

First-Draft Research Statement

Context for Project

Miriam-Webster defines research as “the systematic investigation into and study of materials and sources in order to establish facts and reach new conclusions.” My own investigation this summer will be trying to discover new and exciting conclusions about cancer and cancer treatment.

The Sample Lab is in the department of Genetics at the Medical Center. It researches cancer epigenetics and malignant cellular transformation. Cancer epigenetics is an important, growing field that I find very interesting. The Sample Lab focuses specifically on covalent post-translational modifications to the N-terminal tails of histone proteins in the nucleosome core. These modifications can affect protein expression and look different in cancerous versus non-cancerous cells. This summer, I will be working on a project to understand the mechanisms by which H3K9me3 works in combination with DNA methylation to repress transcription in in-vivo model systems. An open chromatin structure is necessary for binding of transcription factors and RNA Pol-II, which mediates active transcription on unmethylated promoter regions. Gene repression, in the instance of H3K9me3, seems to be mediated by both action of the trimethylated histone and DNA methyltransferases.

Primary Project Aims

1. Characterize H3K9me3 marking in AML cell lines.
2. Investigate the effects of targeted small-molecule inhibition of histone methyltransferases and DNA methyltransferases on histone expression levels.
3. Develop my personal science communication skills.

Headings are a great (optional) way to make sure you're addressing each of the research statement prompts.

Don't waste space on platitudes! Does this definition add to the essay or can it be removed, leaving room for something more meaningful?

Why is the field important and/or interesting? Consider the answer to this question from the perspective of a scientist and non-scientist.

Watch out for jargon and acronyms taking over. Could someone outside of your research area understand what message you are trying to convey?

Try and connect factual statements back to the big picture: why is this research important to the field?

Numbered lists, bulleted items, or just a sentence or two are perfectly acceptable ways to define primary project aims. If your project has well-defined research questions, this section is a good space to include them.

Having a personal development goal in addition to content-specific goal is fine, if relevant!

Individual Roles and Contributions

To accomplish my project's goals, I'll be learning and using many new lab techniques. I will do PCR and Western blots, which I have practiced in my biology lab classes but hope to improve on with practice. However, my graduate student supervisor will also teach me specialized flow cytometry and ChIP-seq techniques. Through the ChIP-seq process, chromatin gets sheared by micrococcal nuclease digestion, cell debris cleared, and protein complexes selectively immunoprecipitated. Direct high-throughput sequencing identifies protein binding sites, allowing for precision mapping of how marked histone proteins influence transcription and, ultimately, phenotype. High-throughput screens will be used to test for potential inhibitory effects of various small molecules identified in the literature. I will be responsible for carrying out these procedures and recording them meticulously in my lab notebook. Each day, I will be mentored by a graduate student, who will help me learn these new techniques and answer questions I have. I will meet with my PI once every two weeks to check on progress.

I will share my findings at weekly lab meetings and expect to be able to eventually publish my work. Because of the effort I'll be putting in, I expect to be first or maybe second author on a paper. The lab group has four other graduate students and a technician in it who can all give me feedback on my presentations and help me put together a poster for the end of the summer. I am excited to contribute to this exciting field and make big contributions to understanding and treating such an important disease.

[Word Count: 481]

This section should show evidence that you and your supervisor have discussed your learning goals for the summer and how you plan on accomplishing them.

Feel free to identify skills and research competencies you are excited to strengthen or learn for the first time! Let your enthusiasm show for the research process.

Use as much detail as you see fit to demonstrate an understanding of your plan for the summer. You do not need to get bogged down in listing reagents or explaining the technicalities of specific protocols, especially if they are new to you.

It is good practice for both your application and your summer research to know who your "go-to" people are for asking questions when they come up.

Papers and authorship are not expected outcomes for a Discover Grant. If you are interested in working towards a publication, talk through that interest with your supervisor.