The Skin and Its Diseases

A subject collection from *Cold Spring Harbor Perspectives in Medicine*

OTHER SUBJECT COLLECTIONS FROM *COLD SPRING HARBOR PERSPECTIVES IN MEDICINE*

MYC *and the Pathway to Cancer*
Bacterial Pathogenesis
Transplantation
Cystic Fibrosis: A Trilogy of Biochemistry, Physiology, and Therapy
Hemoglobin and Its Diseases
Addiction
Parkinson's Disease
Type 1 Diabetes
Angiogenesis: Biology and Pathology
HIV: From Biology to Prevention and Treatment
The Biology of Alzheimer Disease

SUBJECT COLLECTIONS FROM *COLD SPRING HARBOR PERSPECTIVES IN BIOLOGY*

The Origin and Evolution of Eukaryotes
Endocytosis
Mitochondria
Signaling by Receptor Tyrosine Kinases
DNA Repair, Mutagenesis, and Other Responses to DNA Damage
Cell Survival and Cell Death
Immune Tolerance
DNA Replication
Endoplasmic Reticulum
Wnt Signaling
Protein Synthesis and Translational Control
The Synapse
Extracellular Matrix Biology
Protein Homeostasis
Calcium Signaling
The Golgi
Germ Cells
The Mammary Gland as an Experimental Model
The Biology of Lipids: Trafficking, Regulation, and Function
Auxin Signaling: From Synthesis to Systems Biology
The Nucleus
Neuronal Guidance: The Biology of Brain Wiring

The Skin and Its Diseases

A subject collection from *Cold Spring Harbor Perspectives in Medicine*

EDITED BY

Anthony E. Oro

Stanford University School of Medicine

Fiona M. Watt

Kings College London

COLD SPRING HARBOR LABORATORY PRESS

Cold Spring Harbor, New York • www.cshlpress.org

The Skin and Its Diseases

A Subject Collection from *Cold Spring Harbor Perspectives in Medicine*
Articles online at www.perspectivesinmedicine.org

Executive Editor	Richard Sever
Managing Editor	Maria Smit
Senior Project Manager	Barbara Acosta
Permissions Administrator	Carol Brown
Production Editor	Diane Schubach
Cover Design	Denise Weiss
Publisher	John Inglis

Front cover artwork: Mouse tail epidermal whole-mount labeled with antibodies to keratin 14 (red) and the androgen receptor (green). (Image kindly provided by Kai Kretzschmar and Fiona Watt, King's College London.)

Library of Congress Cataloging-in-Publication Data

Skin and its diseases : a subject from the Cold Spring Harbor perspectives in medicine / edited by Anthony E. Oro, Stanford University School of Medicine and Fiona M. Watt, Kings College London.
page cm
Summary: "The skin is a continually renewing organ that acts as a protective barrier isolating us from the external environment. This book examines the cells that make up the skin and their functions, as well as diseases such as psoriasis that affect the skin and new molecular strategies for treating these"– Provided by publisher.
Includes bibliographical references and index.
ISBN 978-1-62182-023-9 (hardback)
1. Skin--Diseases. 2. Skin--Molecular aspects. 3. Dermatology. I. Watt, Fiona M., editor of compilation. II. Oro, Anthony E., 1958- editor of compilation.

RL96.S58 2014
616.5--dc23
2014001351

10 9 8 7 6 5 4 3 2 1

All World Wide Web addresses are accurate to the best of our knowledge at the time of printing.

For a complete catalog of all Cold Spring Harbor Laboratory Press publications, visit our website at www.cshlpress.org.

Contents

Contents

Preface

The Italian philologist and physician Geronimo Mercuriali published the first textbook on skin and its diseases in 1572. Today, however, we are at a nexus in modern biology where we possess unparalleled understanding of the molecular and genetic basis of skin homeostasis and worldwide access to patients and animal models with which to correlate our knowledge and develop therapies for human diseases. This nexus means that laboratory experiments are having a greater direct impact on clinical practice than ever before. Our motivation for publishing *The Skin and Its Diseases* is our belief that the skin is the quintessential model vertebrate tissue. We feel that this compendium of current knowledge is useful for both further studies of the skin itself and insights into related changes in other tissues. Our hope is that this book will catalyze such interactions and stimulate further research in basic science and clinical/translational medicine.

We are well aware that this research topic is enormous and have endeavored to assemble a representative slice of our current knowledge. Although it does not do justice to some emerging and well-developed areas and lacks contributions from certain leaders in the field, the diversity of knowledge in this compendium will whet your appetite for exploring deeper.

The chapters in the book are organized around the major cell types in the skin and the diseases that affect them, including epidermis, dermis, and cutaneous epithelial specializations such as the touch receptor. The topics range from traditional dermatologic strongholds, such as psoriasis and cutaneous oncology, to newer approaches, such as the use of embryonic-stem-cell-based therapies. The content in each chapter may not completely align with that in other chapters. We have purposely given freedom to each author to review the field as they see fit. We feel that the apparent areas of conflict provide motivation for additional experimentation.

We thank Barbara Acosta and her colleagues at Cold Spring Harbor Laboratory Press for their support. Barbara's expertise in helping us put the book together and her patience with the inevitable delays are greatly appreciated. We thank our families for putting up with us as we assembled this reference. We would like to especially thank past and current members of the cutaneous biology community for their conversations, critiques, and insights that have spurred us to investigation. We feel fortunate to have such wonderful colleagues and hope that this book will motivate readers to contribute to new understanding of the skin and its diseases.

Anthony E. Oro
Fiona M. Watt