



## Research Article

# Changes in Publication-Based Academic Interest in Local Anesthetics Over the Past 50 Years



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## ABSTRACT

**Purpose:** To present the history of changes in academic interest in local anesthetics quantitatively.

**Methods:** The changes in publication-based academic interest in local anesthetics were assessed using information from the database of PubMed. The assessment was mostly based on the following indices: general popularity index (GPI), representing the proportion of articles on a drug relative to all articles in the field of regional anesthesia, and specific popularity index (SPI), representing the proportion of articles on a drug relative to all articles in one of the four forms of regional anesthesia: local anesthesia, spinal anesthesia, epidural anesthesia, and peripheral nerve blocks.

**Results:** The most important general feature of the changes in publication-based academic interest in local anesthetics for the past 50 years was the concentration of this interest on a very limited number of drugs. By 2010–2014, only three anesthetics demonstrated the GPI value above 4.0: bupivacaine (10.1), lidocaine (10.0), and ropivacaine (4.6). All other local anesthetics had GPI declining mostly to less than 1.0 (2010–2014). The rate of change in publication-based academic interest was very slow in both its increase and decline. The most profound change in publication-based academic interests was caused by the introduction of bupivacaine. During a 20-year period (from 1965–1969 to 1985–1989), bupivacaine's GPI increased from 1.3 to 12.9.

**Conclusion:** A slowly developing concentration of publication-based academic interest on a very limited number of local anesthetics was the dominant feature related to this class of anesthetic agents.

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## Introduction

Publication-based academic interest in a specific drug may be assessed according to the number of articles on this drug in biomedical journals. We have previously developed a number of scientometric indices to characterize progress in drug development.<sup>1–4</sup> Two of these indices—general popularity index (GPI) and specific popularity index (SPI)—presented as a percentage of articles on a specific anesthetic among all articles related to regional anesthesia (GPI) or to a specific area of it (SPI) were used here.

Changes in publication-based academic interest are mostly determined by two factors: introduction of new agents and discontinuation of the previously used ones. Those factors may be dependent on a particular local anesthetic's advantages and disadvantages in

comparison with other local anesthetics as reflected in academic publications and might also be influenced by economic factors including price and drug availability. The introduction of a new anesthetic or the discovery of an additional advantage (or disadvantage) of an old drug results in the rise of new publications related to a certain category of drugs. One could also speculate that the academic interest in certain drugs reflects the degree of their clinical use.

The aim of this study was to characterize the history of changes in publication-based academic interest related to local anesthetics for the past 50 years.

## Methods

Changes in publication-based academic interest related to local anesthetics were assessed by analyzing the PubMed database, available through the National Library of Medicine's PubMed Web site ([www.ncbi.nlm.nih.gov/pubmed](http://www.ncbi.nlm.nih.gov/pubmed)), which covers more than 24 million journal articles in biomedicine. PubMed provided very consistent retrievals of information over the past 50 years of our assessment.

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**Table 1**  
GPI<sup>a</sup> in the field of regional anesthesia<sup>b</sup>

Years	GPI for individual local anesthetics <sup>c</sup>												
	Cocaine	Procaine	Dibucaine	Tetracaine	Lidocaine	Mepivacaine	Prilocaine	Bupivacaine	Etidocaine	Chloroprocaine	Articaine	Ropivacaine	Levobupivacaine
1965-1969	1.0 (12) <sup>d</sup>	4.2 (53)	1.0 (12)	3.3 (41)	18.4 (230)	6.9 (86)	4.4 (55)	1.3 (16)	–	–	–	–	–
1970-1974	1.0 (20)	3.5 (70)	0.5 (11)	2.4 (48)	17.7 (358)	4.4 (88)	2.5 (51)	5.7 (115)	0.6 (13)	–	–	–	–
1975-1979	1.0 (28)	2.6 (73)	0.4 (12)	1.8 (50)	13.0 (364)	2.3 (64)	1.0 (28)	9.3 (262)	2.5 (71)	0.7 (20)	–	–	–
1980-1984	0.4 (15)	2.8 (101)	0.4 (14)	1.0 (36)	9.8 (355)	1.8 (65)	0.7 (25)	10.6 (383)	1.0 (37)	1.8 (65)	–	–	–
1985-1989	0.6 (31)	1.5 (79)	0.3 (15)	1.4 (72)	10.5 (540)	1.3 (68)	1.1 (57)	12.9 (663)	0.5 (27)	0.7 (36)	0.1 (5)	–	–
1990-1994	0.9 (65)	1.4 (101)	0.2 (13)	1.2 (86)	13.5 (971)	1.4 (101)	1.3 (94)	12.5 (900)	0.4 (29)	0.7 (50)	0.2 (14)	0.5 (38)	–
1995-1999	0.6 (51)	0.7 (63)	0.2 (14)	1.0 (85)	14.6 (1257)	1.8 (156)	1.3 (112)	12.9 (1108)	0.2 (16)	0.4 (34)	0.2 (17)	1.3 (113)	0.2 (17)
2000-2004	0.5 (47)	0.7 (62)	0.1 (9)	0.6 (56)	12.6 (1183)	1.7 (160)	1.0 (94)	12.1 (1141)	0.1 (9)	0.3 (28)	0.4 (38)	4.9 (457)	1.0 (94)
2005-2009	0.2 (22)	0.5 (61)	<0.1 (3)	0.3 (34)	11.3 (1268)	1.4 (157)	0.8 (90)	11.4 (1272)	<0.1 (2)	0.3 (34)	0.9 (100)	5.0 (565)	2.0 (224)
2010-2014	0.2 (27)	0.4 (56)	<0.1 (2)	0.2 (27)	10.0 (1322)	0.9 (122)	0.8 (107)	10.1 (1355)	–	0.2 (27)	1.0 (132)	4.6 (622)	2.0 (267)

<sup>a</sup> GPI is the percentage of articles on a specific anesthetic among all articles related to the field of regional anesthesia published over the same 5-year period.

<sup>b</sup> Field of regional anesthesia that includes local anesthesia, spinal anesthesia, epidural anesthesia, and peripheral nerve blocks.

<sup>c</sup> Local anesthetics in injectable forms.

<sup>d</sup> Raw number of articles is in parenthesis.

The main advantage of the retrievals is the inclusion in the PubMed searches of medical subject heading (MeSH) that provides an exceptional focus and precision. The number of articles related to a specific local anesthetic published in biomedical journals presented as a proportion of all articles related to the specific area was taken as a reflection of academic interest in this drug. The GPI and SPI were used to assess such interest.<sup>2,3</sup> GPI is the percentage of articles on a specific anesthetic among all articles related to the field of regional anesthesia published over the same 5-year interval (the raw number of publications is also presented, Table 1). The regional anesthesia field included the following PubMed categories: local anesthesia (Anesthesia, Local [MeSH term]), spinal anesthesia (Anesthesia, Spinal [MeSH term]), epidural anesthesia (Anesthesia, Epidural [MeSH term]), and peripheral nerve blocks (Nerve Block [MeSH term]). For the calculation of GPI, the number of articles in all these four categories was summed. SPI is the percentage of articles on an anesthetic among all articles on only one of the four specific categories: local anesthesia, spinal anesthesia, epidural anesthesia, or peripheral nerve blocks.

Searches were performed by placing the name of a local anesthetic into the search box. In addition to the name of a drug, the name of a PubMed category of anesthesia (MeSH term) was also placed into the search box (such as “lidocaine AND Anesthesia, Spinal”). Filters for

language (English) were used. All types of articles were taken into account. The rate of change in academic interest in a specific drug was assessed by the degree of rise (or decline) of these two indices. In addition, the time period (number of years) between the publication of the 10th article and the 100th article was also calculated.

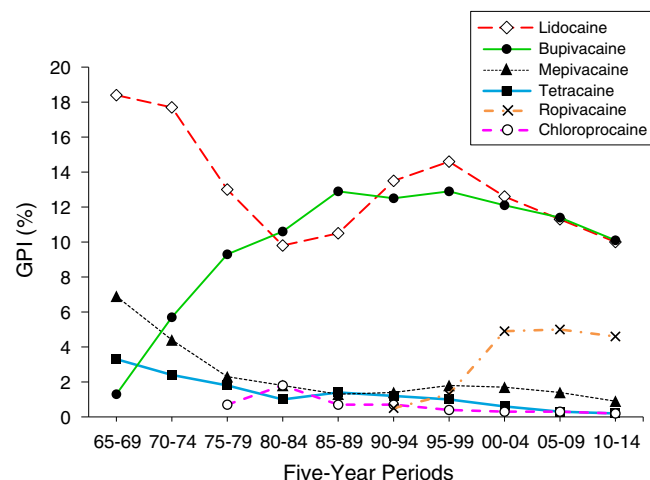
A local anesthetic was selected for analysis if the following two criteria were satisfied:

1. It was previously approved by the FDA in injectable form as indicated in the FDA Approved Drug Products database (accessible through the Drugs@FDA Web site on June 25, 2015).
2. It had maximal GPI of  $\geq 1.0$  during any of the 5-year periods since 1965.

As a result, the following drugs were selected: cocaine, procaine, dibucaine, tetracaine, lidocaine, mepivacaine, prilocaine, bupivacaine, etidocaine, chloroprocaine, articaine, ropivacaine, and levobupivacaine.

## Results

Table 1 representing the GPI index (and also raw number of articles) indicates 13 local anesthetics with a GPI index of at least 1.0 at



**Fig. 1.** Time course of GPI for local anesthetics: lidocaine, bupivacaine, mepivacaine, tetracaine, ropivacaine, and chloroprocaine. The GPI is the percentage of articles on a specific anesthetic among all articles related to the field of regional anesthesia that include local anesthesia, spinal anesthesia, epidural anesthesia, and peripheral nerve blocks.

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