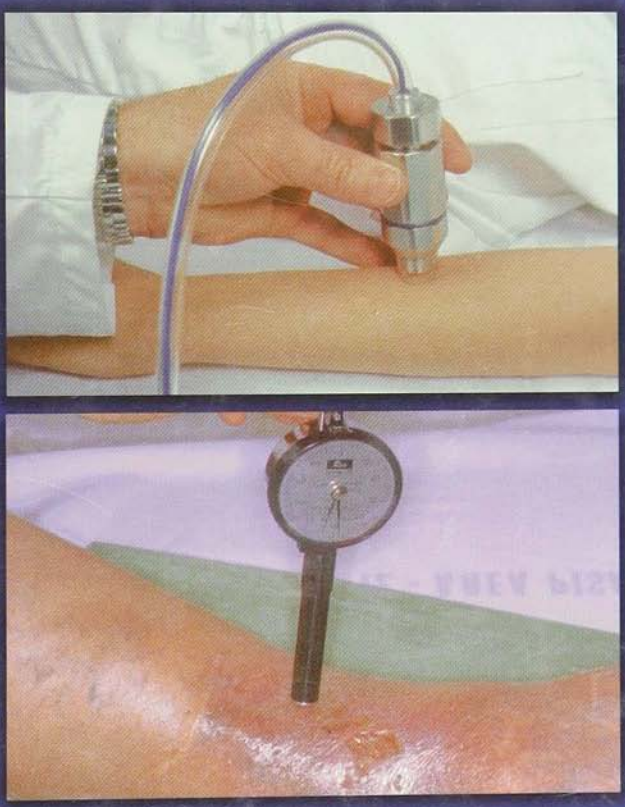
BIOENGINEERING OF THE SKIN

Skin Biomechanics



Edited by Peter Elsner
Enzo Berardesca
Klaus-P. Wilhelm
Howard I. Maibach

DERMATOLOGY: CLINICAL & BASIC SCIENCE SERIES

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Series Preface

Our goal in creating the *Dermatology: Clinical & Basic Science Series* is to present the insights of experts on emerging applied and experimental techniques and theoretical concepts that are, or will be, at the vanguard of dermatology. These books cover new and exciting multidisciplinary areas of cutaneous research; and we want them to be the books every physician will use to become acquainted with new methodologies in skin research. These books can be given to graduate students and postdoctoral fellows when they are looking for guidance to start a new line of research.

The series consists of books that are edited by experts and that consist of chapters written by the leaders in a particular field. The books are richly illustrated and contain comprehensive bibliographies. Each chapter provides substantial background material relevant to the particular subject. These books contain detailed tricks of the trade and information regarding where the methods presented can be safely applied. In addition, information on where to buy equipment and helpful web sites for solving both practical and theoretical problems are included.

We are working with these goals in mind. As the books become available, the efforts put in by the publisher, the book editors, and the individual authors will contribute to the further development of dermatology research and clinical practice. The extent to which we achieve this goal will be determined by the utility of these books.

Howard I. Maibach, M.D.

Preface

The skin plays an important role in maintaining the integrity of the living organism while allowing the interaction of the organism with its environment. To fulfill these functions, mechanical stability is as important as flexibility. The mechanical properties of skin are very diverse depending on the anatomical location, and they evolve throughout life from the fetus to old age. Both genetic and acquired skin diseases modify skin biomechanics, as do intrinsic and photoaging. Since aging is so closely linked with changes of skin mechanical properties that lead to wrinkles and furrows, the desire for eternal youth leads to attempts to modify skin mechanics by a variety of interventions, including cosmeceuticals, peeling, and laser treatments.

It is within this wide scope of interests that this book gathers up-to-date information on the noninvasive assessment of skin biomechanics by modern bioengineering technology. The editors are grateful that leading investigators have shared their experiences in the development and use of standard and new techniques, their applications in dermatology, and in the testing of pharmaceutical, cosmetic, and nonfood products for safety and efficacy. The editors are indebted to all authors for the knowledge and effort they have invested in this project. At the same time, we would like to thank Ms. Barbara Norwitz and Ms. Tiffany Lane of CRC Press, Boca Raton, for their help in the publishing process.

We sincerely hope that this book will provide valuable advice to our readers and that it will stimulate them to apply bioengineering techniques skillfully in their professional settings.

Jena/Pavia/Hamburg/San Francisco, May 2001

Peter Elsner, M.D.

Enzo Berardesca, M.D.

Klaus-P. Wilhelm, M.D.

Howard I. Maibach, M.D.

The Editors

Peter Elsner, M.D., studied medicine at Julius Maximilians University, Würzburg, Germany, from 1974 to 1981 and was trained as a dermatologist and allergologist at the Department of Dermatology, Würzburg University, 1983 to 1987. He received his doctoral degree in 1981 and his lectureship in dermatology in 1987. From 1988 to 1989, he was visiting research dermatologist at the Department of Dermatology, University of California at San Francisco; and from 1991 to 1997, he was consultant and associate professor, Department of Dermatology, University of Zurich, Switzerland. Since 1997 he has served as professor and chairman, Department of Dermatology and Allergology, Friedrich Schiller University, Jena, Germany.

Dr. Elsner has published more than 200 original papers and 18 books. He is a member of more than 30 scientific societies; has served as chairman of the International Society for Bioengineering and the Skin (ISBS) and as a member of the Scientific Committee for Cosmetics and Non-Food Products (SCCNFP) of the European Commission and the European Group on Efficacy Measurement of Cosmetics and Other Topical Products (EEMCO).

Enzo Berardesca, M.D., is senior dermatologist and professor at the School of Dermatology of the University of Pavia in Pavia, Italy. Dr. Berardesca obtained his training at the University of Pavia and earned his M.D. in 1979. He served as resident and dermatologist at the Department of Dermatology, IRCCS Policlinico S. Matteo, Pavia, from 1982 to 1987, and as research assistant at the Department of Dermatology, University of California School of Medicine in San Francisco in 1987. He assumed his present position in 1988.

Dr. Berardesca has been chairman of the International Society for Bioengineering and the Skin from 1990 to 1996 and is a member of the Society for Investigative Dermatology, the European Society for Dermatological Research, the Italian Group for Research on Contact Dermatitis (GIRDCA), and the European Group for Standardization of Efficacy Measurements of Cosmetics (EEMCO group). He is currently vice chairman of the EEMCO group. He has organized several international meetings on skin bioengineering and irritant contact dermatitis in Europe.

Dr. Berardesca's current major research interests are irritant dermatitis, barrier function, and noninvasive techniques to investigate skin physiology (with particular regard to racial differences in skin function), sensitive skin, and efficacy evaluation of topical products.

He has authored five books and more than 200 papers and book chapters.

Klaus-P. Wilhelm, M.D., is president and medical director of proDERM Institute for Applied Dermatological Research, Schenefeld/Hamburg, Germany, and Lecturer of Dermatology at the Medical University of Lübeck, Germany.

Dr. Wilhelm earned his M.D. degree in 1986 from the Medical University of Lübeck and was awarded the degree of Lecturer by the same institution in 1995.

From 1988 to 1990, Dr. Wilhelm was a visiting scientist at the Department of Dermatology, University of California, San Francisco Medical School. He completed his residency at the Department of Dermatology, Medical University of Lübeck in 1993. In 1994 he founded the contract research institute proDERM in Schenefeld/Hamburg.

Dr. Wilhelm is a member of the Executive Board of the International Society for Bioengineering and the Skin and a member of the European Society for Dermatological Research, the European Contact Dermatitis Society, the German Dermatological Society, and the American Academy of Dermatology. He has received three consecutive government grants and has published more than 40 scientific papers and book chapters. His research interests include physiology of healthy and diseased skin, irritant contact dermatitis, skin pharmacology, and evaluation of bioinstrumentation techniques for the skin.

Howard Maibach, M.D., is a Professor of Dermatology at the University of California, San Francisco, and has been a leading contributor to experimental research in dermatopharmacology, and to clinical research on contact dermatitis, contact uticaria, and other skin conditions. His work on pesticides includes clinical research on glyphosate, chlorothalonil, sodium hypochlorite, norflurazon, diethyl toluamide, and isothiazolin compounds. His experimental work include research on the local lymph node assay, and the evaluation of the percutaneous absorption of atrazine, boron-containing pesticides, phenoxy herbicides, acetochlor, glyphosate, and many other compounds.