

Bibliographic coupling in toxicology journals

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Explores the phenomena of bibliographic coupling in nine core journals in toxicology indexed in the Toxicology Information Online (TOXLINE), the international database. A total of 1218 articles were taken for analysis using Software Package for Social Sciences (SPSS). The journal *Toxicology* had highest percentage of bibliographically coupled articles i.e. 15.3%. There was no fixed trend in the development of number of bibliographically coupled articles. The number of coupled articles decreased as the coupling strength increased.

Introduction

In all kinds of technical writings, citations play an important role. Citations are frozen footprints in the landscape of scholarly achievements and bear witness to the passage of ideas¹. The concept of bibliographic coupling is introduced by Kessler². Bibliographic coupling occurs when two works refer a common third work in their bibliographies. Small introduced the concept of co-citations and compared the co-citation analysis with that of bibliographic coupling³. Michael M. Kessler's work on bibliographic coupling in 1963 was a milestone⁴. In later years bibliographic coupling was essentially displaced by co-citation clustering as a tool for mapping science. After another fifteen years, bibliographic coupling assumed a highly significant role in information retrieval when the Institute for Scientific Information (ISI) implemented "Related Records". The application of bibliographic coupling first appeared in the CD ROM version of Science Citation Index (SCI) and Social Sciences Citation Index (SSCI) in 1988⁴. The impact of bibliographic coupling on information retrieval is difficult to quantify. In bibliometric terminology the citing articles create a research front, when a cluster of cited documents is called an intellectual base⁵.

Objectives

- To analyse bibliographic coupling in nine core journals during 1998 to 2003; and
- To compute the strength of bibliographic coupling.

Methodology

The sample for the study is selected by searching various entries of articles and their citations indexed in the online database on toxicology, TOXLINE produced by the National Library of Medicine, Washington.

Analysis

A total of 1218 articles published in the 9 core journals during the year 1998 to 2003 are taken for analysis using SPSS package.

Discussion

Bibliographic coupling in Toxicology journals

Out of the 1218 articles published in the 9 core journals in toxicology during the year 1998 to 2003, 68 pairs of articles had common citation entries.

The journal *Toxicology* had a total of 131 articles, 10 pairs i.e. 20 articles published the highest percentage of articles (15.3%) which had common citations. The next positions were occupied by *Environmental Toxicology* (15.22%) and *Journal of Applied Toxicology* (14.87%) followed by *Chemosphere* (12.5%), *Ecotoxicology* (11.54%), *Chemical Research in Toxicology* (9.44%), *Toxicon* (6.52%) and *International Journal of Toxicology* (4.8%). The journal *Neurotoxicology* had the minimum

Table 1—Bibliographic coupling in toxicology journals

S. No.	Name of the journal	No. of pairs of articles having coupling	Total number of articles	% from the total articles of the journal
1	<i>Chemical Research in Toxicology</i>	16	339	9.44
2	<i>Environmental Toxicology</i>	14	184	15.22
3	<i>Toxicology</i>	10	131	15.3
4	<i>Journal of Applied Toxicology</i>	9	121	14.87
5	<i>Chemosphere</i>	7	112	12.5
6	<i>Ecotoxicology</i>	6	104	11.54
7	<i>Toxicon</i>	3	92	6.52
8	<i>International Journal of Toxicology</i>	2	84	4.8
9	<i>Neurotoxicology</i>	1	51	3.92
	Grand Total	68	1218	

number of bibliographically coupled articles (3.92%). The bibliographic coupling in journals and their percentage from total articles of the journal are provided in the Table 1.

Bibliographic coupling during different years

The number of bibliographically coupled articles during 1998 was minimum (5) which showed an increase to 7 immediately in 1999 and then to 9 in the next year in 2000. The next year 2001, there was a sharp increase to 15 in the number of bibliographically coupled articles. But in the next year 2002, the number of bibliographically coupled articles were reduced to 12 and the year 2003 showed an increase in the number to 20. The details of bibliographic coupling during different years are provided in the Table 2.

Strength of bibliographic coupling

Among the bibliographically coupled articles, maximum pair of articles (48.52%) were published in toxicology journals during 1998 to 2003 had only one common citation entry. The number of articles coming under each category on the basis of their bibliographic coupling strength are provided in the Table 3. It is observed that the number of coupled articles decreased as the coupling strength increased. Only one pair of article was available where there are five common citation entries. 18 pairs of articles were reported when the bibliographic coupling strength was 2, i.e. (26.5%), 9 pairs of articles were present when the bibliographic coupling strength was 3, i.e. (13.23%), 7 pairs of articles were present when the bibliographic coupling strength was 4, i.e. (10.27%).

Table 2—Bibliographic coupling during different years

Years	No. of pairs of articles having bibliographic coupling	Total articles	% from the total articles
1998	5	53	18.9
1999	7	62	22.6
2000	9	270	6.7
2001	15	245	12.24
2002	12	275	8.73
2003	20	313	12.8

Table 3—Strength of bibliographic coupling

Strength of bibliographic coupling	Total articles	% from the total articles
1	33	48.53
2	18	26.47
3	9	13.24
4	7	10.29

Findings

The journal *Toxicology* had highest percentage of articles (15.3%) which had common citations, i.e. 10 pairs.

The journals *Toxicology*, *Environmental Toxicology*, *Journal of Applied Toxicology*, *Chemosphere*, *Ecotoxicology* and *Chemical Research in Toxicology* had published articles whose basic subjects were mostly similar nature in individual volumes, because of high rate of common bibliographic entries. But the rest of the journals *Toxicon*, *International Journal of Toxicology*

and *Neurotoxicology* had published articles whose subject coverage were mostly different in nature in individual volumes, because of their low rate of common bibliographic entries which gave us an indication that the articles published in individual volumes were mostly distantly related.

Every year some of the articles published in the different journals of *Toxicology* had little similarities in relation to their subject content. There was no fixed trend in the development of number of bibliographically coupled articles in different journals in *Toxicology*.

The maximum pair of articles (33) were reported when the bibliographic coupling strength was 1. The number of coupled articles decreased as the coupling strength increased. Only one pair of article was available when there were five common citation entries.

Few of the articles had perhaps some similarities and the rest of the articles were not related to their original subject content. The strength of bibliographic coupling was very weak because only few articles were having more than 5 common citations i.e. each of the volumes of the journals, published articles are of trans-

disciplinary nature which belong to different areas of research. Hence the diversity and transdisciplinary nature of Toxicology can be evident from this analysis.

Conclusion

Bibliographic coupling is valuable in all fields of research since it helps the researcher to find related research done in the past. It operates on a similar principle to that of co-citation, but in a way it is its mirror image.

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