Private Company

Preclinical models to evaluate hair and scalp aging and longevity

Background

We are a leading player in the consumer health and beauty industry, with a diverse portfolio that spans various channels, demographics, and categories. We are seeking an in vitro or ex vivo testing platform to assess cellular and metabolic health, with a specific focus on the impacts of aging, mitochondrial function, and cellular senescence as they relate to hair follicle biology and scalp longevity.

As consumers age, the prevalence of Androgenetic Alopecia (AGA) and senescent alopecia increases, yet the correlation between hair follicle aging and its surrounding microenvironment remains only partially understood. Histological changes such as follicular miniaturization and an extended latency between hair growth cycles are observed in both AGA and aging-related hair loss. These conditions are often characterized by disruptions in the normal hair growth cycle, which consists of the anagen (growth), catagen (regression), and telogen (resting) phases. Additional factors such as decreased collagen production and impaired mitochondrial function contribute to a shortened anagen phase.

Currently, there are limited options on the market that effectively prevent or reverse age-related impairments in hair growth and maintenance. Our goal is to establish a reliable, medium-throughput screening platform capable of evaluating both novel and existing botanical interventions for use in consumer packaged goods. The system should also allow for benchmarking against pharmaceutical compounds with established senolytic or anti-aging activity, such as Rapamycin, Dasatinib, or Navitoclax, which have been studied for their roles in suppressing senescence markers or reducing DNA methylation age.

Scientific literature indicates that biochemical and transcriptional markers can be used to assess hair follicle aging in vitro. These may include changes in key signaling pathways (e.g., WNT, SHH, Nrf2), mitochondrial health indicators, markers of DNA damage and oxidative stress, and ex vivo observations of hair follicle performance. Understanding and measuring these factors is crucial for identifying interventions that support cellular longevity and help preserve healthy hair growth as part of the aging process.

What we're looking for

We are seeking a medium to high-throughput screening system/model to evaluate the anti-aging potential of botanicals, natural ingredients, and pharmaceutical references on hair and scalp health. The platform should be suitable for assessing markers related to cellular aging, senescence, and longevity through enzymatic inhibition, receptor interference, activity reduction, and/or gene expression modulation. Additionally, mitochondrial functions, specifically measurements of mitochondrial activity or reduction in mitochondrial potential, should be included as key outputs. Our ultimate goal is to leverage this model to identify targeted interventions addressing the root causes of progressive hair follicle miniaturization, such as cellular arrest, senescence, hormonal influences, and impaired mitochondrial function.

Solutions of interest include:

- Identification of novel biochemical and transcriptional markers of aging
- Models that evaluate hair follicle health and proliferation
- In vitro or ex vivo models (e.g., HaCaT keratinocytes, dermal papilla cells, dermal fibroblasts, endothelial cells, or ex vivo human hair follicle cultures) to assess hair follicle aging and longevity
- Models that monitor signaling pathways such as WNT (Axin-2, Lef-1, Lgr-6), SHH, and Nrf2, as well as nuclear localization of β-catenin, as an indicator of Senescence in dermal papilla cells (DPCs)
- Assays detecting DNA damage or stress markers, such as heat shock protein 27 (HSP-27), superoxide dismutase (SOD) catalase, ataxia-telangiectasia-mutated kinase (ATM), and ATMand Rad3-related protein
- Models measuring mitochondrial health, glutathione (GSH), taurine metabolism, and mitophagy-related gene expression (e.g., Phb2, Lc3, Becn1)
- Benchmarking models using known senescence-inhibiting pharmaceuticals such as Rapamycin, Dasatinib, or Navitoclax
- Cell chip systems, including microfluidic platforms and lab-on-a-chip technologies

Our must-have requirements are:

- Capable of medium to high throughput screening for the effects of botanicals or pharmaceuticals via in vitro, cell-based, ex vivo, or biopsy-based systems focused on cellular aging, longevity and cellular health models
- Accommodates a diverse range of chemicals, extracts, and compounds, with tolerance for complex mixtures, differing solubility, and cytotoxicity
- Validated model/s

Our nice-to-have's are:

- Demonstrated reproducibility
- Higher throughput in nature (ability to screen >20 materials at a time)

- High sensitivity (ideal)
- Cost-effective
- Time effective - need to deliver results through testing ingredients in the platform by the end of 2025

What's out of scope:

- Animal or animal-derived models or systems
- Methodologies/models requiring major developments (over 2-3 months)

Acceptable technology readiness levels (TRL): Levels 4-9

1. Basic principles observed
2. Concept development
3. Experimental proof of concept
4. Validated in lab conditions
5. Validated in relevant environment
6. Demonstrated in relevant environment
7. Regulatory approval
8. Product in production
9. Product in market

What we can offer you

Eligible partnership models:

- Sponsored research
- Co-development
- Material transfer

Benefits:

Sponsored Research

Funding is proposal dependent, but an accepted proposal could expect support in the range of ~$50,000-175,000 for POC project(s) (tech readiness and milestone dependent) with the potential for follow-on funding.

Expertise

Partners will interact with a project lead to mutually develop a project plan and engage in regular meetings to ensure success. Partners will have access to internal team/experts as appropriate.

Please contact the University of South Florida Technology Transfer o8ice representative for submission – Karla Schramm at kschramm@usf.edu