and McCarty OJ, "Characterizing the role of blood coagulation factors on cancer cell migration", 3rd Annual National Cancer Institute Physical Sciences – Oncology Center Conference, Tampa, FL (APR, 2012).

Tormoen GW, Gruber A and McCarty OJ, "Spatial Separation of Tissue Factor-Carriers Modulates Procoagulant Activity of Circulating Tissue Factor", Annual Meeting of the American Society for Hematology, San Diego, CA (DEC, 2011).

Tormoen GW, Gruber A and McCarty OJ, "Procoagulant Activity of Intravascular Tissue Factor is Dependent on Carrier Burden", XXIIIrd Congress of the International Society on Thrombosis and Haemostasis, Kyoto, JP (JUL, 2011).

Tormoen GW, Berny MA, Aslan JE and McCarty OJ, "Characterization of the Procoagulant Activity of Tumor Cells", Physical Sciences-Oncology Center TSRI site visit, La Jolla, CA (OCT, 2010).