Jeff Aronson &

Robin Ferner

Wye speling matturs

Nominal ISOMERs
(Incorrect Spellings Of Medicines Eluding Researchers)

Variants in the spellings of names of medicines in PubMed

Nominal ISOMERs (Incorrect Spellings Of Medicines Eluding Researchers)—variants in the spellings of drug names in PubMed: a database review

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ABSTRACT

OBJECTIVE

To examine how misspellings of drug names could impede searches for published literature.

DESIGN

Database review.

DATA SOURCE

PubMed.

REVIEW METHODS

The study included 30 drug names that are commonly misspelt on prescription charts in hospitals in Birmingham, UK (test set), and 30 control names randomly chosen from a hospital formulary (control set). The following definitions were used: *standard names*—the international non-proprietary names, *variant names*—deviations in spelling from standard names that are not themselves standard names in English language nomenclature, and *hidden reference variants*—variant spellings that identified publications in textword (tw) searches of PubMed or other databases, and which were not identified by textword

together accounted for 2924 (74%) of the variants. Amitriptyline (8530 hits) yielded 18 hidden reference variants (179 (2.1%) hits). Names ending in "in," "ine," or "micin" were commonly misspelt. Failing to search for hidden reference variants of "gentamicin," "amitriptyline," "mirtazapine," and "trazodone" would miss at least 19 systematic reviews. A hidden reference variant related to Christmas, "No-el", was rare; variants of "X-miss" were rarer.

CONCLUSION

When performing searches, researchers should include misspellings of drug names among their search terms.

Introduction

Variant spellings of drug names can cause confusion, which could lead to serious harm.[1,2] Nevertheless, these names are expected to be correctly spelled and indexed in published work. We have tested this assumption, which underlies many search strategies for systematic reviews and meta-analyses of therapeutic interventions.

Girils are great!

Surely you mean girls?

What about us girils?

FILLERS

WHEN I USE A WORD..

BMJ 1996; 313 doi: 10.1136/bmj.313.7066.1201 (Published 9 November 1996)

Cite this as: *BMJ* 1996;313:1201

Jeff Aronson

Ae, ae, ae!

A young man came in 12 hours after taking 100 paracetamol tablets. We gave him acetylcysteine. He had no major symptoms or signs, but there were a few petechiae over the shoulders and his platelet count was $9x10^9$ /l. I searched Medline: thrombocytopenia in paracetamol overdose does occur and is a poor prognostic sign (Am J Hematol 1994;45:258-9). Of course, I didn't look for just <paracetamol> AND <thrombocytopenia>, but for <paracetamol OR acetaminophen> AND <thrombocytopenia OR thrombocytopaenia>. It is always important, when searching, to remember that drugs may have alternative names—but how often do you need to remember that a word may be misspelled?

Of 5169 papers on thrombocytopenia published in 1990–5, 55 (1.1%) used the wrong spelling -paenia; the figure for the previous 24 years was 155 (0.8%) of 10 445 papers (χ^2 = 3.33; P(about)0.07). So, authors and editors are getting it wrong, and perhaps more often now than before. In contrast, the incorrect spelling "gentamycin" occurred in 10.5% of 7893 papers in 1966–89 and in only 8.7% of 2618 papers in 1990–5 (P(about)0.006); things may be bad for gentamicin, but my two minutes' worth of computerised research suggests that they are at least getting better.

the incorrect spelling "gentamycin" occurred

in 10.5% of 7893 papers in 1966–89 and in only 8.7% of 2618 papers in 1990–5

Mizspellin and Medline

Joel G Ray, Marian J Vermeulen

Literature searches, whether conducted for patient care or for construction of a systematic overview, depend on at least two factors to be comprehensive. These are, firstly, use of an inclusive set of search strategies,[1] and, secondly, correct entry and referencing of published material within the database.[2] There is limited evidence on the accuracy of information within electronic databases. We assessed the accuracy of entries in Medline by searching for misspelt textwords.

Methods and results

We conducted a literature search of 10 commonly used medical terms selected from the subject index of the *ACP Journal Club* (May/June 1996 issue).[3] We intentionally misspelt each term by altering one or two letters within the word (for example, myocardial infarction became myocardial infraction). We searched for the terms as textwords in Medline from 1966 to November 1996 but did not use medical subject headings (MeSH). We analysed the number of times a misspelt term occurred within an article's title, abstract, or both and the proportion of misspelt citations that might be missed if a search was conducted using only a textword search with the correctly spelt term.

Results

Table 1 summarises the results of our misspelt searches. A total of 200 citations were retrieved from the 10 selected search terms. Most misspelt textwords occurred within the abstract only (141/200; 71%). Surprisingly, 98 of the 200 articles (49%) with misspelt textwords might be missed if you conducted a Medline search using the correctly spelt word alone without the MeSH heading.

Comment

Although we did not evaluate the impact of adding proper MeSH headings to the above searches (assignment of MeSH headings is automated and thus they are never misspelt), we feel that a substantial proportion of minor articles on these subjects would be missed in a detailed systematic literature search.

Department of Clinical Epidemiology and Biostatistics, McMaster University, Hamilton, Ontario L8L 4L8
Joel G Ray, *graduate student*

Department of Community Health, University of Toronto, Toronto, Ontario
Marian J Vermeulen, *graduate student*

BMJ 1996;313:1658–9

Table 1—*Results of Medline search using 10 misspelt textwords*

Misspelt term (correct spelling)	No of misspelt citations retrieved	No (%) with misspelling in title alone	No (%) with misspelling in abstract alone	No (%) of potentially missed citations using textword search alone
Angima (angina)	3	2 (67)	1 (33)	1 (33)
Antibotics (antibiotics)	15	6 (40)	9 (60)	8 (53)
Asprin (aspirin)	13	5 (38)	8 (62)	7 (54)
Canzer (cancer)	0	0	0	0
Dopler (Doppler)	8	3 (38)	5 (63)	5 (63)
Cholestrol (Cholesterol)	47	9 (19)	38 (81)	25 (53)
Hamorrhage (haemorrhage)	4	1 (25)	3 (75)	2 (50)
Myocardial infraction (myocardial infarction)	96	22 (23)	71 (74)*	41 (43)
Spetic (septic)	10	5 (50)	5 (50)	7 (70)
Thrombolism (thromboembolism)	4	3 (75)	1 (25)	2 (50)
Total	200	56 (28)	141 (71)	98 (49)

*Three articles contained misspelling within both the title and abstract.

Indeed, given the number of ways that words can be misspelt our findings clearly underestimate the magnitude of the problem. The topics that we chose for our misspelt searches are common to clinical practice and have been used within systematic literature reviews for various medical specialties, thereby making our findings relevant to such uses of Medline.

Researchers need to beware of misspelt textwords within Medline and to realise the importance of using both MeSH headings and textwords in any systematic literature search.[1-4]

Did you mean: ***misspelling*** and medline

Mizspellin and **Medline**.
JG Ray, MJ Vermeulen - BMJ: British Medical Journal, 1996 - ncbi.nlm.nih.gov
Methods and results We conducted a literature search of 10 commonly used medical terms selected from the subject index of the ACP Journal Club (May/June 1996 issue).'We intentionally misspelt each term by altering one or two letters within the word (for example,
Cited by 16 Related articles All 14 versions Cite Save

Bahrain Medical Bulletin, Volume 30, No 3, September2008

Editorial

Cracking Up in the Search for Randomised Trials

Mike Clarke, BA, DPhil*, Liz MacKinnon BA**, Anne Eisinga BA Comb, MSc ***

Earlier this year, during the UK Cochrane Centre's systematic search of the database, EMBASE, for records that might relate to reports of trials to be included in the Cochrane Central Register of Controlled Trials some records were found in which words or letters in the abstract had cracked apart[3]. One record was found in which the m in randomised had become "rn", making the word "randomised" and, in another record, the word "random" had broken into "rand om". We sought to examine how widespread these mistakes are within EMBASE and MEDLINE.

There are 64 records in which "random" and its derivatives have cracked up in MEDLINE (7 records) and EMBASE (57). These were all unique records with no duplication between the databases. Most of the examples arose because of a break within the word itself, but two (both in EMBASE) were caused by the letter m breaking into rn.

PMC ▾ randorn[tw] NOT random[tw]

Save search Journal List Advanced

Display Settings: ▾ Summary, Sorted by Pub Date Send to: ▾

Search results

Items: 3

1. A single copy subclone, p1-101, from cosmid 3-3B, defines three RFLPs on 10pter-q23 [HGM9 no. D10S4].

   M Litt, O T Mueller, T B Shows, R Litt

   Nucleic Acids Res. 1987 Mar 25; 15(6): 2783.

   PMCID: PMC340693

   Summary Page Browse PDF–63K Citation

2. Nucleotide sequence of the tcml gene (ribosomal protein L3) of Saccharomyces cerevisiae.

   L D Schultz, J D Friesen

   J Bacteriol. 1983 Jul; 155(1): 8–14.

   PMCID: PMC217644

   Summary Page Browse PDF–905K Citation

3. Reviews

   Br Med J. 1934 Jan 20; 1(3811): 106–108.

   PMCID: PMC2444231

   Summary Page Browse PDF–857K Citation

[PDF] Cracking up in the search for randomised trials

M Clarke, L MacKinnon, A Eisinga - Bahrain Med J, 2008 - bahrainmedicalbulletin.com

Searches of electronic bibliographic databases are a key to finding articles in the healthcare literature. If records in these databases are incorrect because of spelling mistakes or transcription errors, users might fail to find them. We did a study to identify records in MEDLINE and EMBASE in which the word random (or its derivatives) had "cracked up" in the title or abstract in the database. This cracking up could include the introduction of ...

Cited by 2 Related articles Cite Save More

Cracking up in the search for randomised trials

Search within citing articles

[HTML] Christmas 2016: In the Literature: Nominal ISOMERs (Incorrect Spellings Of Medicines Eluding Researchers)—variants in the spellings of drug names in ...

RE Ferner, JK Aronson - The BMJ, 2016 - ncbi.nlm.nih.gov

Results The 30 standard names of drugs in the test set gave 325 979 hits in total, and 160 hidden reference variants gave 3872 hits (1.17%). The standard names of the control set gave 470 064 hits, and 79 hidden reference variants gave 766 hits (0.16%). Letter

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[HTML] Nominal ISOMERs (Incorrect Spellings Of Medicines Eluding Researchers)—variants in the spellings of drug names in PubMed: a database review

RE Ferner, JK Aronson - bmj, 2016 - bmj.com

Results The 30 standard names of drugs in the test set gave 325 979 hits in total, and 160 hidden reference variants gave 3872 hits (1.17%). The standard names of the control set gave 470 064 hits, and 79 hidden reference variants gave 766 hits (0.16%). Letter

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Nominal ISOMERs (Incorrect Spellings Of Medicines Eluding Researchers)—variants in the...

Search within citing articles

Schreibfehler machen Studien unsichtbar

HS Füeßl - MMW-Fortschritte der Medizin, 2017 - Springer

_ Englische Forscher gaben am 30. Juni 2016 in die medizinische Datenbank PubMed 30 Medikamentennamen ein, die auf Anforderungen an die Krankenhausapotheke notorisch falsch geschrieben wurden. Sie verwendeten dabei zunächst die korrekten englischsprachigen Internationalen Freinamen

All 2 versions Cite Save More

Definitions

- the standard name of a medicine: the international non-proprietary name (INN), as approved by the World Health Organization; if there was no INN we used the British Approved Name (BAN)
- a variant name: any name deviating in spelling from the standard name that was not itself a standard name in English-language nomenclatures, such as British Approved Names (BANs) or United States Adopted Names (USANs); for example, for the purposes of this study we would not have regarded thimerosal (USAN) as a transpositional variant of thiomersal (INN), even though many papers would be missed by not searching for both
- a hidden-reference variant: a name with variant spelling that, when used as a text-word search term in PubMed and other databases, identified publications that were not identified by searching for the standard name as a text-word

Test set of 30 medicines that experienced Birmingham pharmacists reported to be commonly misspelt on in-hospital prescription charts

amitriptyline
aprepitant
azathioprine
capecitabine
carbamazepine
ciprofloxacin
clotrimazole
cotrimoxazole
dipyridamole
fidaxomicin
filgrastim
fosfomycin
frusemide/furosemide
gentamicin
goserelin
granisetron
ipratropium
lamotrigine
levetiracetam
mirtazapine
mycophenolate
netilmicin
nortriptyline
opioid
pentoxifylline
phenytoin
propranolol
sertraline
trazodone
venlafaxine

Control set of 30 medicines chosen at random from a hospital drug inventory [the Sandwell and West Birmingham Hospitals NHS Trust Formulary]

abacavir
acetylcysteine
bumetanide
capsaicin
chloroquine
domperidone
doxepin
fludarabine
fluocinolone
hydrocortisone
ibandronic [acid]
lopinavir
mannitol
melatonin
mexiletine
midazolam
minoxidil
naloxone
olanzapine
ombitasvir
oxycodone
oxytetracycline
paracetamol
penicillin [V]
perphenazine
prednisolone
pyridoxine
tacrolimus
testosterone
treosulfan

Effect	Examples
Substitution	i ↔ y
	one unaccented vowel → another vowel
	soft c ↔ s
	hard c ↔ k
	f ↔ ph
	m ↔ n
	x → ks
Omission	sertraline → sertralin or sertaline
	propranolol→ popranolol or propanolol
Addition	gentamicin → gentamicine
	cotrimoxazole → clotrimoxazole
Transposition	furosemide → fruosemide
	filgrastim → filgastrim
Duplication and	l ↔ ll
deduplication	n ↔ nn
Combinations of these	gentamicin → gentamycine
	amitriptyline → amytriptilin

We searched for

'standard name[tw]'

and

'variant spelling[tw] NOT standard name[tw]'

For example

'mirtazapine[tw]'

and

'mirtazepine[tw] NOT mirtazapine [tw]'

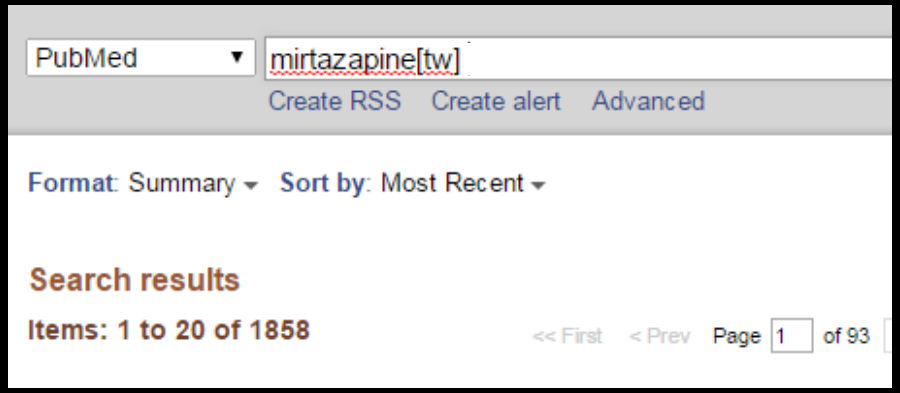
J Toxicol Clin Toxicol. 2003;41(7):1037-8.

Mirtazepine overdose and miosis.

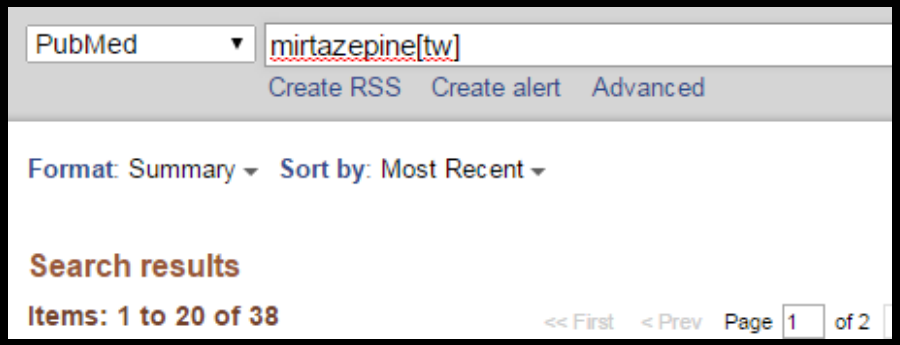
Langford NJ, Ferner RE, Patel H, Munyame C, Hamlyn AN.

PMID: 14705856

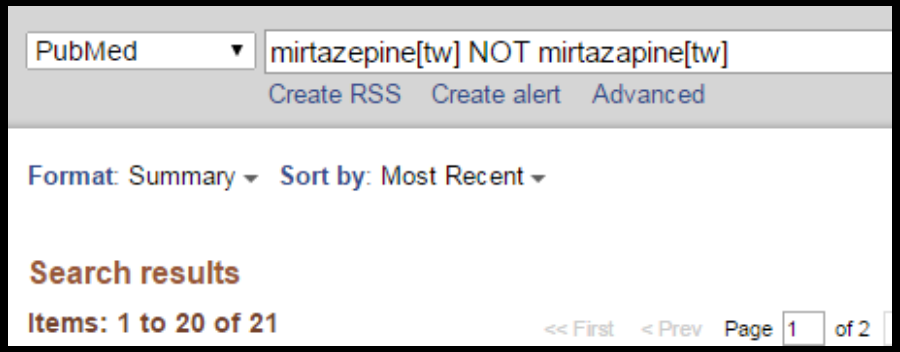
[PubMed - indexed for MEDLINE]



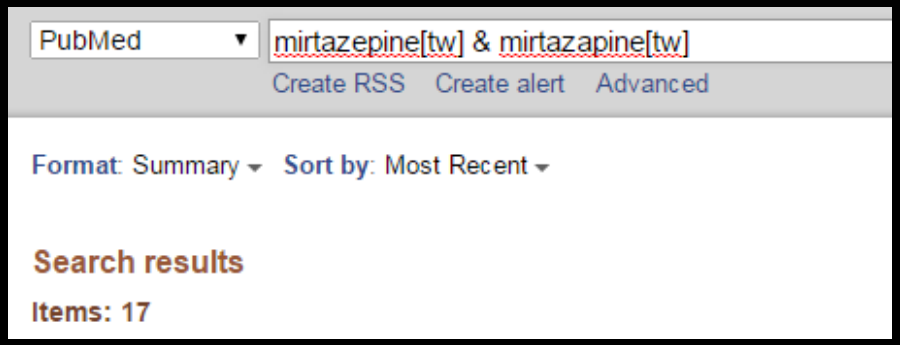
Standard name

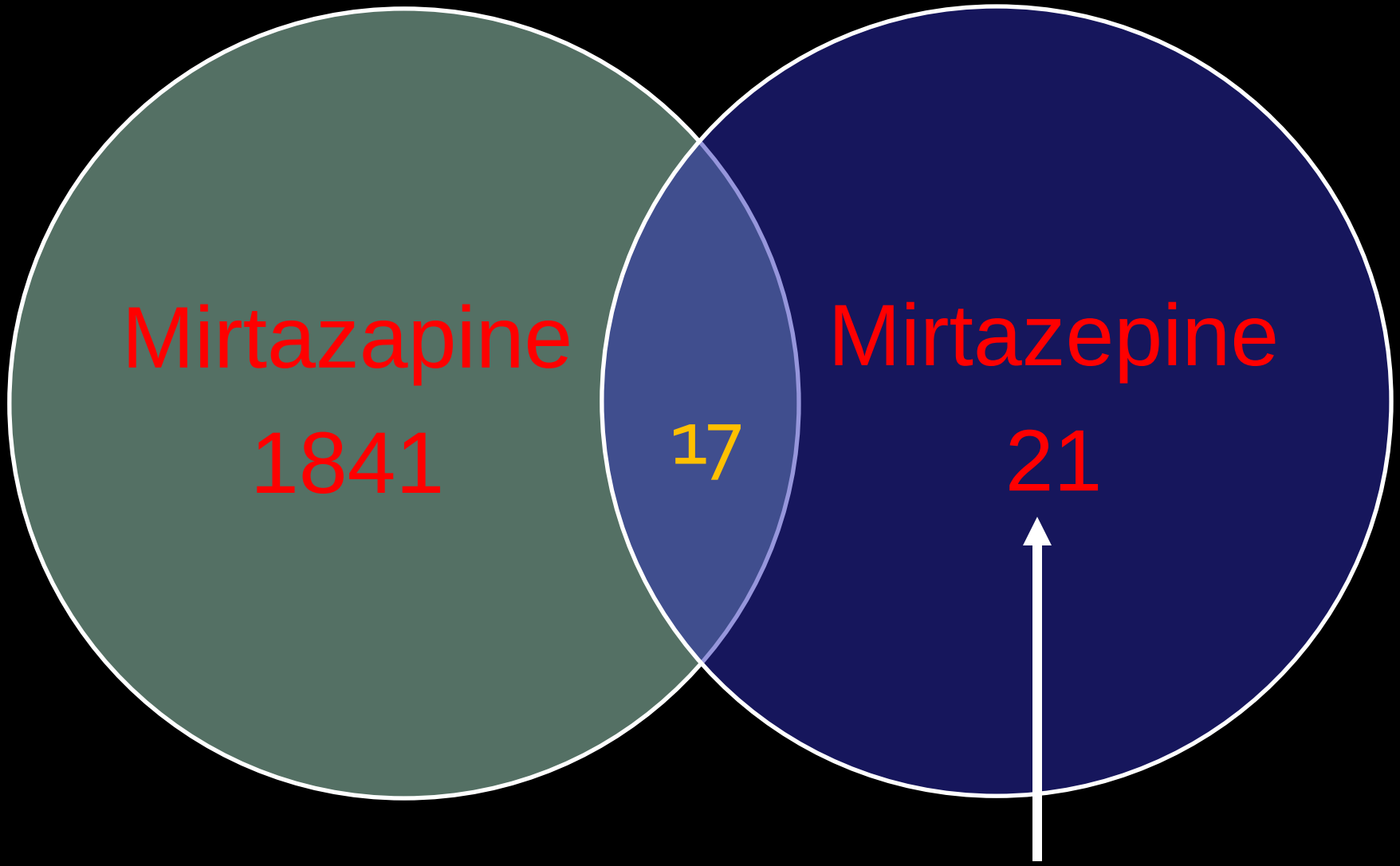


Variant name



Hidden variant





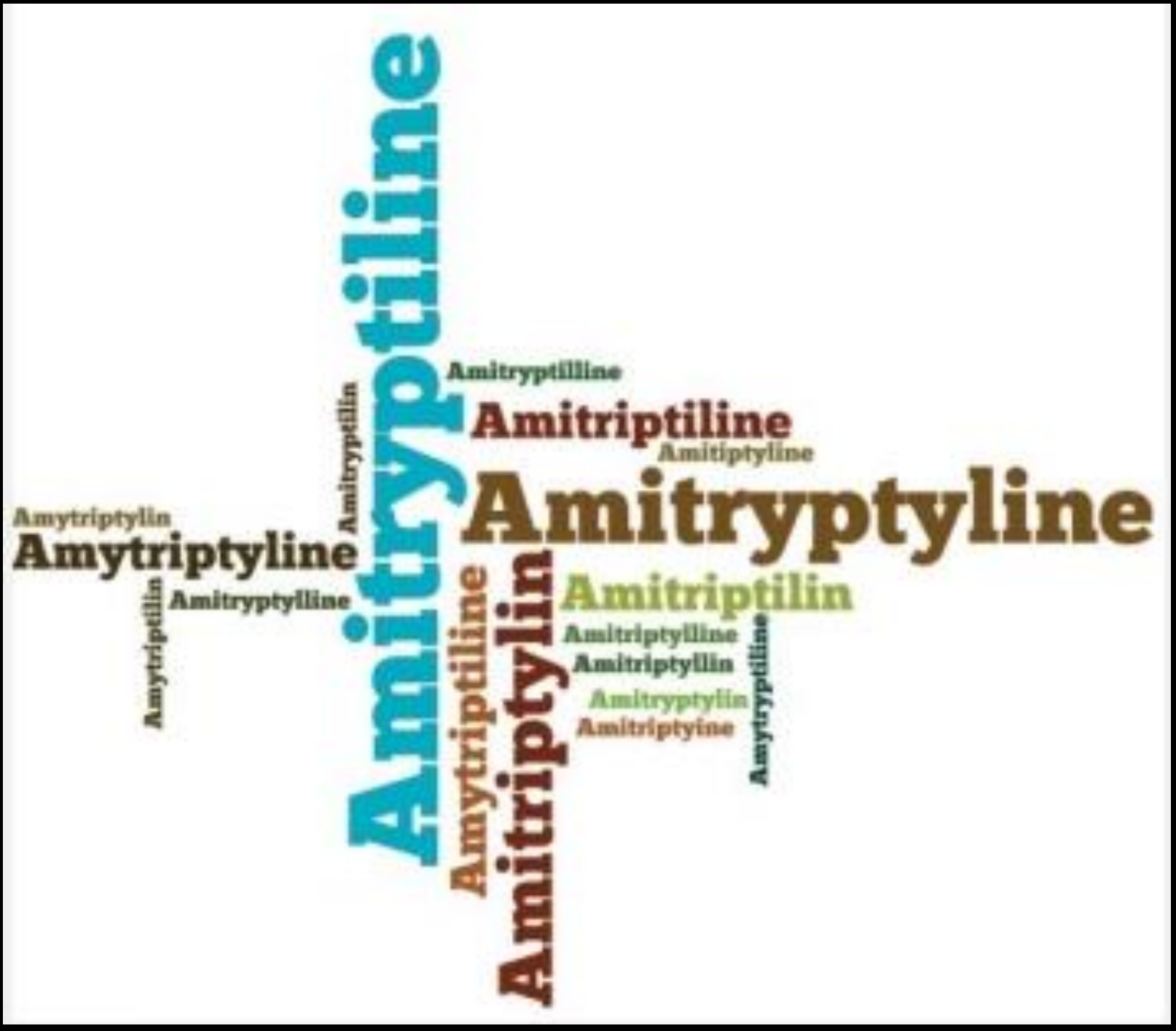
Papers missed by searching for "mirtazapine", including 7 reviews and 2 systematic reviews

amitriptyline

	Single letter l		Double letter l	
i ↔ y versions	minus final e	plus final e	minus final e	plus final e
i–i–i	8	8	0	0
i–i–y	14	[8433]	1	2
i–y–i	4	79	0	1
i–y–y	1	32	0	1
y–i–i	2	10	0	0
y–i–y	1	10	0	0
y–y–i	0	2	0	0
y–y–y	0	0	0	0
Total	30	141	1	4

+ amitiptyline

177/8433 = 2.1%


Amitryptiline
Amitryptilline
Amitriptiline
Amitiptyline
Amitryptyline
Amytriptylin
Amytriptyline
Amitriptilin
Amytriptilin
Amitryptylline
Amitriptylin
Amytriptiline
Amitriptiline
Amitriptylline
Amitriptyllin
Amitryptylin
Amitriptyine
Amytryptiline

Set	Standard names	Hidden-reference variants
Test (n=30)	320 830 hits	3795 hits (1.17%; n = 152)
Control (n=30)	463 519 hits	717 hits (0.15%; n = 74)

$\chi^2 = 3458$
$P < 0.0001$

Single changes (n=196 and combinations (n=30)	Frequencies	Frequencies in cases of multiple changes (n = 30 names, 60 changes)
Substitutions (total) Single Double Treble	101 (45%) 85 15 1*	26 (19 single, 7 double)
Omissions	63 (28%)	18
Additions	19 (8.4%)	7
Transpositions	10 (4.4%)	1
Duplications	2 (0.9%)	4
Deduplications	0 (0%)	4
No variants found†	1 (0.4%)	
Any combination of these	30 (13%)	

*Amytryptiline (2 hits)

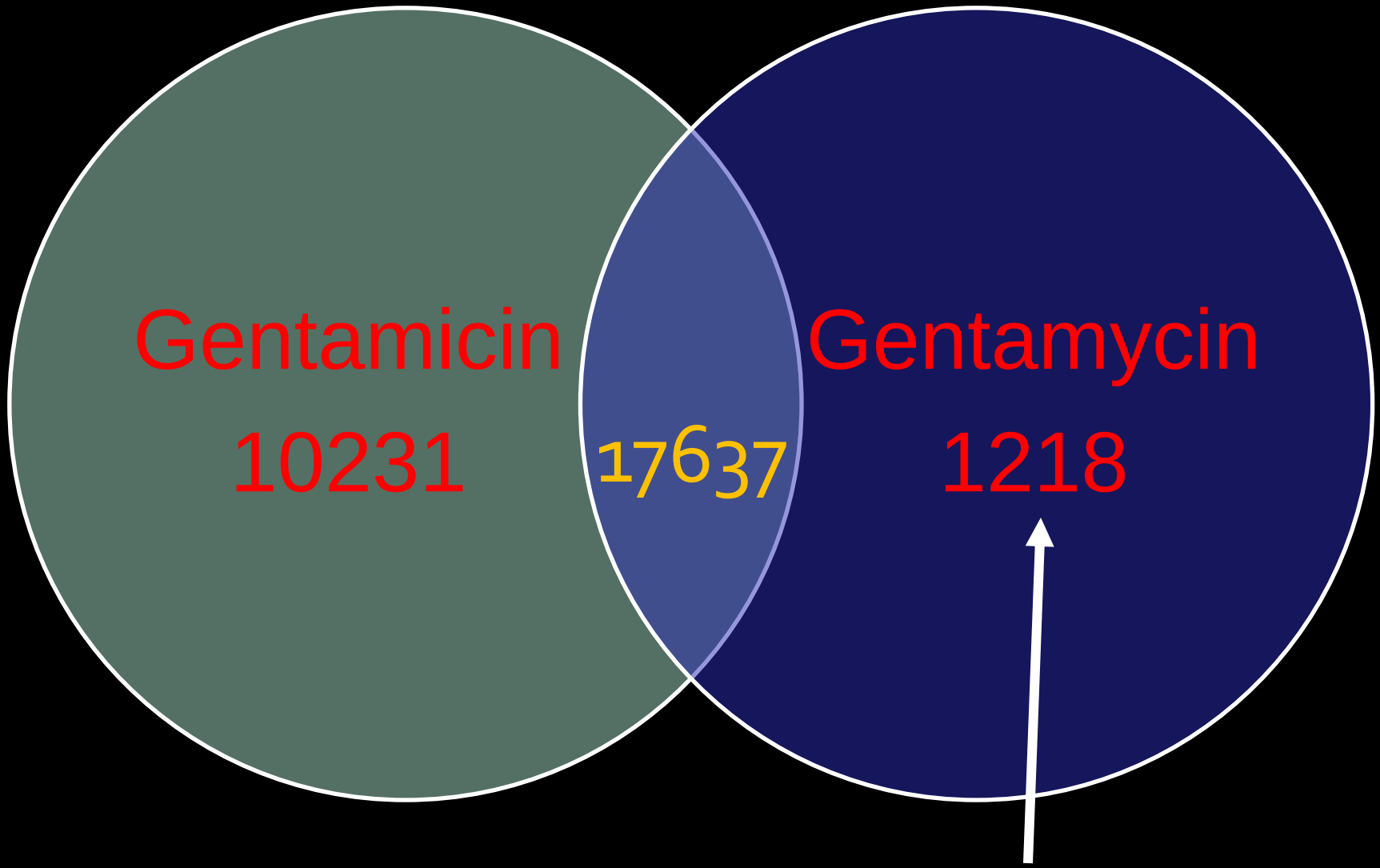
†Aprepitant

A variant index score

the number of letters in the name
the number of syllables in the name
the number of unaccented vowels + 1
the numbers of i's and y's + 1
the numbers of f's or ph's + 1
the numbers of potential duplications or deduplications
(l, m, n, s, t) + 1
ending in -in or -ine (1 if no, 2 if yes)
ending in -micin (1 if no, 2 if yes)

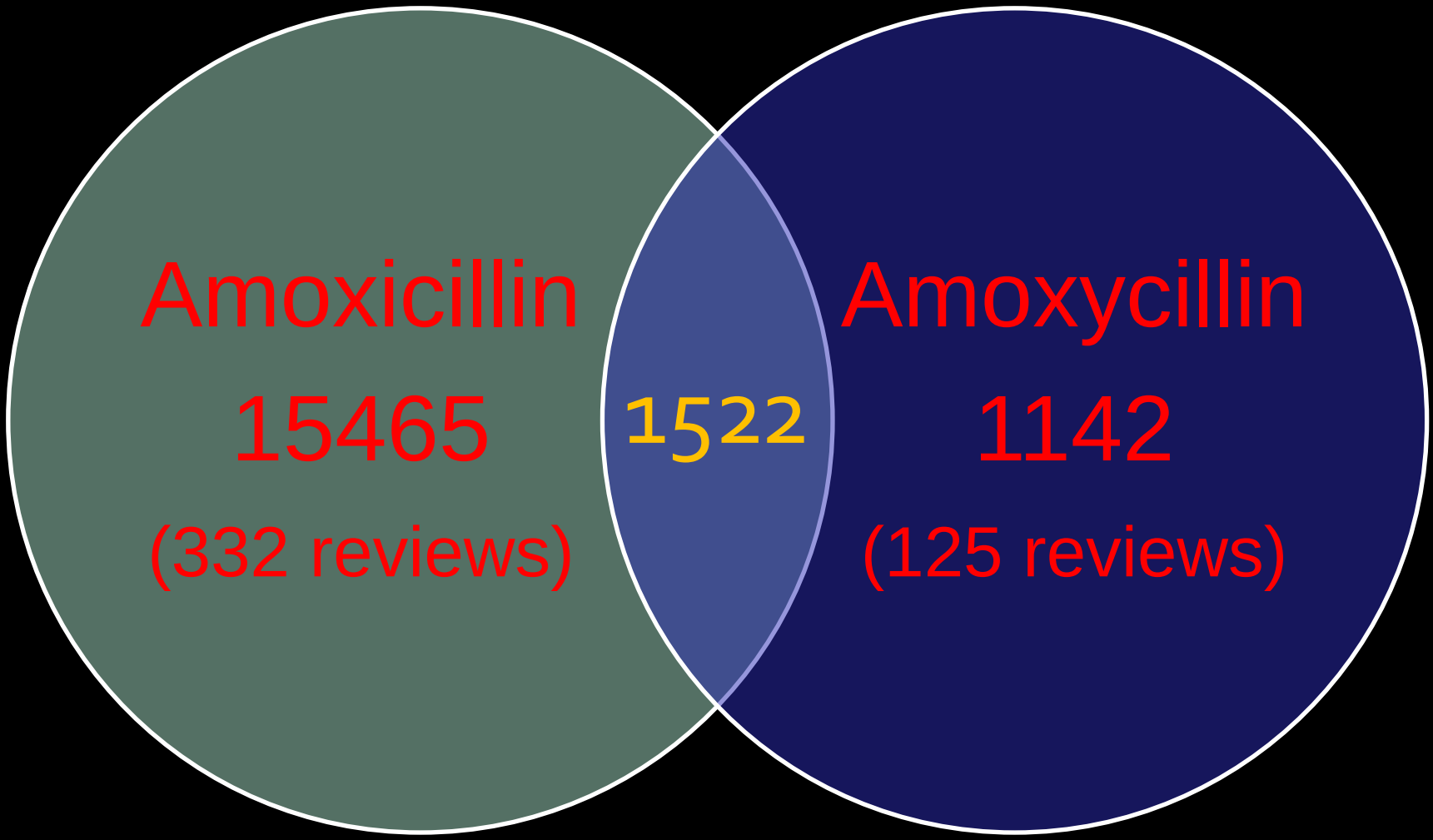
Set	Score
Test (n=30)	54-4480 (median 524)
Control (n=30)	36 to 1440 (median 272)

P = 0.028

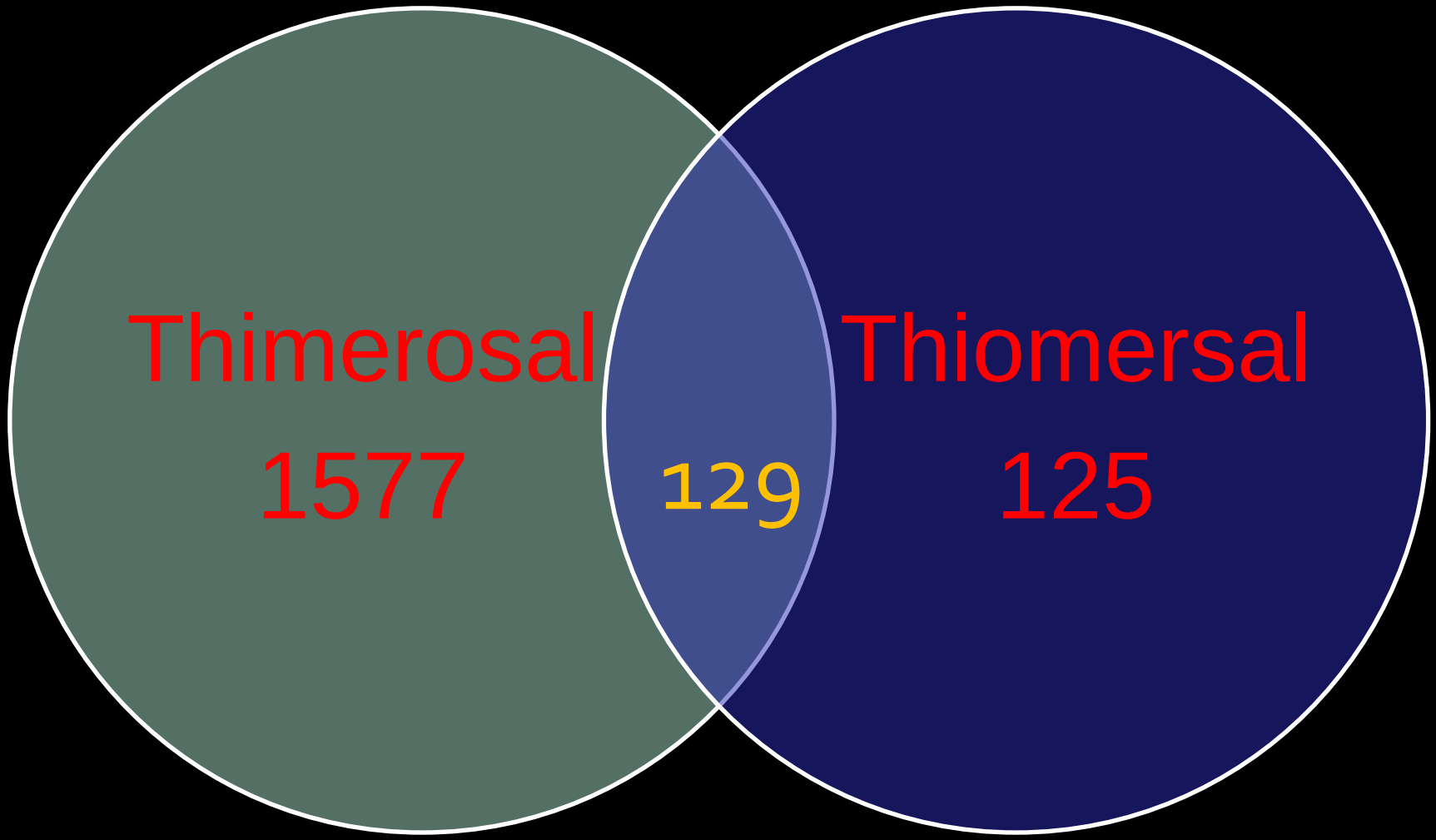

Gentamicin
10231
17637
Gentamycin
1218
Papers missed by searching for "gentamicin", including 6 systematic reviews

Systematic reviews

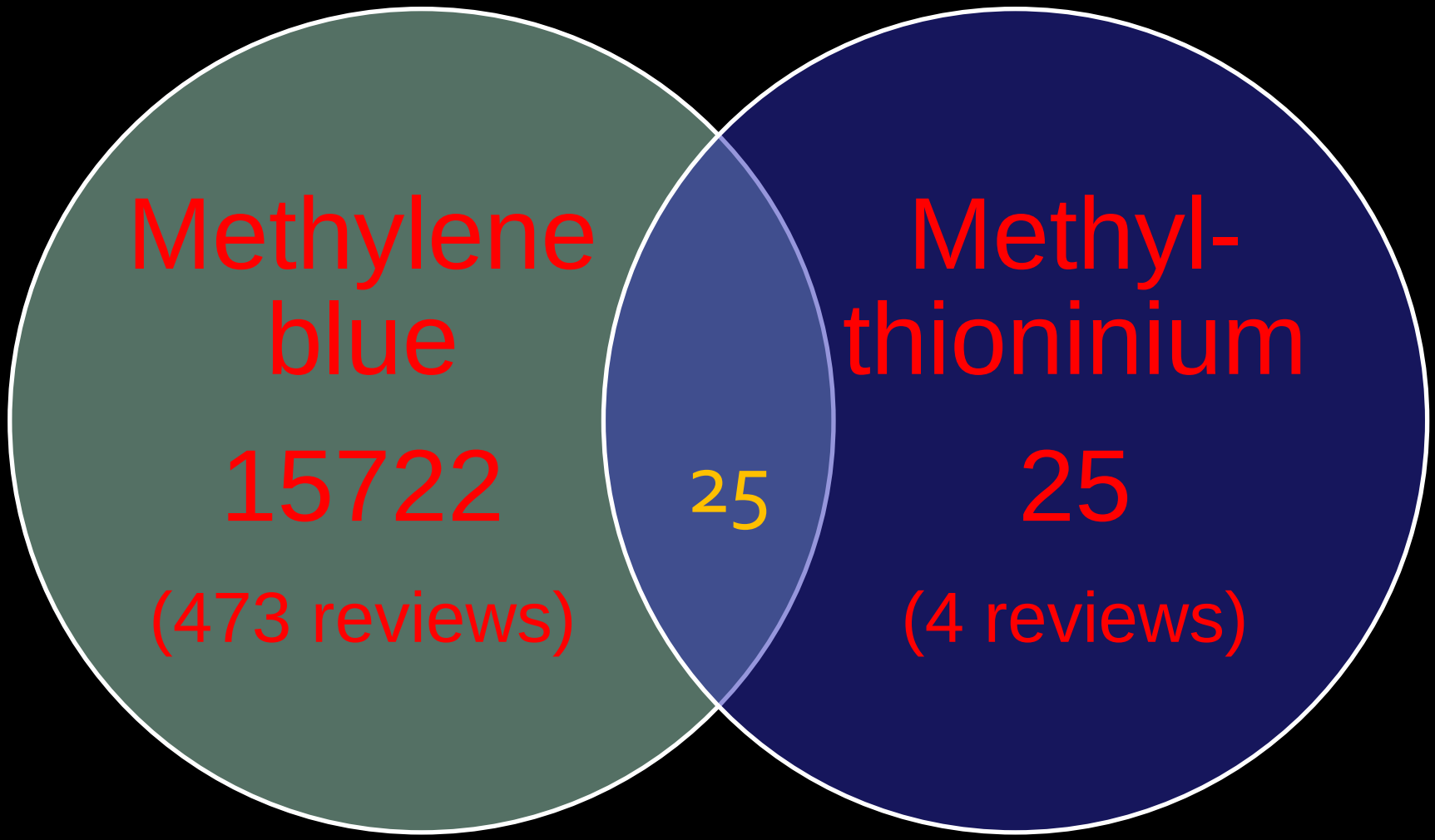
Drug	Reviews found	Hidden variants
Amitriptyline	179	5
Mirtazapine	110	6
Gentamicin	87	6
Trazodone	47	2
Totals	455	19 (4.2%)


Amoxicillin
15465
(332 reviews)
1522
Amoxycillin
1142
(125 reviews)

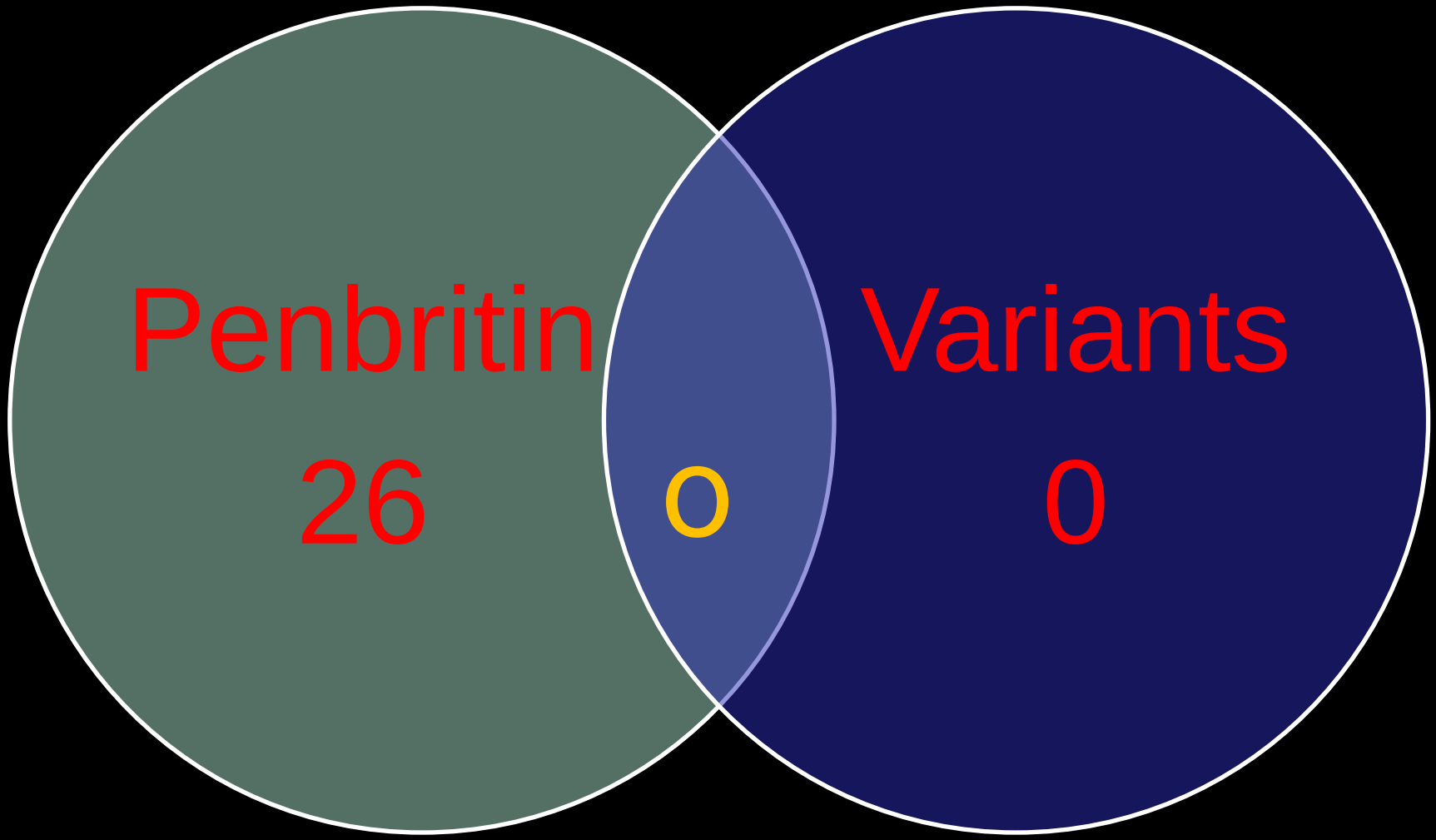
Total 18129



Total 1831


Methylene blue
15722
(473 reviews)
25
Methyl-thioninium
25
(4 reviews)

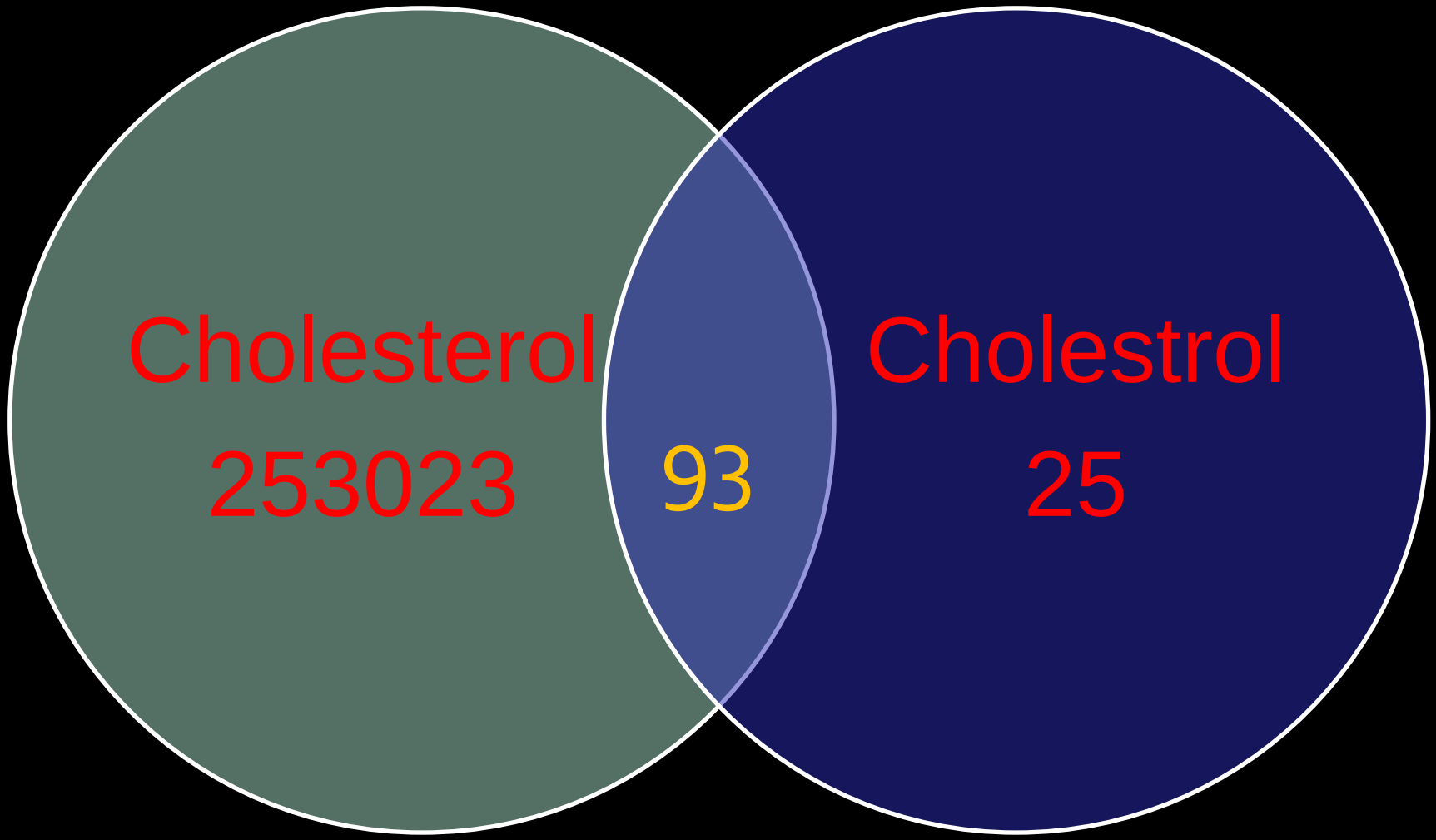
Total 15772



Penbriten
Prenbitin

Penbrityn
Penbrytin

Penbritain
Penbrexit



0.01%

We have really everything in common with America nowadays except, of course, language

Oscar Wilde, 1887

England and America are two countries separated by the same language

George Bernard Shaw (attr)

NOAH WEBSTER LL.D.

AN

AMERICAN DICTIONARY

OF THE

ENGLISH LANGUAGE:

INTENDED TO EXHIBIT,

I. The origin, affinities and primary signification of English words, as far as they have been ascertained.
II. The genuine orthography and pronunciation of words, according to general usage, or to just principles of analogy.
III. Accurate and discriminating definitions, with numerous authorities and illustrations.

TO WHICH ARE PREFIXED,

AN INTRODUCTORY DISSERTATION

ON THE

ORIGIN, HISTORY AND CONNECTION OF THE

LANGUAGES OF WESTERN ASIA AND OF EUROPE,

AND A CONCISE GRAMMAR

OF THE

ENGLISH LANGUAGE.

BY NOAH WEBSTER, LL. D.

IN TWO VOLUMES.

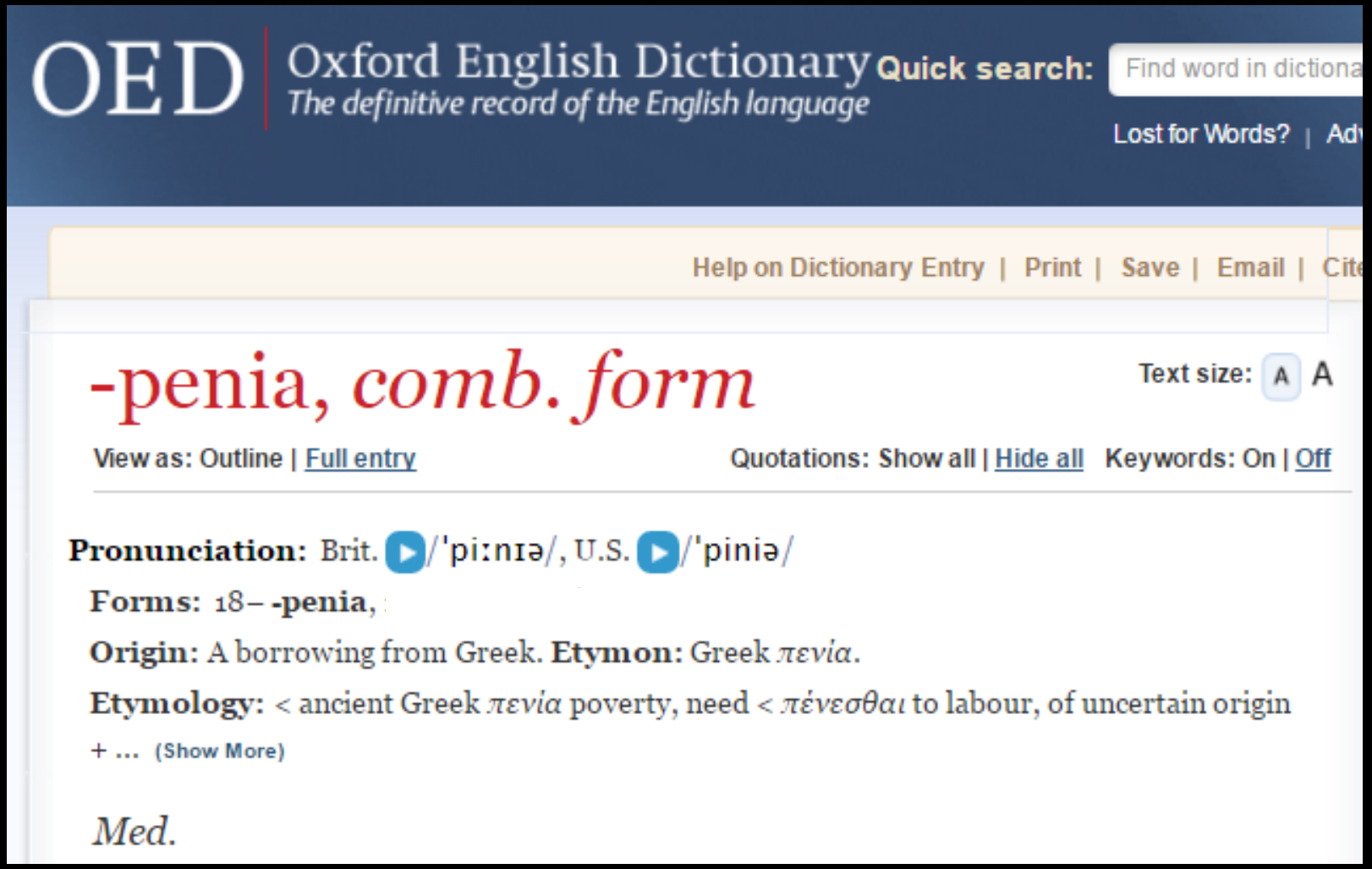
VOL. I.

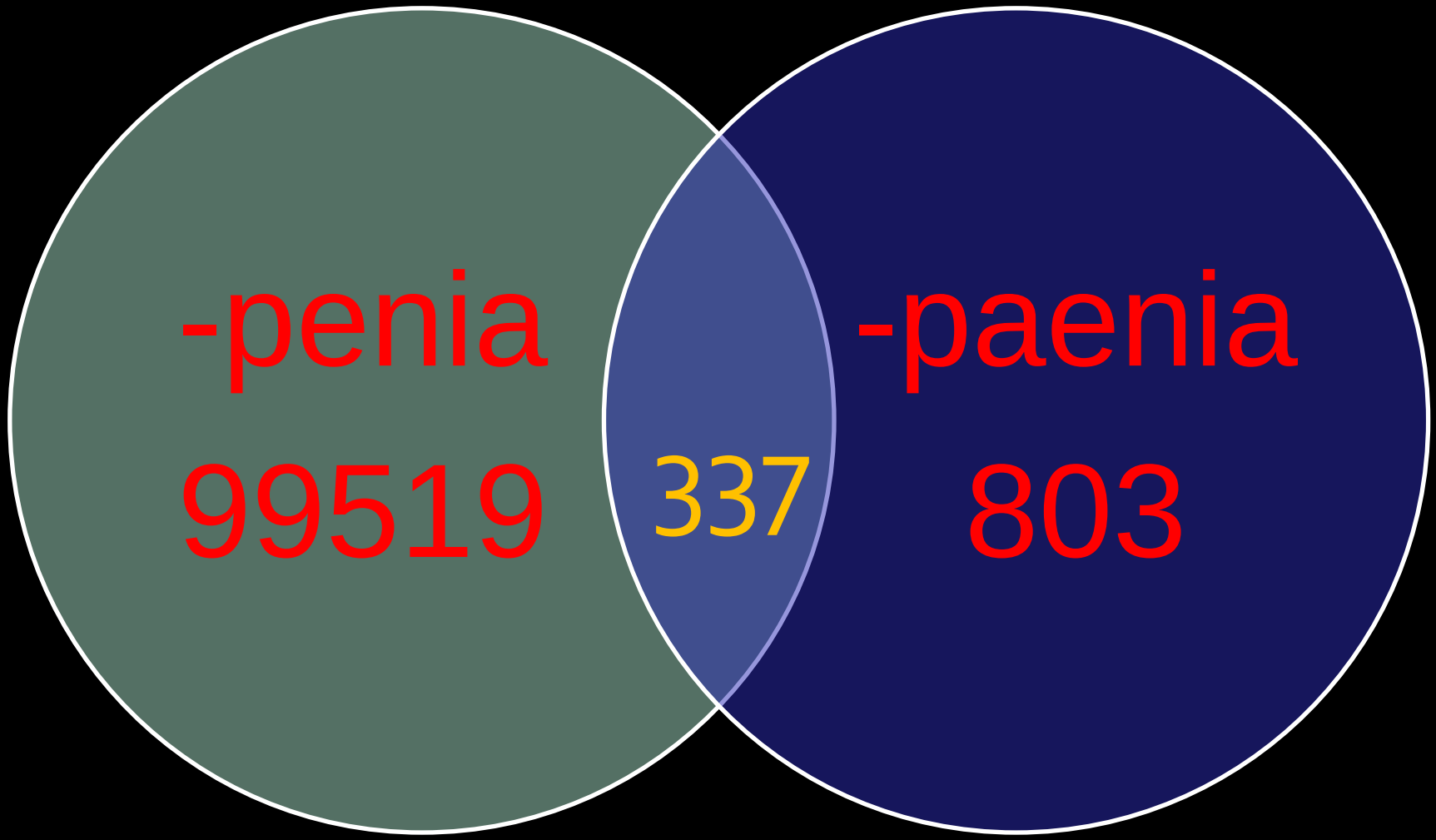
He that wishes to be counted among the benefactors of posterity, must add, by his own toil, to the acquisitions of his ancestors.—Rambler.

NEW YORK:
PUBLISHED BY S. CONVERSE.
PRINTED BY HEZEKIAH HOWE—NEW HAVEN.
1828.

Thrombocytopenia

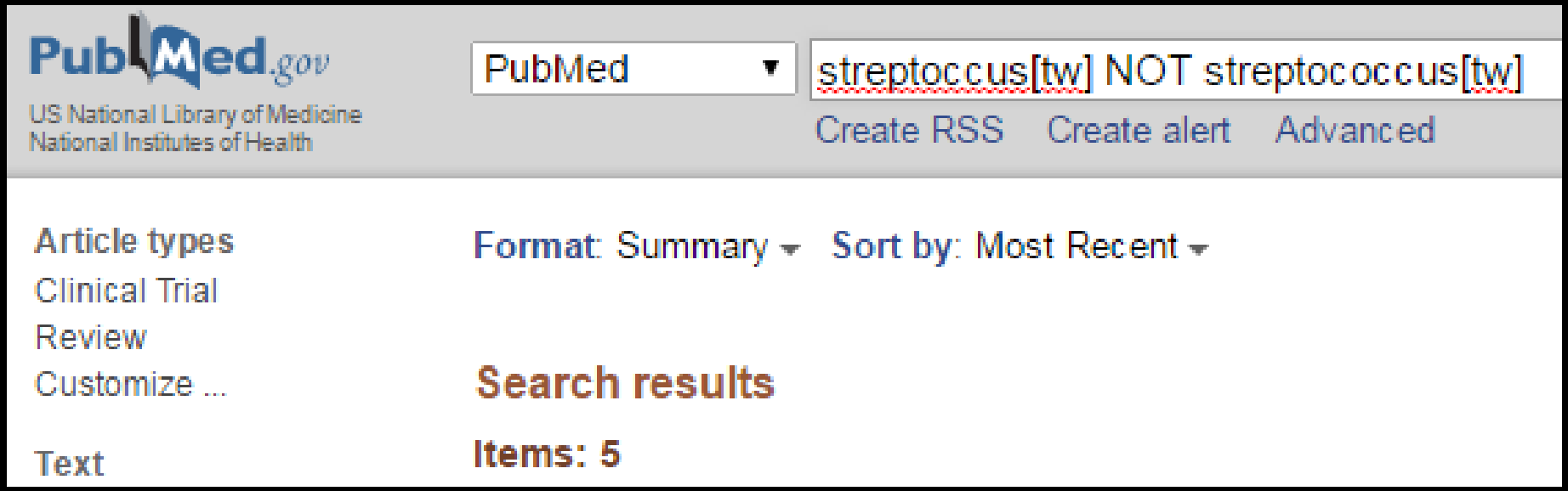
Thrombocytopaenia





0.8%

Streptoccus



But there is no such orgasm

Jeffrey Aronson: When I use a word . . . Wye speling matturs

December 16, 2016

Drug names are difficu
example, which of the

- amitriptylin
- amitryptiline
- amitriptylline
- amytriptyline
- amitriptiline

One way to find out is
"amitriptylin":

Ani Shakarishvili,MD mentioned you.

Reply

Ani Shakarishvili,MD Dec 18

@AniShakari

Wye speling mutters @JKAronson in @bmj_latest blogs.bmj.com/bmj/2016/12/16… #medicine #pharma #spelling #language

Concloozhuns

Wen sertching for drug naims, use misspelings as well as the propper wuns

http://www.cebm.net/wye-misspeling-drug-naims-matturs-jeffrey-k-aronson-robin-e-ferner

@JKAronson