

Faculty Spotlight:

Paul A. Khavari, MD, PhD

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*Carl J. Jerzog Professor of Dermatology, Stanford University School of Medicine
Chair, Department of Dermatology
Director, Stanford Program in Epithelial Biology*



Summary of Work

Dr. Paul Khavari is the Carl J. Herzog Professor of Dermatology at Stanford University School of Medicine. He also chairs Stanford's Department of Dermatology, a position he has held since 2010, and serves as the Chief of Dermatology Service at the VA Palo Alto Hospital. Dr. Khavari co-directs Stanford's interdisciplinary Program in Epithelial Biology, which he also helped to found in 1999. This program, which studies the vital tissues lining humans' and other animals' internal and external surfaces, now spans more than two dozen departments with over 75 faculty members.

Dr. Khavari has been at the forefront of Stanford's medical research for more than two decades. His current research centers on stem cell differentiation and cancer, and on the development of new molecular therapeutics for a wide range of skin diseases including melanoma and non-melanoma skin cancers, psoriasis, ichthyosis, ectodermal dysplasias, and epidermolysis bullosa.

Dr. Khavari's cancer research is particularly notable. His laboratory was the first in the world to transform normal human tissue into three-dimensional cancers in a tissue culture dish, a breakthrough that has greatly accelerated the pace of cancer research around the world. Studies that used to take months can now be completed in days, at considerable cost savings. Further, the engineered tissue provides researchers with a superior alternative to cells grown in cancer cell lines, whose accumulated genetic changes may not accurately reflect what happens in humans. Finally, by reconstructing the molecular networks sufficient to convert normal tissue into cancer, this research has laid the foundation for many new molecular cancer therapies.

In another recent cancer study, Dr. Khavari's lab identified two RNA molecules that act as powerful tumor suppressors. Previously believed to be merely cellular housekeepers, these molecules actually block cancer growth by binding to an important cancer-associated protein called KRAS. More than a quarter of

all human cancers are missing these RNAs; fully understanding their role could help doctors block KRAS function in skin, breast, ovarian, liver, and lung cancer, and other cancers. Another recent study announced a previously unknown oncogene that, when exposed to UV light, can drive the development of cutaneous squamous cell carcinoma and melanoma. This gene, called KNSTRN, may be one of the most commonly mutated oncogenes in the world and the driving force behind millions of human skin cancers.

Among Dr. Khavari's most important achievements is laying the foundation for the molecular treatment of an extremely rare and devastating skin disease called epidermolysis bullosa, or EB. In severe cases, EB patients experience the equivalent of third-degree burns in response to the slightest touch, and few patients live past the age of 30. In the mid-1990s, Dr. Khavari discovered new ways of applying then-nascent gene therapy techniques to correct genetic skin defects like EB, marking the first time this was shown to be possible. Building on this research and successful clinical trials, Stanford recently announced the first skin-based gene therapy that's been demonstrated to be safe and effective in humans.

Dr. Khavari's research, which has been extensively recognized by the National Institutes of Health, has been published in leading journals including Nature, Nature Genetics, Cell, Nature Medicine, and Science. Upcoming research priorities include defining the network of key regulators that control normal skin self-renewal and cancer; elucidating the key RNA-protein interactions that drive homeostasis and cancer; and developing an integrative understanding of genome regulation in health and disease. In addition to his research efforts, Dr. Khavari still actively practices medicine and teaches Stanford undergraduates, medical students, graduate students, and post-doctoral fellows. As Stanford's Dermatology Department chair, he leads a world-class faculty that's dedicated to transforming the field.

Biography

Dr. Paul Khavari earned his undergraduate degree at Stanford and his M.D. degree at Yale University. After completing his internship and residency training at Yale, he earned his Ph.D. at Stanford, where he also undertook his postdoctoral training. He is board certified in dermatology by the American Board of Dermatology and joined the Stanford faculty in 1993.

Dr. Khavari has been elected to the American Society for Clinical Investigation, the American Association of Physicians, and the National Academy of Medicine. He is the recipient of the U.S. Presidential Early Career Award for Scientists and Engineers and the Shannon Award from the National Institutes of Health. He has also received the American Dermatological Association Young Leader Award, the American Academy of Dermatology Marion B. Sulzberger Award, and the Society for Investigative Dermatology William Montagna Award.



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