

---

# Hair and Hair Care

---

edited by  
Dale H. Johnson

---

# Hair and Hair Care

edited by  
**Dale H. Johnson**

*Helene Curtis, Inc.  
Rolling Meadows, Illinois*



MARCEL DEKKER, INC.

NEW YORK • BASEL

3, edited by  
tions, edited  
l Approach,  
edited by P.  
d by James  
  
and Carl B.  
y William C.  
L. Rietschel  
jects, edited  
ermann and  
  
d by Dennis  
cts, Howard  
  
Aspects.  
as J. Lowe,  
is: Principles

### Library of Congress Cataloging-in-Publication Data

Hair and hair care / edited by Dale H. Johnson.  
p. cm. — (Cosmetic science and technology ; 17)

Includes index.

ISBN 0-8247-9365-X (alk. paper)

1. Hair preparations. 2. Hair—Care and hygiene. 3. Hair preparations industry—United States. I. Johnson, Dale H.  
II. Series: Cosmetic science and technology series ; v. 17.

TT969.H343 1997

646.7'24—dc21

97-4018

CIP

The publisher offers discounts on this book when ordered in bulk quantities. For more information, write to Special Sales/Professional Marketing at the address below.

This book is printed on acid-free paper.

**Copyright © 1997 by MARCEL DEKKER, INC. All Rights Reserved.**

Neither this book nor any part may be reproduced or transmitted in any form or by any means, electronic or mechanical, including photocopying, microfilming, and recording, or by any information storage and retrieval system, without permission in writing from the publisher.

MARCEL DEKKER, INC.

270 Madison Avenue, New York, New York 10016

## About the Series

The Cosmetic Science and Technology series is a collection of a broad range of edited volumes with a focus on the intersection of science and technology. The series covers a wide range of topics in academia, and the government, and the private industry.

The aim of this series is to provide a comprehensive overview of the latest developments in cosmetic science and technology. Topics are discussed in the context of chemistry, physics, biology, safety, efficacy, toxicity, and polymer chemistry, and toxicology all play a role in the development of new products.

There is little competition in the market for high-quality, scientifically based cosmetic and toiletries. Products range from lipsticks, nail polishes and skin care products to over the counter products such as antibacterial soaps, and acne treatments. The series covers the entire range of cosmetic and toiletries.

# 4

---

## Conditioning of Hair

**Myra A. Hoshowski**

*Helene Curtis, Inc., Chicago, Illinois*

### I. INTRODUCTION

Hair that is conditioned is in a proper and healthy state. Healthy hair looks shiny, feels soft, is easy to comb and style, and retains body and bounce.

If hair were left alone, it would tend to remain in a conditioned state. The cuticle, or outer layer of hair would remain intact and a layer of sebum would provide the hair with protection from mechanical friction. However, a buildup of sebum gives the hair an undesirable appearance. During the process of cleansing, wet hair is vulnerable to mechanical abrasion and therefore becomes damaged. Chemical treatments used to permanently alter hair's color and curl further weaken and damage hair.

It is the job of conditioners to help counteract these negative effects. When conditioning agents are applied to the hair, frictional force is reduced and combing becomes easier, thus maintaining the hair in its proper and healthy state. Some conditioning agents may even penetrate the hair fiber to actually restore damaged hair to a healthy condition.

There is no single perfect conditioning agent, but rather a multitude of conditioning agents available to the formulating scientist. An endless number of combinations of these conditioning agents can be used in conditioners. By utilizing the technical information that is provided about the conditioning agents and examining the examples of formulations, the formulator can use this chapter as a starting point for developing a balanced conditioner which meets the needs of his or her target market segments.

## II. HOW HAIR STRUCTURE RELATES TO ITS CONDITION

The hair shaft is composed of two major morphological regions, the cortex and the cuticle. The cortex's function is to provide mechanical properties such as strength to the hair fiber. The cuticle is the chemically resistant outer layer responsible for protecting the cortex. Six to 10 layers thick, the cuticle resists physical and chemical degradation by forces such as friction, pulling, bending, and ultraviolet radiation. Hair's appealing visual and tactile characteristics are due to the cuticle's arrangement. Cuticle cells arranged in overlapping scales lie flat, reflecting light and allowing each strand to slide smoothly against its adjacent neighbors. Even though the cuticle is remarkably resistant, it is not impervious to attack and will break down from repeated exposure to the environment, physical manipulation during grooming, and chemical alteration. This greatly simplified overview of hair structure is provided to show how hair's structure relates to its condition. Robbins (1) and Chapters 1 and 2 of this volume explain the morphology of hair in greater detail.

## III. HAIR DAMAGE AND ITS CAUSES

Numerous researchers have studied the way in which physical and chemical processes damage hair by observing how hair loses its color and luster, becomes more harsh, stiff, weak, brittle, and flyaway.

### A. Grooming

Gould and Sneath (2) compared the cross sections of proximal, or root portions of the hair to the distal, or end portions of the hair before and after repeated shampoos. They found that damage was limited to the cuticle and increased from the proximal to the distal portion of the hair fiber.

Kelly and Robinson (3) studied the effect of the normal grooming process of shampooing, towel drying, wet combing, and wet brushing on the cuticle. During the shampooing stage of the grooming process, hair becomes tangled in knots. Wet hair has a lower resistance to abrasion than dry hair, while at the same time, the wet hair is subjected to very strong abrasive forces. Although shampooing and towel drying alone can abrade the cuticle, wet combing and particularly wet brushing inflicts much greater damage. Cuticle layers are lost at a rate of 1 to 2.5 cuticles per 50 treatments. On the basis of this rate, if the grooming procedure is undertaken only twice per week, the entire cuticle is removed in only 14 to 60 months leading to subsequent splitting of the cortex.

Sandhu et al. (4) developed a sensitive colorimetric method to quantify the amount of hair protein fragments abraded during combing. Chemically treated hair exhibits greater protein loss than untreated hair.

# Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

## Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

## Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

## Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

## API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

## LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

## FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

## E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.