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TRI Princeton
RESEARCH EDUCATION SERVICE

2023



*Lipids & Hair Breakage
in Textured Hair*

TRI Princeton
RESEARCH EDUCATION SERVICE



Study Aim

TO INVESTIGATE WHAT LIPIDS CAN DO TO STRENGTHEN TYPE 4 HAIR

Put More Broadly...

TO LINK THE COMPOSITION OF THE CMC LIPID BILAYERS WITH THE MECHANICAL PROPERTIES OF THE HAIR, & TO USE THIS TO CREATE EFFECTIVE METHODS TO IMPROVE HAIR STRENGTH

Business Case

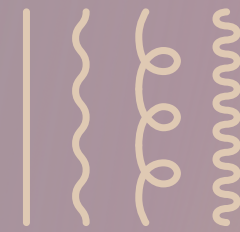
THE WIDESPREAD BELIEF, AMONGST CONSUMERS, IS THAT OILS ENHANCE THE SHINE, SOFTNESS AND FLEXIBILITY OF THEIR TEXTURED HAIR, & REDUCE HAIR BREAKAGE



70%

FEMALE ADULT CONSUMERS WITH WALKER TYPE 4 HAIR

*Use Hair Oils
Multiple Times a Week*



2021

GLOBAL HAIR OILS MARKET

\$ 4 Billion in Revenue



3.8% CAGR

COMPOUND ANNUAL GROWTH RATE

Between 2022-2030



But...the Technical Questions Still Remain...

What Is the Role of Fibre Lipids In Hair Strength?

And Can Supplementing Hair Lipids with Hair Oils Enhance the Strength of Textured Hair?

Background

HAIR LIPIDS

Cell Membrane Complex (CMC) lipids in the hair fibre exist in **paired bilayer** structures and comprise of a mixture of different lipid molecules (some chemically bound to the cell walls)

CMC lipids provide (1) **cohesion** between cuticle cells, cortical cells and the cuticle-cortex interface, and (2) provide the **main route of diffusion** into the fibre and, simultaneously, are the **main barrier for penetration**.

Previous studies using solvents and surfactant treatments have shown that **lipid extraction** of straight hair is associated with **reduced hair fatigue strength**.

Background

HAIR LIPIDS & HAIR STRENGTH

Cohesion

Breakage patterns in Type-4 hair show long, longitudinal fractures, suggestive of cracks between cortical cells and along the CMC. Any weakness in CMC lipids would, therefore, logically lead to increased breakage.

Barrier for Penetration

Damage to CMC lipids, would logically, lead to faster water diffusion. This may be important for Type 4 hair, since low water content is linked to fibre fragility and increased numbers of premature fractures.

Overall Aim

To investigate the relationships between curl type, hair lipid composition, and hair properties, and to use these insights to create effective methods to improve hair strength for textured hair.

A 12-month study, starting on September 1st, 2023, and completing on August 31st, 2024

Objective 1

Investigate the effects of **curl type**, and **inter-subject variation**, on hair lipid composition and hair properties for natural hair

Objective 2

Investigate the effects of **lipid removal** and **hair damage** on lipid composition and hair properties for textured hair

Objective 3

Investigate the effects of **oil/lipid treatments** on properties of natural and damaged hair for textured hair

Scientific Techniques

WHICH WILL BE PROPOSED

Lipid Composition – HPTLC

Matrix Protein Properties – Elastic Modulus vs Humidity Isotherms (MTT)

Lipid Cohesion — Hair Fracture Patterns on Light Microscopy

Lipid Cohesion — Chemical Composition of Fracture Planes by TOF-SIMS

Lipid Barrier for Penetration (Hair Porosity) + Matrix Protein Swelling - Hair Swelling Using LSM

Lipid Barrier for Penetration (Hair Porosity) - Lateral Diffusion Assay Using FTIR

Lipid Barrier for Penetration (Hair Porosity) + Matrix Protein Swelling – DVS

Hair Breakage by Fatigue Testing

Hair Breakage by MTT & Analysis of Premature Fractures

TRI is looking for...

12 Sponsors

PROVIDING \$45,000 FOR THE STUDY

25%

TOP-UP FROM TRI PRINCETON

\$675,000

TOTAL PROJECT BUDGET



Contact Us for More Information

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