

**Exploration of the Structure and Integrity of Keratin Molecules in Conditions Created by
Irradiated Wound Beds**

(Technical Report)

Racial Biases in Healthcare in the United States

(STS Research Paper)

An Undergraduate Thesis Portfolio
Presented to the Faculty of the
School of Engineering and Applied Science
In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Biomedical Engineering

by

Alec Korsah

May 12, 2023

Preface

In the United States, racial inequities in healthcare contribute to many preventable deaths every year. Even state-of-the-art-medicine is ineffective if care is inequitable. Burn treatment consists largely of pain management; little is done to reverse the damage. What current treatments lack is a product or technique to actively reverse the damage that occurred. Recently, Molecular Biologicals LLC has shown that keratin can be used to treat a variety of chronic wounds, including partial and full thickness burns (types II and III). Keratin gels may also be useful in treating radiation exposure, but such applications have not been investigated. Because keratin has high biocompatibility, degrades, and can harbor growth factors, it has potential as a biomaterial and nanoparticle. Keratin-based hydrogels have demonstrated regenerative capabilities in volumetric muscle loss injuries. This technical project demonstrated that keratin has the ability to be as effective in radiation wounds through in depth research. This project examined how keratin reacts on a chemical level in high pH and temperature environments to simulate the wound bed of radiation wounds. It additionally outlines how this project could move forward with proper clearances to use radiation on mice models.

Table of Contents

Title Page/ SocioSynthesis..... 1-2

Technical Report..... 3-9

Sociotechnical Research.....10-22

Prospectus.....23-31