Rice Products in Hair Growth

Kiana Hashemi[1], Christine Pham, BS[1], Aunna Pourang, MD[1], Tiana Mamaghani[1], Margit Juhasz, MD, MSc[1], Natasha Atanaskova Mesinkovska, MD, PhD[1]

[1] University of California, Irvine, Department of Dermatology, Irvine, CA

Authors have no conflicts of interest to disclose

Introduction & Methods

- Historically, rice extracts have been part of skin and hair care practices in Asia
- Cosmetic hair and scalp products contain a variety of natural ingredients, such as rice and its derivatives
  - Heralded to enhance hair growth with limited scientific evidence
- Study Aim: Review the potential effects of *Oryza sativa* (rice) extract, specifically rice bran extract (RB), on hair health
- PubMed literature search to identify articles on rice extract and hair growth.

  Results: five studies analyzing the efficacy of rice extract for hair growth [human (n=1), in vitro (n=3), animal (n=1)] and four studies analyzing the safety profile of rice extract [in vitro and animal (n=2), animal (n=2)]
- An Amazon.com search was also performed using the terms "rice hair products" to determine rice-containing hair products available to consumers in May 2019

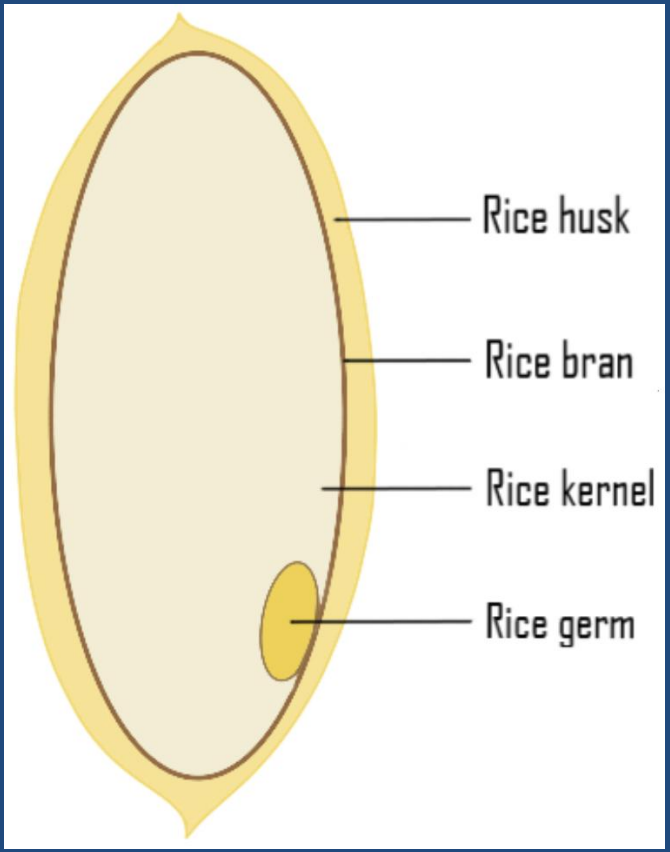

Figure 1. Illustration of a rice grain

Maintaining Anagen

Table 1. Summary of RB's effect on molecules involved in maintaining anagen phase

Abbreviations: ALP (alkaline phosphatase), IGF-1 (insulin-like growth factor-1), KGF (keratinocyte growth factor), IL-1α (interleukin 1 alpha), TGF-β (transforming growth factor beta), VEGF (vascular endothelial growth factor)

Molecule	Effect of RB on molecule	Effect/function of molecule on hair
Alkaline phosphatase	Increase	High ALP activity induces hair follicle formation during anagen phase
Fibronectin	Increase	Glycoprotein that is prevalent in dermal papilla cells during anagen phase but disappears during catagen phase
IGF-1	Increase	Increase growth (maintain anagen)
KGF	Increase	Increase growth (maintain anagen)
IL-1α	Decrease	Inhibits hair follicle growth; may play a role in the pathophysiology of inflammatory hair loss conditions
TGF-β	Decrease	Decrease growth; induce apoptosis (reduce anagen and induce catagen)
Type I collagen	Increase	Predominant ECM protein of the dermis; found in the dermal sheath and dermal papilla throughout hair cycle
Type IV collagen	Increase	Essential protein of basement membranes of developing hair follicles; expressed in outer root sheath basement membrane and in ECM of dermal papilla in the anagen and catagen stages
VEGF	Increase	Increase growth (maintain anagen)
Versican	Increase	Proteoglycan located in the ECM; increased expression during proliferation of dermal papilla cells and no expression in telogen phase; maintains growth (anagen) phase
Wnt/β-catenin	Increase Wnt-3α Increase β-catenin	Increase growth; Wnt signals β-catenin to target transcription of genes for BMP4 and SHH; induces anagen phase

RB was found to maintain anagen:

- Promotes expression of bFGF, KGF and VEGF, which are involved in the proliferation and differentiation of germ cells in the anagen phase
- Promotes transition between telogen and anagen through Wnt signaling pathways and increase in types I and IV collagen, fibronectin, ALP, and versican
- Promotes reduction of inflammatory TGF-β expression which allows hair follicles to remain in the anagen phase

Inhibiting 5α-reductase & Promoting Melanogenesis

RB was found to inhibit 5α-reductase type I:

- Over-activation of 5α-reductase has been implicated in the development of AGA
- High levels of the bioactive unsaturated fatty acids, γ-linolenic acid, linoleic acid, and oleic acid found in RB have inhibitory effects on 5α-reductase type I, and to a lesser extent type II, thereby increasing hair growth via prolongation of the anagen phase.

Table 2. Summary of RB's effect on molecules involved in promoting melanogenesis.
Abbreviations: bFGF (basic fibroblast growth factor), ET-1 (endothelin-1), IL-1α (interleukin 1 alpha), MITF (melanocyte inducing transcription factor), TRP-1 (tyrosinase-related protein-1)

Molecule	Effect of RB on molecule	Effect/function of molecule on hair
bFGF	Increase	Increase growth; Promote activity and growth of dermal papilla cells; stimulate melanocytes
ET-1	Increase	Induces differentiation and melanogenesis in melanocytes
Laminin	Increase	Present in ECM of dermal papilla cells during anagen and catagen phase and aids in attachment to melanocaytes
Melanin	Increase	Pigment produced by melanocytes (melanogenesis occurs in anagen)
MITF	Increase	Regulates tyrosine, TRP-1, and TRP-2
TRP-1	Increase	Catalyze processes in melanogenesis
Tyrosinase	Increase	Catalyzes tyrosine conversion to L-dopa, producing melanin (during anagen)

- RB was found to promote melanogenesis:
  - Potential therapeutic value for both transient hair loss where the anagen phase is shortened and repigmentation of gray hair through induction of melanogenesis.
  - A combination of RBM and EMF (extremely low frequency electromagnetic fields) suggest potential therapeutic value for the treatment of vitiligo through the same melanogenesis pathway
- Further investigation of RB's phytochemical components as well as a dose concentration study is necessary to clarify the effect of RBM versus RB extract on hair growth

Amazon Search

- Consumers are concerned about long-term health effects, so natural and organic products with fewer ingredients have become favorable
- Growing trend over the past five years for US consumers to seek "organic" and "natural" beauty products
- An Amazon.com search identified 176 products containing rice ingredients (Fig 2)
- Products were from the United States (n=119), Japan (n=8), Italy (n=3), France (n=3), Thailand (n=2), Sri Lanka (n=2), Korea (n=2), New Zealand (n=1), the Netherlands (n=1), and Spain (n=1)
- RB may be used as an adjunct "natural alternative" for hair loss patients, who wish to avoid use of medications such as finasteride, dutasteride, or topical minoxidil
- Further clinical investigations are needed to evaluate the efficacy of rice bran extracts in human hair

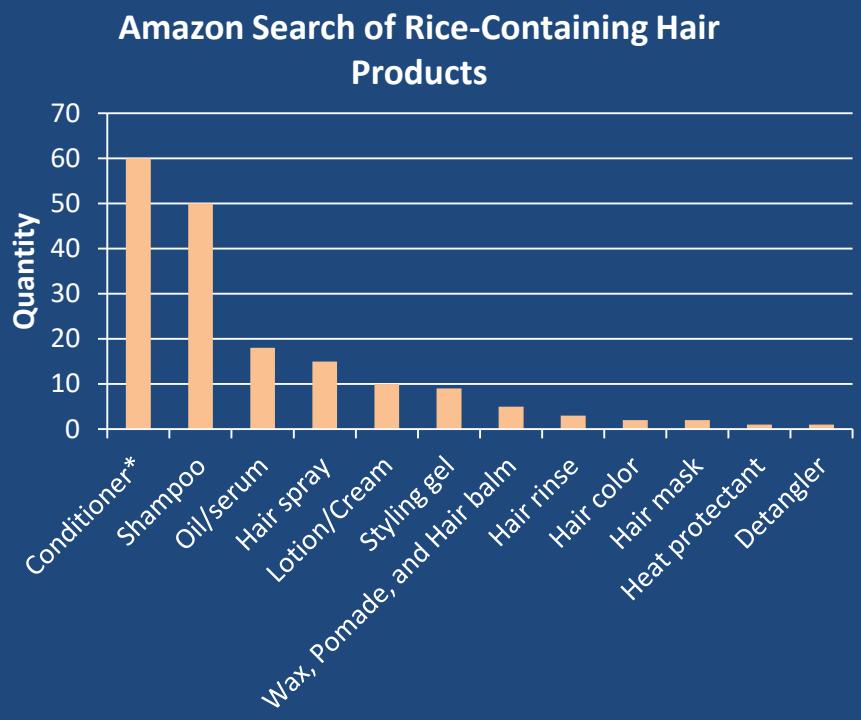

Figure 2. Hair products containing rice ingredients available from an Amazon.com search for "rice hair products".

* Includes 2-in-1 shampoo and conditioner products.