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Project Title: Establishing Scarless Healing in Adult Skin Fibroblasts Using CRISPR-Cas9 Gene Targeting
Year Awarded: 2018 WHF 3M Fellowship Recognition Travel Award

What do you hope to/did you learn through this research? I hope to learn two things through this research: 1) how to achieve scarless wound healing and 2) how to develop a career as a future clinician-scientist. Scar formation is an important clinical problem. Many patients suffer from disfigurement, pain, growth restriction, and contractures because of their scarring after injury or surgery. By studying scarless wound healing in fetal mice, I hope to elucidate a method by which we can achieve scarless healing in human adults and children. I hope, too, that a better understanding of skin scarring can help uncover the mechanism of other fibrotic organ diseases such as in the liver, lung, bone, and kidney. As a clinician-scientist, this project will give me the ability to use a variety of techniques, animal models, and more, to enhance my knowledge base as a researcher. Using these advanced methodologies will more fully develop me as a scientist, and hopefully will allow me to progress in my career as a principle investigator.

How can this research help patients, clinicians and/or scientists? With this project, we may finally define the differences in developmental signaling in the skin that produce either the scarless or scarring phenotype. This could lead to an acceleration of research and funding in the field, allowing investigation through several avenues and disciplines. For clinicians and patients, our findings might result in novel therapeutic options for people with scars from surgery, burns, trauma, and chronic wounds.

Has/Did your work thus far yielded any surprises? I was pleasantly surprised to find that a role for TGF-beta signaling was implied in our epigenetic studies. Prior research in the field of scarless wound healing, and wound healing in general, has focused on the differences in TGF-beta isotypes, ratios, and their importance in wound healing. Our studies show no difference in the TGF-beta epigenetic accessibility over time. Thus, if TGF-beta signaling is involved in scarless wound healing, it must be regulated by another mechanism.

How did this award help your career? I have had the opportunity to share my work with other basic scientists and surgeons, but I have not had had the opportunity to share my work with other experts in the field of wound healing. By attending the annual Wound Healing Society Meeting, I plan on making professional connections and hearing both the positive and negative critiques of my research.

How did you get interested in wound healing and this area in particular? General surgery residents and surgeons are all too familiar with the outcomes of severe scarring. For me personally, my training has included

many interactions with burn victims and children with cancers requiring large resections. When I followed-up with these patients long-term, I was struck by how archaic and unacceptable the outcome was both physiologically and cosmetically. I was fortunate to find Dr. Longaker as a mentor. He has tremendous experience in the field, and I also benefit from his being a surgeon-scientist. Under his guidance, I have been able perform sophisticated studies while also growing as a future surgeon-scientist myself.

What are your future plans for your work in wound healing? At the moment, I am focused on completing my postdoctoral fellowship at Stanford and my residency at Brigham and Women's Hospital. Once complete, I will be a board certified General Surgeon and likely a specialist as well. My plan from there is to become an academic surgeon with a productive lab. I hope that I can continue to study the mechanism of scarless wound healing to encourage native tissue regeneration. But, I also want to develop methods of autologous transplantation and ex vivo tissue modification into true, transplantable and functional tissues. For people with significant injuries, encouraging scarless wound healing alone will never be enough to completely close their wounds. As such, I want to have a lab focused on organ regeneration to speed healing and recovery in people with significant skin injuries.

Tell us about your life away from the lab and/or clinic? Outside of the lab and clinic, I prefer to spend time with my husband, family, and friends. I'm lucky to have a large, close family on both mine and my husband's side, and we have great friends that we love to see as often as we can. Outside of social gatherings, I love to hike, camp, travel, horseback ride, and try new restaurants and foods.