BIOENGINEERING, BIOMEDICAL, AND MANUFACTURING FRONTIERS

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Dr. Horton joined the Cullen College of Engineering (CCOE) in January 2019. Prior to joining the CCOE, she worked as an Assistant Professor of Agricultural and Biological engineering at Mississippi State University (MSU). Her research focuses on understanding the factors that lead to heart disease and sickle cell anemia. At the CCOE, Dr. Horton is the Principal Investigator of the Cardiovascular Tissue Engineering Laboratory (CTEL) that focuses on developing tools and techniques to investigate cardiovascular disease development and progression.

CARDIOVASCULAR DISEASE MODELS

Fig. 1 - *Engineered cardiac tissues*

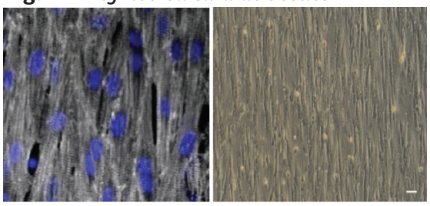


Fig. 2 - *Heart on Chip model*

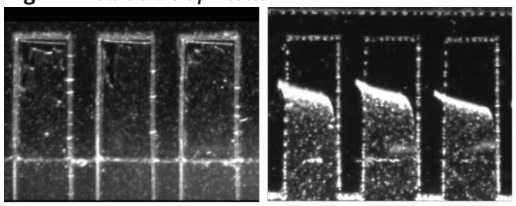
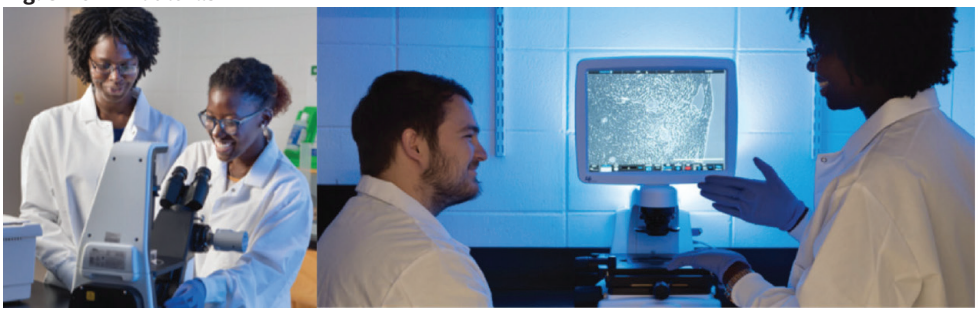


Fig. 3 - *CTEL in the lab*



There is a long-standing need for adequate models to investigate disease mechanisms and therapies including but not limited to cardiovascular diseases, one of the leading causes of death globally. Dr. Horton's laboratory is currently using organs-on-chip and microfabrication technologies to develop disease models with a specific focus on the cardiovascular system. Organs-on-chip cellularized microdevices mimic portions of an organ, such as the atria within the heart or vessel, rather than whole organs. This area combines microfluidics and tissue engineering. Her laboratory employs 3D printing, lithography, and topographical techniques to engineer cardiac tissues which are used within their organs-on- chip platforms. These platforms can be used as test beds for drug therapies as well as for investigations in organ development, tissue regeneration, and disease mechanisms. These platforms can also be used to identify novel therapeutic targets and to shed light on mechanisms that contribute to disease progression. Further, these systems can enhance the current knowledge surrounding epigenetic and genetic factors that play a role in disease severity. Dr. Horton is currently using this technology to conduct research in the areas of cardiomyopathies, immune disorders, and sickle cell disease.

Publications

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2. Pasqualini, FS, Nesmith, AP, Horton, RE, Sheehy, SP, and Parker, KK, Mechanotransduction and Metabolism in Cardiomyocyte Microdomains. BioMed Research International, vol. 2016, Article ID 4081638, 2016.

3. Horton, RE, Yadid, M, McCain, ML, Sheehy, SP, Pasqualini, FS, Park, SJ, Cho, A, Campbell, P, Parker, KK. (2016) Angiotensin II Induced Cardiac Dysfunction on a Chip. PLoS ONE 11(1): e0146415.

4. Horton, RE, Auguste, DA. Synergistic effects of hypoxia and extracellular matrix cues in cardiomyogenesis. Biomaterials. 2012 Sep 33 (27): 6313-9.

5. Horton, RE, Millman, JR*, Colton, CK, Auguste, DA. Engineering microenvironments for embryonic stem cell differentiation to cardiomyocytes. Regenerative Medicine. 2009 Sep 4 (5):721-32.*

6. Abkarian, M, Faivre, M, Horton, RE, Smistrup, K, Best-Popescu, CA, Stone, HA (2008). Cellular-scale hydrodynamics. Biomedical Materials. 2008 Mar 3(3):034011.