

# Achievements of dermatological research in Denmark and Israel: a comparative 10-year study

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## Abstract

Wide differences of achievement in dermatological research between Denmark and Israel have been reported, although the two countries are comparable in terms of academic dermatological structure. The aims of the present study were to document these differences by means of bibliometric analysis, and to attempt to elucidate the causes of these differences. Employing MEDLINE searches for the 10-year period 1988–97, quantitative and qualitative comparisons of the dermatological publications from these two countries were conducted. We found the achievements of Danish dermatological research to be superior to those of Israel, and suggest that the large proportion of case reports and reviews is one cause of the relatively low ranking of Israeli dermatological research efforts.

**Abbreviations:** Acta Derm Venereol = Acta Dermato-Venereologica; Am J Dermatopathol = American Journal of Dermatopathology; Arch Dermatol = Archives of Dermatology; Arch Dermatol Res = Archives of Dermatological Research; BJD = British Journal of Dermatology; Clin Dermatol = Clinics in Dermatology; Contact Derm = Contact Dermatitis; Dermatol = Dermatology; Dermatol Clinics = Dermatologic Clinics; General Urin Med = GenitoUrinary Medicine; J Cutan Pathol = Journal of Cutaneous Pathology; J Dermatol Surg Oncol = Journal of Dermatologic Surgery and Oncology; JAAD = Journal of the American Academy of Dermatology; JID = Journal of Investigative Dermatology; STD = Sexually Transmitted Diseases.

## Introduction

Measurement of the productivity of biomedical research is of increasing importance because of demands for quality control and cost-effectiveness by funding agencies.<sup>1–3</sup> The productivity of research may be estimated from the number of publications; however, an assessment of research productivity must also take into account the numbers of citations generated by the publications and the quality of the scientific journals in which the papers are published, expressed by the 'impact factor' (IF),<sup>4,5</sup> as measures of the quality of the papers. Whereas researchers from larger countries such as the United States and the United Kingdom dominate international academic medicine, because of the numbers of scientists working in these countries, medical researchers in smaller countries such as Denmark and Israel actually produce more publications per million population than do the US and the UK.<sup>6</sup> In fact, Denmark ranked eighth and Israel eighteenth among the top 25 countries with respect to the total number of citations generated by dermatological articles published in the period 1981–94.<sup>7</sup>

Because Denmark and Israel are comparable in terms of population size and dermatological infrastructure, we have found it of interest to evaluate Danish and Israeli dermatological

publications in terms of both quantity and quality over a 10-year period by means of bibliometric methods.

## Methods

Employing MEDLINE using a Silver Platter® search-engine for the years 1988–98, the total numbers of articles published in each year of the 10-year period 1988–97 were noted. In addition, the abstracts of the articles were scanned, the first authors of which were affiliated with Danish or Israeli departments of dermatology. Each article was classified as a case report or review (category 1), clinical study (category 2) or basic study (category 3).

Articles were weighted according to the journal in which they were published by means of the average of the IFs listed in the Science Citation Index for the years 1995, 1996 and 1997. To assess the relative weights of Danish and Israeli publications in terms of citation rate, the total impact factor (TIF)<sup>8</sup> was calculated by multiplying, for each journal, the IF by the number of publications from each country that appeared in that journal during a given year.

To compare the academic productivity of the dermatologists from each country in terms of dermatological publications, the dermatology activity index<sup>9</sup> was calculated as:

**Table 1** Numbers of published papers and activity indices

	All countries		Denmark			Israel		
	Total	Dermatology	Total	Dermatology	Activity index	Total	Dermatology	Activity index
1988	354 211	1985	2646	56	3.78	2550	39	2.73
1989	369 530	2250	2610	73	4.59	2585	28	1.77
1990	376 710	2674	2770	56	2.85	2745	40	2.06
1991	375 691	2728	2643	61	3.16	2724	41	2.07
1992	377 426	2849	2576	46	2.39	2931	45	2.05
1993	382 799	2833	2599	40	2.08	3049	41	1.81
1994	389 934	2973	2702	41	2.00	2922	42	1.89
1995	398 353	3078	2707	54	2.58	3156	28	1.16
1996	403 567	3260	2764	63	2.81	3579	28	0.96
1997	406 171	3125	2706	66	3.17	3313	31	1.22
Median	38 011	2841	2672	56	3.01	2990	40	1.85

No. of Danish or Israeli dermatological publications  
 × no. of world-wide publications in all medical disciplines [1]  
 No. of Danish or Israeli publications in all medical disciplines  
 × no. of world-wide dermatological publications [2]

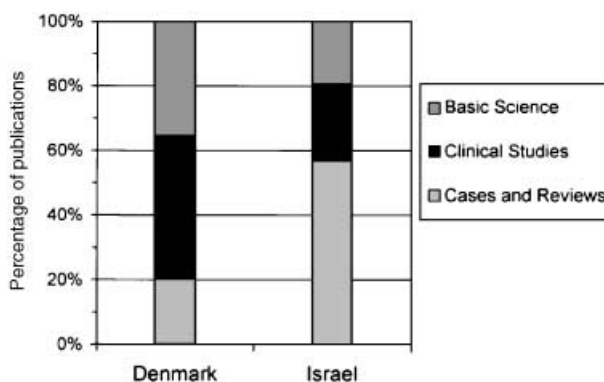
The data were then tabulated and analyzed by means of the  $\chi^2$ -test, employing the Stata 'intercooled' statistics program® (Stata Corporation, TX).

## Results

Listed in Table 1 for every year of the 10-year period 1988–97 are the total number of papers published during that year, the total number of dermatological publications, and the numbers of papers published by authors from Danish and Israeli departments of dermatology. In terms of numbers of publications, as expressed by the Danish and the Israeli dermatology activity indices, both Danish and Israeli departments of dermatology were more active than the world-wide average ( $P < 0.00001$ ). In addition, the Danish departments of dermatology were more active than were their Israeli counterparts ( $P < 0.00001$ ).

Another striking difference between the output of Danish and Israeli departments during the years 1988–97 is the distribution of published papers according to category (Fig. 1). Case reports and reviews accounted for only approximately one-fifth of the Danish publications, whereas papers of this category accounted for more than half of the Israeli publications. On the other hand, more than one-third of the Danish papers described basic studies, whereas fewer than one-fifth of the Israeli papers fell into this category. Finally, the proportion of Danish papers describing clinical studies was almost twice as large as the corresponding proportion of Israeli papers. These distributions of papers by category differ significantly ( $P < 0.00001$ ).

The 919 dermatological papers included in this study appeared in 139 journals; the numbers of papers appearing in



**Figure 1** Distribution of publications according to publication category

the 15 most cited dermatological journals are shown in Table 2. Here, too, a significant difference may be discerned between the papers published by Danish departments of dermatology and those published by their Israeli counterparts. More than two-thirds of the 556 papers published by Danish departments of dermatology appeared in the 15 most cited journals, whereas fewer than half of the 363 papers published by Israeli departments of dermatology appeared in these journals ( $P = 0.001$ ). Further analysis of the publications appearing in the 15 most cited dermatological journals is shown in Table 2. Weighting the importance of the publications by means of the TIF emphasizes the superiority of Danish (total impact: 488) over Israeli (total impact 224) dermatological research activities. Considering only the publications appearing in the 15 most cited journals, case reports and reviews account for nearly half of the total impact of Israeli publications, but for fewer than one-fifth of the total impact of Danish publications.

**Table 2** Numbers of articles in the 15 most cited journals

	Impact Factor	Denmark:				Israel:			
		total impact				total impact			
		No. Papers	All Categories	Category 1 <sup>a</sup>	Category 2 or 3 <sup>b</sup>	No. Papers	All Categories	Category 1 <sup>a</sup>	Category 2 or 3 <sup>b</sup>
JID	4.123	23	95	4	91	4	17	0	17
Arch Dermatol	2.210	12	27	9	18	7	15	9	6
STD	1.926	2	4	2	2	0	0	0	0
BJD	1.774	38	67	7	60	8	14	4	10
JAAD	1.694	30	51	14	37	66	112	61	51
Gen Urin Med	1.573	5	8	2	6	0	0	0	0
Arch Dermatol Res	1.282	25	32	3	29	3	4	0	4
J Cutan Pathol	1.256	3	4	3	1	2	3	1	1
Dermatol Clinics	0.968	3	3	2	1	0	0	0	0
J Dermatol Surg Oncol	0.950	1	1	0	1	1	1	1	0
Contact Derm	0.932	78	73	18	55	4	4	1	2
Am J Dermatopathol	0.924	0	0	0	0	20	18	4	15
Acta Derm Venereol	0.922	127	117	20	97	25	23	12	11
Dermatol	0.724	6	4	1	4	14	10	6	4
Clin Dermatol	0.642	3	2	1	1	4	3	0	0
Total		336	488	86	401	158	224	99	121

<sup>a</sup>Case reports or reviews; <sup>b</sup>clinical or basic studies.

## Discussion

In the present study, we describe a bibliometric assessment of dermatological research activity in Denmark and Israel. Wide differences of achievement in dermatological research have been reported between the two countries.<sup>7</sup> Thus, Denmark ranked eighth among the top 25 countries by the total number of citations of dermatological articles, whereas Israel ranked eighteenth; however, when the countries were ranked by the “blended” IF, defined as the country’s total number of citations divided by the total number of articles published from that country,<sup>10</sup> Denmark rose to sixth place and Israel fell to twenty-second place, suggesting a relatively low citation frequency of Israeli dermatology publications. Differences in dermatological infrastructure can only partly explain these differences. Thus, the number of dermatologists per 100 000 inhabitants was 3 and 5 for Denmark and Israel, respectively. Both countries have four university-affiliated dermatology departments, and the number of investigative dermatologists in Denmark is approximately 50 compared with 20 in Israel.

The purpose of the present study was to elucidate by means of bibliometric analysis the causes of the wide difference of achievement in dermatological research between the two countries. Our results show that, during the years 1988–97, both Danish and Israeli dermatologists published more papers than did the dermatologists of other countries, as judged by the activity indices of both countries, with the Danish dermatologists being significantly more active than their Israeli counterparts. During the years studied, 0.7% of

all indexed medical publications were within the field of dermatology; Danish dermatological publications constituted, on average, 2.0% of all Danish publications, whereas Israeli dermatological publications accounted for an average of 1.2% of Israeli publications.

Assessment of the quality of the papers demonstrates more clearly the superiority of Danish dermatological research. Employing the journal of publication as a measure of quality, it was found that 64% of the 556 Danish dermatological papers were published in the 15 top-ranked international dermatology journals, whereas only 43% of the 363 Israeli papers appeared in these journals.

Considering the TIF, which takes into account both the number of publications appearing in a given journal and the IF of that journal, the superior quality of the Danish dermatological papers is even more apparent; the TIF of the Danish papers was 2.3 times greater than that of the Israeli papers. This difference was not simply the result of the greater number of Danish dermatological publications, which was only 1.6 times greater than the number of Israeli papers. The IF of a journal is determined by the number of citations generated by the papers published in that journal; original papers are far more likely to be cited than are case reports and reviews.<sup>11</sup> Thus, of a TIF of 488 for Danish papers, 401 (82%) resulted from papers categorized as clinical studies or basic research, whereas the corresponding figures for Israel are only 121 of the 224 (54%). It is of special interest that, in four of the top-ranked journals listed in Table 2 (*Archives of Dermatology*, *Journal of the American Academy of Dermatology*,

*Acta Dermato-Venereologica*, and *Dermatology*), the proportion of the TIF that resulted from case reports and reviews exceeded that from clinical and basic science studies for Israeli publications. Similar proportions were not found for Danish publications.

Our findings must be interpreted with some reservations. First, because papers listed in Silver Platter are identified only with the department with which the first author is affiliated, the search did not identify as emanating from a department of dermatology a paper in which a member of a department of dermatology was a co-author whereas the first author was affiliated with another department. To assess the magnitude of this problem, we conducted a secondary search, employing as search criteria the names of the heads of dermatology departments in Denmark and Israel. (We chose to limit this search only to papers co-authored by heads of departments of dermatology, because the other members of these departments were far too numerous, and, especially for the earlier years of the 10-year period, were not all known to us.) In this way, we expected to find additional papers from departments of dermatology, the first authors of which were not members of these departments. This secondary search revealed only a small number of papers in which dermatologists participated who were not first authors, and therefore had been missed in our primary search; therefore, we conclude that, although our primary search based on first authors might not have revealed all publications originating from dermatology departments in Denmark and Israel, only a small number of publications were missed, and we appear to have underestimated equally the numbers of dermatological publications in Denmark and Israel.

Second, the correlation between citation frequency and research activity is uncertain, and enumeration of research papers and employment of the IF as a measure of the quality of research has indeed been questioned.<sup>5,12</sup> Citation analysis of individual publications might be more representative and preferable to the IF of the journal as a measure of research achievement;<sup>4</sup> however, citation analysis of the hundreds of individual papers published over a 10-year period from these two countries was not possible.

In conclusion, our data demonstrate the superiority, both quantitative and qualitative, of Danish dermatology research achievements over those of Israel, and suggest the large proportion of case reports and reviews to be a cause of the low ranking of Israeli dermatology research efforts.

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