

An Investigation on Vanadium-Implants and Dermatitis

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Abstract

Dermatitis by contact is a challenge for Vanadium implants. This review analysis had been conducted to understand the active authors, organizations, journals, and countries involved in the “Vanadium implants and dermatitis”. All published articles related to “Vanadium-implants and dermatitis” from “Scopus”, were analyzed using the Meta Analysis to develop analysis tables and visualization maps. This article had set the objective to consolidate the scientific literature regarding “Vanadium-implants and dermatitis” and also to find out the trends related to the same. The leading Journals were the Contact Dermatitis and British Medical Journal. The most active countries were the United States of America and Italy. The leading organization engaged in the research regarding this research domain was the North western Multidisciplinary Eczema Center, USA. The most active authors who had made valuable contributions related to Vanadium-implants and dermatitis was Cristaudo A.

Keywords: Vanadium-implants, Dermatitis, Material engineering, Review analysis, Meta Analysis,

1. Introduction

Vanadium implants are artificial medical devices for replacing missing or damaged biological structures in the human body. It's not only Vanadium but several other missing or damaged biological structure. Vanadium orthopedic implants, knee implants, dental implants (Zagury *et al.*, 2007) are various applications of Vanadium implants. The major issues associated with implants of Vanadium are the hypersensitivity and toxicity of the metal; cytotoxicity of Vanadium implants. Corrosion of Vanadium-implants is a negative feature associated with Vanadium implants and various types of surface engineering and surface coating can be conducted in Vanadium-implants to improve their performance and longevity. There is evidence for the improvement of the performance of the Vanadium implant through thermal and chemical modifications (MacDonald *et al.*, 2004).

The metal release can happen not only from implants but from metal-based ornaments like earrings based on Vanadium and may lead to dermatitis (Bocca *et al.*, 2007). Vanadium allergy can be expected with Vanadium implants and the allergic reactions due to Vanadium may even lead to failure of the implant. Proper allergy testing can reduce the chances of chronic dermatitis. There are evidence for the Vanadium skin allergy due to usage Vanadium pentoxide. Similarly the development of systematic dermatitis and implant failure.

In short, material engineering and surface engineering can play a significant role in improving the performance and life of Vanadium-implants along with measures for reducing toxicity and hypersensitivity of the metal. This review analysis will be a useful platform for future researchers by realizing the top researchers, organizations, and countries involved in research regarding Vanadium-implants and the associated dermatitis.

This article is arranged into four sections. The first section is the introduction, followed by the discussion of the methodology by which the research was conducted. The third section deals with results and discussion. The fourth section deals with the conclusion. The following research objectives and research questions were framed for conducting review analysis systematically.

1.1 Research Objectives

- a) To consolidate the literature regarding dermatitis and Vanadium-implants
- b) To find out the trends related to research in dermatitis and Vanadium-implants

1.2 Research Questions

- a) Who are the active researchers working on dermatitis and Vanadium -implants?
- b) Which are the main organizations and countries working on dermatitis and Vanadium-implants?
- c) Which are the main journals on dermatitis and Vanadium -implants?

2. Research Methodology

Scopus files had been used for this article. For the article selection, the Boolean used was TITLE-ABS-KEY(Vanadium dermatitis). All the tables in this paper were created by using Microsoft Excel and Meta Analysis. Grammarly was used for spelling and grammar checks. Mendeley was used for article review and citation. This paper had been inspired by review analysis in its presentation style, analysis, and methodology from the works.

3. Results and discussion

3.1 Results

This first round of search produced an outcome of 64 documents, in seven languages, out of which 54 documents were in English. The classification of document categories is shown in Table 1. For improving the quality of the analysis, we had selected only the peer-reviewed articles and all other documents had not been considered. Thus after using filters “Article” and “English” the second round search produced an outcome of 38 English articles (both open access and others) and had been used to conduct review analysis and visualization using Meta Analysis. The English research articles in this domain since 1974 had been shown in Table1.Co-authorship analysis of top authors had been shown in Table1. For a better presentation of the analysis, the parameters used were the minimum number of documents of an author as two and the minimum number of citations of authors as one. This combination plotted the map of 16 authors, in 6 clusters. The overlay visualization map of co-authorship analysis plotted in Table1, points out the major researchers with their strong co-authorship linkages and clusters involved. The citation analysis of top authors had been shown in table 1, along with co-authorship links. For the citation analysis, the parameters used were the minimum number of documents of an author as one and the minimum citations of an author as one.

Table 1: Highlights of most active authors

Description	Authors	Documents	Citations	Average citations per documents	Link strength
Authors with the highest publication and co-authorship links	Cristaudo A	4	79	20	28
Authors with the highest citations	Elves E.M	1	177	177	3
	Kemp H.B.S	1	177	177	3
	Scales J.T	1	177	177	3
	Wilson J.N	1	177	177	3

In Co-occurrence analysis, we had used all keyword analyses, by keeping the minimum number of occurrences of a keyword as 10. This combination plotted the map of 22 thresholds, in two clusters. The overlay visualization of co-occurrence analysis of keywords has been shown in Table 3. The leading organizations engaged in research on “dermatitis and Vanadium -implants” had been found out by the volume of publications and citation analysis, the parameters used are the minimum number of documents of an organization as one and the minimum number of citations of organizations as one. The leading organization in the research regarding “dermatitis and Vanadium -implants”, with the highest number of publications and citations, was the Northwestern Multidisciplinary Eczema Center (Refer to table 2).

Table 2: Highlights of the most active organization

Organizations	Country	Documents	Citations	Average Citations per document
North Western Medicine Multidisciplinary Eczema Center	United States of America	2	43	21.5

Co-authorship analysis of the countries engaged in the research on “dermatitis and Vanadium -implants” had been shown in Table 3. The overlay visualization map of co-authorship analysis plotted in Table 3, points out the main countries with their strong co-authorship linkages and clusters involved. The citation analysis of top countries had been shown in table 3, along with co-authorship links. For the citation analysis, the parameters used were the minimum number of documents of a country as one and the minimum citations of the country as one.

Table 3: Highlights of Active Countries

Description	Country	Documents	Citations	Average citations
The country with the highest publication, citations, and co-authorship links	United States of America	13	176	13.5
The country with the highest citations	Italy	9	248	27.5

The most active countries in this research domain were the United States of America and Italy with the highest number of publications, and citations respectively.

Link analysis and citation analysis were used to identify the most active journal in this research domain. We have taken the parameters of the minimum number of documents of a journal as one and the minimum number of citations of a journal as one for the link analysis and citation analysis. Highlights of the most active and relevant journals related to “dermatitis of Vanadium -implants” are shown in table 4. Table 4 shows the journal activity of this research domain through parameters of publication volume, citations, and co-authorship linkages.

Table 4: Analysis of journal activity

Description	Journal details	Documents	Citations	Average citations per documents	Links
Journal with the highest publications and citations	Contact Dermatitis	12	145	12	7
Journal with highest co-authorship	British Medical Journal	1	177	177	3

From the above discussion regarding the review patterns in the research regarding Vanadium -implants, and dermatitis, this research had observed a gradual increase in research interest regarding Vanadium -implants, and dermatitis from the starting of the millennium, and the momentum is going on positively. This points out the relevance and potential of this research domain (Refer to Table 2). The most active author in this research domain was Cristaudo A with the highest publication and co-authorship links (Refer to table 1). The overlay analysis of top countries researching on dermatitis and Vanadium-implants indicates that the United States of America was the leading country relating to the highest number of publications, and co-authorship links; and Italy leading in the citations (Refer to Table 5). The top journals of this research domain were identified as the Contact Dermatitis and British Medical Journal. From these wide sources of information, researchers can focus on top journals where they can identify the most relevant and highly cited articles regarding dermatitis of Vanadium-implants.

4. Conclusion

Vanadium -implants, and dermatitis was an interesting research domain and the most active journals related to this research domain were the Contact Dermatitis and British Medical Journal. The most active countries were the United States of America and Italy. The leading organization engaged in the research regarding this research domain was the Northwestern Multidisciplinary Eczema Center, USA. The most active authors who had made valuable contributions related to Vanadium-implants and dermatitis was Cristaudo A. This research domain offers a new avenue for researchers and future research can be on innovations in Vanadium-implants and dermatitis.

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