

A Review on Platinum-Based Ortho-Implants

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Abstract

Platinum is a widely used metal for ortho implants. Thereview analysis had been conducted to understand the active authors, organizations, journals, and countries involved in the research domain of “Platinum ortho-implants”. All published articles related to “Platinum ortho-implants” 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 “Platinum ortho-implants” and also to find out the trends related to the same. The leading Journals were the Organometallics and Journal of American Chemical Society. The most active country was the United States of America. The leading organization engaged in the research regarding Platinum-based ortho-implants was the University of Barcelona, Spain. The most active authors who had made valuable contributions related to Platinum-based ortho-implants were Van Koten G, Fraser A, and Spek A.L.

Keywords: Platinum, Ortho-implants, Material engineering, Review analysis, Meta Analysis,

1. Introduction

Ortho implants are a very popular type of implant. Medical implants are engineered medical devices to replace the non-performing or damaged biological structure. Different types of metals Platinum, Titanium, Steel are used to create orthopedic implants. Platinum had been used for diversified orthopedic implants. Platinum is widely used for breast implants (Maharaj, 2008)(Maharaj, 2007)(Maharaj, 2004); cochlear implants (Durisin *et al.*, 2014)(Eisenberg *et al.*, 2000); dental implants (Jacobs and Göttingen, 1974); for glaucoma surgery (Muldoon, Ripple and Wilder, 1951); eyelid implants based on platinum (Schrom *et al.*, 2005). However several health issues are associated with Platinum-based orthopedic implants like allergic reactions of platinum implants (Lykissa and Maharaj, 2006b)(Lykissa and Maharaj, 2006a). There are also concerns associated with platinum implants and urinary platinum (Nuttall, Gordon and Ash, 1994). (Schierl *et al.*, 2014). However, contradictory studies are highlighting the mis concepts of hypersensitivity and health issues associated with Platinum-based implants (Arepalli, Bezabeh and Brown, 2002)(Lane, 2006)(Brook, 2006)(Wixtrom, 2007).

The adversities of toxicity and hypersensitivity of the platinum implants can be reduced by Material engineering and surface engineering. Future research can also be on surface coatings by using, metal implants using Platinum. This review analysis will be a useful platform for future researchers by realizing the top researchers, organizations, and countries involved in research regarding Platinum-implants.

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 Platinum-based ortho-implants
- b) To find out the trends related to research in Platinum-based ortho-implants

1.2 Research Questions

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

2. Research Methodology

Scopus files had been used for this article. For the article selection, the Boolean used was TITLE-ABS-KEY(Platinum-Ortho). This paper had used Microsoft Excel, Meta Analysis, Mendeley and Grammarly for analysis and review of this article. 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 603 documents, in eight languages, out of which 575 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 550 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 1924 had been shown in Table 1. Co-authorship analysis of top authors had been shown in Table 1. For a better presentation of the analysis, the parameters used were the minimum number of documents of an author as five and the minimum number of citations of authors as one. This combination plotted the map of 29 authors, in 12 clusters. The overlay visualization map of co-authorship analysis plotted in Table 1, 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	Van Koten G	17	579	34	82
Authors with the highest citations	Frustner A	2	806	403	3
Authors with the highest co-authorship links	Spek A.L	16	564	34	84

In Co-occurrence analysis, we had used all keyword analyses, by keeping the minimum number of occurrences of a keyword as 25. This combination plotted the map of 25 thresholds, in three clusters. The overlay visualization of co-occurrence analysis of keywords has been shown in Table 2. The leading organizations engaged in research on “Platinum-based ortho-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 organizations in the research regarding “Platinum-based ortho-implants”, with the highest number of publications and citations, were the University of Barcelona, Spain (Refer to table 2).

Table 2: Highlights of the most active organization

Organizations	Country	Documents	Citations	Average Citations per document
University of Barcelona	Spain	19	577	30.5

Co-authorship analysis of the countries engaged in the research on “Platinum-based orthopaedic-implants” had been shown in Table3. The overlay visualization map of co-authorship analysis plotted in Table3, 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	Link strength
The country with the highest publication, citations, and co-authorship links	United States of America	79	3733	38

The most active country in this research domain was the United States of America, with the highest number of publications, links, and citations.

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 “Platinum-based ortho-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 links	Organometallics	53	2050	38.7	77
Journal with highest citation	Journal of American Chemical Society	27	2527	96	35

From the above discussion regarding the review patterns in the research regarding Platinum-based ortho-implants, this research had observed a gradual increase in research interest regarding Platinum-based ortho-implants 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 authors in this research domain were Van Koten G, Frustner A and Spek A. L with the highest publication, citations, and links respectively (Refer to table 1). The overlay analysis of top countries researching Platinum orthopaedic-implants indicates that the United States of America was the leading country relating to the highest number of publications,

citations, and co-authorship links (Refer to Table 5). The top journals of this research domain were identified as the Organometallics and Journal of American Chemical Society. From these wide sources of information, researchers can focus on top journals where they can identify the most relevant and highly cited articles regarding Platinum-based ortho-implants.

4. Conclusion

Platinum-implants was an interesting research domain and the most active journals related to this research domain were the Organometallics and Journal of American Chemical Society. The most active country was the United States of America. The leading organization engaged in the research regarding Platinum-based ortho-implants was the University of Barcelona, Spain. The most active authors who had made valuable contributions related to Platinum-based ortho-implants were Van Koten G, Frustner A and Spek A.L. This research domain offers a new avenue for researchers and future research can be on innovations in Platinum ortho-implants.

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