

Laboratory of Chemical Genomics at DSU

Welcome to the home of The Laboratory of Chemical Genomics, located within the Department of Chemistry, on the main campus of the Delaware State University.



Photo: Dr. Eric Kmiec (front row, second from the left) is surrounded by members of his lab at a recent benefit awards ceremony. Dr. Kmiec's work in sickle cell disease has been recognized by several organizations, including the Proudford Foundation. [View article here.](#) [1]

Research in the Kmiec Laboratory

For over twenty years, the Kmiec laboratory has studied the reaction mechanics, biochemistry and molecular genetics of gene editing in human cells. During the late 90s, this laboratory began a long-term investigation centered on understanding the mechanism and regulation of gene editing using single-stranded DNA oligonucleotides (ODNs). The lab was a pioneering force in developing the use of these specialized ODNs for the treatment of inherited disorders. Building largely on early genetic studies in lower eukaryotes, we were able to define a reaction protocol that can achieve a sustainable level of correction of genetic mutations in human cells. Development of clinical application is underway with a particular focus on utilizing nanofiber scaffolds as patches for implantation of gene edited cells into human tissues. For example, Phenylketonuria (PKU) is an amenable target for which nanofiber patches containing genetically modified cells can be implanted and the mutant phenotype reversed. These nanofiber scaffolds are constructed from natural biodegradable composite fibers, such as chitosan/PCC, created by electrospinning in both aligned and random configurations. Importantly, these patches enable robust proliferation of genetically modified cells. Since the nanofiber constructs are biodegradable, the 3D patchwork is slowly dissolved as the modified or gene corrected cells effectively implant in the target tissue. A major part of this effort centers on identifying chemical compositions of nanofibers that enable the greatest degree of expansion of cells that have been altered by the gene editing protocol. The laboratory is also investigating related reaction barriers including a reduced growth potential and the frequency at which gene editing activity takes place. The ultimate goal of all of this translational research is to develop a feasible protocol for the delivery of genetically modified cells into human tissues using biodegradable nanofiber patches.

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[1] <http://www.desu.edu/news/proudford-foundation-honors-dsus-orphagenix-sickle-cell-research>

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