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Engineering & Scientific Consulting

Alex Avendano, Ph.D.

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Professional Profile

Dr. Avendano's training has focused at the interface between mechanical engineering and the performance of biological systems. His experiences have focused on utilizing a diverse set of methods and techniques across various disciplines to generate quantitative data used to assist decision makers across industry and academia. These techniques include design and microfabrication of microfluidic devices, experimental characterization of flow and mechanical behavior of tissue both ex vivo and in vitro, computational modeling of biomaterials, quantitative image analysis, and microscopic image acquisition.

Dr. Avendano also has experience related to the aviation industry which includes static structural analysis of airplane interior and landing gear components, fatigue analysis of landing gear components, and durability analysis of locomotive parts for maintenance contract cost estimation.

During his Ph.D. research at The Ohio State University, Dr. Avendano worked with engineers and cancer researchers to develop quantitative measurements of mechanical and flow properties relevant to understanding physical mechanisms of tumor growth and progression. These properties include tissue stiffness, hydraulic permeability, diffusivity, and extracellular matrix features such as fiber alignment and pore size. His work helped to provide functional assays that could characterize the effect of genetic alterations on measurable physical parameters relevant to tumorigenesis and drug delivery, thus creating opportunities to advance cancer research using engineering approaches.

Academic Credentials & Professional Honors

Ph.D., Biomedical Engineering, The Ohio State University, 2020

M.S., Mechanical Engineering, The Ohio State University, 2017

B.S., Mechanical Engineering, Iowa State University, 2014

Prior Experience

Postdoctoral Research Associate, Microsystems for Mechanobiology and Medicine Laboratory, The Ohio State University, May 2020-July 2020

Graduate Research Assistant, Microsystems for Mechanobiology and Medicine Laboratory, The Ohio State University, August 2014- May 2020

Landing Gear Stress Engineering Intern, The Boeing Company, June 2015-August 2015; May 2014-August 2014

Interiors Stress Engineering Intern, The Boeing Company, May 2013-August 2013

Durability Engineering Intern, GE Transportation, May 2012-August 2012

Professional Affiliations

Society of Hispanic Professional Engineers (SHPE)

Biomedical Engineering Society (BMES)

Languages

Spanish

Publications

Wormsbaecher, C., Hindman, A. R., Avendano, A., Cortes-Medina, M., Jones, C. E., Bushman, A., Onua, L., Kovalchin, C. E., Murphy, A. R., Helber, H. L., Shapiro, A., Voytovitch, K., Kuang, X., Aguilar-Valenzuela, R., Leight, J. L., Song, J. W., & Burd, C. J. (2020). In utero estrogenic endocrine disruption alters the stroma to increase extracellular matrix density and mammary gland stiffness. Breast cancer research : BCR, 22(1), 41. https://doi.org/10.1186/s13058-020-01275-w

Avendano, A.; Chang, J. J.; Cortes-Medina, M. G.; Seibel, A. J.; Admasu, B. R.; Boutelle, C. M.; Bushman, A. R.; Garg, A. A.; DeShetler, C. M.; Cole, S. L.; Song, J. W., Integrated Biophysical Characterization of Fibrillar Collagen-Based Hydrogels. ACS Biomaterials Science & Engineering 2020. DOI: 10.1021/acsbiomaterials.9b01873.

Chang, C.-W., Seibel, A. J., Avendano, A., Cortes-Medina, M. G., Song, J. W., Distinguishing Specific CXCL12 Isoforms on Their Angiogenesis and Vascular Permeability Promoting Properties. Adv. Healthcare Mater. 2020, 9, 1901399. https://doi.org/10.1002/adhm.201901399

Avendano A, Cortes-Medina M and Song JW (2019) Application of 3-D Microfluidic Models for Studying Mass Transport Properties of the Tumor Interstitial Matrix Front. Bioeng. Biotechnol. 7:6. doi: 10.3389/fbioe.2019.00006

Pitarresi, J. R., Liu, X., Avendano, A., Thies, K. A., Sizemore, G.M., Hammer,A. M., et al. (2018). Disruption of stromal hedgehog signaling initiates RNF5-mediated proteasomal degradation of PTEN and accelerates pancreatic tumor growth Life Sci. Alliance 1:e201800190. doi: 10.26508/lsa.201800190

Hammer, A.M.; Sizemore, G.M.; Shukla, V.C.; Avendano, A.; Sizemore; S.T.; Kladney, R.D.; Verfurth, Q.; Cuitiño, M.C.; Thies, K.A.; Chakravarti, A.; Leone, G.; Yee, L.D.; Song, J.W.; Ghadiali, S.N., Ostrowski, M.C.; “Stromal PDGFR-α Activation Enhances Matrix Stiffness, Impedes Mammary Ductal Development, and Accelerates Tumor Growth” Neoplasia 19(6), p. 496-508 (2017) doi: 10.1016/j.neo.2017.04.004

Xu, J.; Bigelow, T.A.; Davis G.; Avendano A.; Shrotriya P.; Bergler K.; Hu, Z.; “Dependence of ablative ability of high- intensity focused ultrasound cavitation-based histotripsy on mechanical properties of agar.” J. Acoust. Soc. Am. 136, 3018 (2014); https://doi.org/10.1121/1.4898426

Presentations

Avendano, A.; Chang J.; Ennis, C.; Stratton, A., Pitarresi J.R; Ostrowski M.C.; Song, J.W.; “PTEN Deletion in Pancreatic Cancer Associated Fibroblasts Decreases Hydraulic Permeability Through Hyaluronan and AKT Signaling in a 3D Microfluidic Tumor Stroma Model” 2017 BMES Annual Meeting, Phoenix, AZ, Oct. 2017

Avendano, A.; Chang J.; Ennis, C.; Stratton, A., Pitarresi J.R; Ostrowski M.C.; Song, J.W.; “PTEN Deletion in Pancreatic Cancer Associated Fibroblasts Decreases Hydraulic Permeability Independent of Collagen Fiber Alignment in a 3D Microfluidic Model of the Tumor Stroma.” 2017 American Society for Investigative Pathology Meeting at Experimental Biology , Chicago, IL, Apr. 2017