



REVIEW ARTICLE

Volume, trend and citation analyses of skin related publications from 1966 to 2003

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Summary Research activities in the field of dermatology and skin biology have markedly improved our understanding of the physiology of skin and pathogenic mechanisms of cutaneous diseases. To evaluate the progress of such activities in a retrospective manner, we extracted more than 250,000 skin-related publications between 1966 and 2002 from the MEDLINE database and categorized them on the basis of the topics and experimental approaches. We observed that the annual number of publications in skin research had increased comparably with publications in lung or kidney research, and we identified several notable changes in research trends. To assess the impact of skin research on the biomedical community as a whole, we extracted from the PubMed database in excess of 3200 skin-related articles published between 1975 and 2003 in 19 highly ranked journals with impact factors greater than 10.0. Interestingly, two major research areas, immunology and cancer, appeared to dominate both clinical and basic science articles published in those top tier journals. From this collection of publications, we generated a list of the top 101 skin-related articles based on the citation numbers. Not only does our survey highlight past accomplishments, it also provides an important clue for predicting the future direction of skin research.

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1. Introduction

The specialties of dermatology and skin biology have witnessed progressive growth of overall research activities in the areas of both clinical and basic science. Such growth may be evident from marked increases in the numbers of papers being presented at annual meetings of the Society for Investigative Dermatology, European Society for Dermatological Research, and the Japanese Society for Investigative Dermatology. Moreover, many milestone discoveries have been made over the last two to three decades that have dramatically advanced our understanding of the fundamental biology of skin and pathophysiology of dermatological disease. To evaluate the outcome of skin research in a retrospective manner, we conducted a survey of skin-related publications using two public databases.

Literature surveys of dermatology articles have been reported previously. Based on the numbers of citations, the 200 most cited articles were identified from the 11,271 articles published in the *Journal of Investigative Dermatology* (*J Invest Dermatol*) between 1955 and 1986 [1]. By analyzing the papers published between 1945 and 1990 in one of 10 clinical dermatology journals (excluding *J Invest Dermatol*), Dubin et al. reported a list of 129 'landmark' clinical articles that were cited 100 or more times [2]. From a collection of skin-related articles published between 1981 and 1994 in one of 17 dermatology journals (including *J Invest Dermatol*), Dubin and Arndt ranked academic institutions based on the total numbers of citations [3]. By comparing citation numbers among the articles published from 1981 to 1986 in one of 24 dermatology journals (including the *J Invest Dermatol*), Stern and Arndt reported a list of 'top cited authors' in dermatology [4]. Although those surveys did provide interesting insights into the impact of skin relevant publications, they included only dermatology-targeted journals, thereby possibly omitting many breakthrough papers published outside the dermatology specialty. Moreover, none of the previous surveys was designed to determine whether research activities in the field of derma-

tology and skin biology might differ from those in other fields quantitatively or qualitatively. Therefore, we sought to obtain a more global view of the outcome of cutaneous research by extracting skin-relevant publications from the MEDLINE database (1965–2002) and the PubMed database (1975–2003). Our survey has revealed several interesting trends and hot areas of skin research in the past and it provides a list of the top 101 most cited skin related articles.

2. Volume and trend analyses of the MEDLINE database

2.1. Survey methods

To extract relevant publications in all areas of dermatology and skin biology, we searched the MEDLINE database (1966–2002) using the keyword of 'skin'. These papers were then categorized by various topics or disciplines using more specific search words, such as 'keratinocyte', 'cytokine', 'apoptosis', and 'transgenic mouse'.

2.2. Numbers of skin relevant publications

A total of 263,719 papers were identified in the MEDLINE database with the key word of 'skin'. An almost linear increase was observed in the annual number of publications from 1966 (2101 papers) to 2002 (11,587 papers) (Fig. 1). In the same database, we identified 301,656 papers with the keyword of 'lung', 295,996 papers with 'kidney', and 516,180 papers with 'heart'. The numbers of publications in these fields also increased at similar growth rates from 1966 to 2002. Thus, it appears that skin research has been comparable to lung or kidney research in the total volume as well as the growth rate of publications.

2.3. Changes in research trends

To categorize these publications, we searched the MEDLINE database with various keywords together

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