

# The Review Paper on Platinum-Based Dental Implants

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## Abstract

A diversified set of metals are used for dental implants. The review analysis had been conducted to understand the active authors, organizations, journals, and countries involved in the research domain of "Platinum dental implants". All published articles related to "Platinum dental 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 dental implants" and also to find out the trends related to the same. The leading Journals were the Journal of Dental Research, Australian Dental Journal, and International Journal of Hygiene and Environmental Health. The most active country was the United States of America. The leading organization engaged in the research regarding Platinum-based dental implants was the Nagasaki University, Japan. The most active authors who had made valuable contributions related to Platinum-based dental implants were Tanaka Y., Hisatsune K; and Tuntiprawon M and Wilson P.R.

**Keywords:** Platinum, Dental implants, Material engineering, Review analysis, Meta Analysis,

## 1. Introduction

Medical implants are engineered medical devices to replace the non-performing or damaged biological structure. However several health issues are associated with Platinum-based implants like allergic reactions of platinum implants (Lykissa and Maharaj, 2006b)(Lykissa and Maharaj, 2006a). There are contradictory studies 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).

Platinum had been used for diversified types of dental implants(Jacobs and Göttingen, 1974). One of the main side effects of platinum dental implants is the issues associated with urinary platinum among occupationally unexposed groups (Nuttall, Gordon and Ash, 1994). (Schierl *et al.*, 2014)(Begerow *et al.*, 1999). Similarly, contact allergy can be resulted in patients using Platinum-based dental implants due to ion release from platinum-based dental alloys (Čelebić *et al.*, 2006). Recent studies had found that the addition of Platinum Nanoparticles can enhance the properties of dental porcelain (Fujieda *et al.*, 2012)(Jacobs and Göttingen, 1974)(Ji and Marquis, 1989). Moreover, the tin oxide coating was found effective with Platinum particles used for strengthening dental porcelain(McLean and Sced, 1976)Platinum is also used for dental filling in dentistry (Iavicoli *et al.*, 2004).

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

This review paper was 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 without bias and systematically.

## 1.1 Research Objectives

- To consolidate the literature regarding Platinum-based dental implants
- To find out the trends related to research in Platinum-based dental implants

## 1.2 Research Questions

- Who are the active researchers working on Platinum-based dental implants?
- Which are the main organizations and countries working on Platinum-based dental implants?
- Which are the main journals on Platinum-based dental implants?

## 2. Research Methodology

Scopus files had been used for this article. For the article selection, the Boolean used was TITLE-ABS (Platinum-Dental). 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 230 documents, in 11 languages, out of which 201 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 156 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 1927 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 two and the minimum number of citations of authors as one. This combination plotted the map of 14 authors, in four 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 and links	Tanaka Y.	4	65	16.3	17
	Hisatsune K.	4	56	14	16
Authors with the highest citations	Tuntiprawon M	1	145	145	1
	Wilson P.R	1	145	145	1

In Co-occurrence analysis, we had used all keyword analyses, by keeping the minimum number of occurrences of a keyword as 15. This combination plotted the map of 27 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 dental 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 dental implants”, with the highest number of publications and citations, were the Nagasaki University, Japan(Refer to table 2).

Table 2: Highlights of the most active organization

Organizations	Country	Documents	Citations	Average Citations per document
Nagasaki University	Japan	6	142	24

Co-authorship analysis of the countries engaged in the research on “Platinum-based dental 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	41	736	13

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 dental” 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	Journal of Dental Research	9	117	13	5
Journal with the highest citation	Australian Dental Journal	3	202	67	3
Journal with the highest links	International Journal of Hygiene and Environmental Health	3	34	11.3	10

From the above discussion regarding the review patterns in the research regarding Platinum-based dental implants, this research had observed a gradual increase in research interest

regarding Platinum-based dental 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 Tanaka Y., Hisatsune K; and Tuntiprawon M and Wilson P.R. with the highest publication and links; and citations, respectively (Refer to table 1). The overlay analysis of top countries researching Platinum dental 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 Journal of Dental Research, Australian Dental Journal, and International Journal of Hygiene and Environmental Health. 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 dental implants.

#### 4. Conclusion

Platinum-based dental implants was an interesting research domain and the most active journals related to this research domain were the Journal of Dental Research, Australian Dental Journal, and International Journal of Hygiene and Environmental Health. The most active country was the United States of America. The leading organization engaged in the research regarding Platinum-based dental implants was the Nagasaki University, Japan. The most active authors who had made valuable contributions related to Platinum-based dental implants were Tanaka Y. Hisatsune K; and Tuntiprawon M and Wilson P.R. with the highest publication and links; and citations, respectively. This research domain offers a new avenue for researchers and future research can be on innovations in Platinum-based dental implants.

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