### Research Theme
Dermatology and Skin Biology

### Research Project Title
Novel Gene Silencers and Topical Formulations for Melasma

### Supervisor
Assistant Professor Navin Kumar Verma, LKCMedicine

### Co-Supervisors
Adjunct Associate Professor Steven Thng Tien Guan  
School of Materials Science and Engineering, NTU

Associate Professor Timothy Tan, School of Chemical and Biomedical Engineering, NTU

### Collaborator
To be advised

### Project Description
Melasma is a hyperpigmentation disorder of the skin, predominantly affecting woman’s face. Singaporeans and other Southeast Asians stand a high chance of developing Melasma, which is often refractory and recurrent. Hydroquinone is deemed the treatment of choice, but its safety has been questioned in certain cases. Alternatively, lasers and light sources are used to treat pigmented lesions; however, such treatments may be challenging in Asian skin with higher melanin content. Thus an effective, safe and patient-acceptable therapeutic strategy is still an unmet need.

The molecular mechanisms underlying Melasma are not fully understood. Localized aberrant expression/activity of a number of proteins and enzymes, including Microphthalmia-Associated Transcription Factor (MITF) and Tyrosinase (TYR), have been identified to be associated with increased melanogenesis and melanocytosis; opening the prospective for gene-silencing-based therapeutics. The goal of this project is to develop new generation target-specific gene silencing molecules for topical applications in Melasma. The student will address the following main aims:-

**Aim1:** Development of a novel approach targeting genes associated with Melasma. The student will design and synthesize RNA interference-based specific inhibitors against selected Melasma targets. The gene silencing efficiency and functional efficacy of the inhibitors will be validated in cultured melanocytes.

**Aim2:** Development of delivery methods for topical applications of selected inhibitory molecule(s). Various approaches, including hydrogel- and cream-based formulations for the topical delivery of inhibitory molecules will be prepared and characterized.

**Aim3:** Efficacy testing of the developed gene silencing formulations for their effect on Melasma. The developed inhibitors will be tested for their dermal permeation and functional effects on melanogenesis, melanocytosis and skin-lightening using *in vitro* and *in vivo* model systems.
We believe this translational study will provide novel insights into the molecular mechanisms of Melasma, develop a non-invasive topical formulation for reducing skin hyperpigmentation and provide a foundation for future research leading to clinical development of new generation Melasma therapeutics. The student will gain specialized training in cell culture, cellular, molecular, biochemical and imaging assays, and in vivo model systems. He/she will write scientific papers that will form the basis of his/her PhD thesis.

Contact Us
If you have questions regarding this project, please email the Principal Investigator.
Assistant Professor Navin Kumar Verma
nkverma@ntu.edu.sg