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A historical review of classic Helicobacter pylori publications in science citation index expanded

Fat-Moon Suk
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Which *Helicobacter pylori* publications in the Web of Science are classic? This study identified classic papers by referring to the Science Citation Index Expanded, which covers 59,904 documents related *Helicobacter pylori* publications in the Web of Science from 1900 to 2016. The present paper lists classic *Helicobacter pylori* papers published between 1991 and 2007. Classic documents that have been cited at least 1,000 times from the Web of Science Core Collection were assessed regarding language of publication, document type publication outputs, distribution of outputs in journals and Web of Science categories, publications of authors, institutions, countries as well as citation life cycles of classic documents. An article published by Parsonnet et al. in 1991 obtained the highest number of citations from the Web of Science Core Collection during the period from its initial publication to the end of 2016. The most impactful article in 2016 was published by Uemura et al. in 2001 with 163 citations in 2016. In addition, results showed that three main research focuses in *H. pylori* study were gastric cancer, low-grade gastric lymphoma, and the *CagA* gene.

Keywords: *Bibliometric, Citation, Classic article*

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1. Introduction

An early, highly cited *Helicobacter pylori* (*H. pylori*)-related article entitled "Prospective double-blind trial of duodenal-ulcer relapse after eradication of campylobacter pylori" [1] was published by Marshall et al. from Royal Perth Hospital and Curtin University in Australia. It was the first report regarding patients with both duodenal ulcer

and *Campylobacter pylori* infection. In 2005, Marshall and Warren won the Nobel Prize in physiology or medicine for their discovery of the bacterium *H. pylori* and its role in gastritis and peptic ulcer disease.

Scholars have studied classic papers [2] on various medical topics, for example liver transplantation [3], Guillain-Barré syndrome [4], lumbar spine surgery [5], melanoma [6], digestive disease [7], Tourette syndrome [8], Parkinson's disease [9], orthopedic surgery [10], critical care medicine [11]. Classic papers have been used to teach organometallic chemistry [12], physiology [13], capillary filtration, and presentation skill development [14]. In recent years, the Web of Science Core Collection has presented classic publications with at least 1,000 total citations from publication to the latest recent year; presentations have been made for articles [15], single-author articles [16], and reviews [17] in the Science Citation Index Expanded. Classic articles in surgery [18] and psychology [19] have also been studied.

In this study, we analyzed classic *H. pylori*-related publications with at least 1,000 total citations from publication to the end of 2016 in the Web of Science Core Collection for citation histories, recent impact, journals, Web of Science categories, and publication performance of countries, institutions, and authors.

2. Methodology

The methodology used in this study was based on the Science Citation Index (SCI-EXPANDED) database, which indexed the Web of Science from Clarivate Analytics (updated on 10 August 2017). To identify *H. pylori* research, documents with *Helicobacter pylori*, *H. pylori*, campylobacter pylori, and *C. pylori* keywords [20] in the title, abstract, author keywords, or *KeyWords Plus* were downloaded. Selecting publications between 1900 and 2016, we found 59,904 *H. pylori*-related documents in SCI-EXPANDED. *KeyWords Plus* supplies additional search terms extracted from the titles of articles cited by authors in their bibliographies and footnotes in the ISI (now Clarivate Analytics) database, and substantially augments title-word and author-keyword indexing [21]. The documents that can only be found by *KeyWords Plus* are less likely to be related to *H. pylori.* In recent years, Ho's group proposed that a "front page" filter [22,23,24] — which searches only documents with specified keywords on the front page, including only the title, abstract, and author keywords — might avoid introducing unrelated publications for analysis [22]. To determine which of these publications might be called classic publications, we used three indicators:

C_{year} : the number of citations in the Web of Science Core Collection in a particular year. C_{2016} means the number of citations in 2016 only [25].

TC_{year} : the total number citations from publication to the end of the latest recent year [26,27]. It is 2016 (TC_{2016}) in this study.

CPP_{year} : citations per publication ($CPP_{2016} = TC_{2016}/TP$) [25].

To provide another filter, we defined classic *H. pylori* publications as those with $TC_{2016} \geq 1{,}000$ [18,28]. Finally, we found 22 publications (0.037% of the 59,897 total publications) to be classic publications in *H. pylori*-related research. Hard copies of these 22 publications were analyzed; these records were downloaded into spreadsheet software, and additional coding was manually performed using Microsoft Excel 2013 for analysis [29]. In subsequent analysis, publications originating from England, Scotland, Northern Ireland, and Wales were classified as being from the United Kingdom [30]. The impact factor (IF_{2016}) as reported in Journal Citation Reports 2016 was then determined for each journal that published classic publications.

3. Results and Discussion

The "front page" filter [22] was used to improve bias from *KeyWords Plus* in the Web of Science. It was pointed that highly cited articles unrelated to a relevant study topic can be analyzed if the analyst uses *KeyWords Plus* [31]. Another possible bias is that a search may include *H. pylori* publications that do not include keywords such as *Helicobacter pylori*, *H. pylori*, campylobacter pylori, and *C. pylori* on the front page. Some papers that are related to *H. pylori* may not have the expected keywords on their front pages. All of 22 classic *H. pylori* publications ($TC_{2016} \geq 1{,}000$) were checked by a senior gastroenterologist to avoid detectable bias. One example was an article entitled "Inference of population structure using multilocus genotype data: linked loci and correlated allele frequencies" [32] that had a TC_{2016} of 3,992. In the most highly cited article, authors described extensions to the method of Pritchard et al., and *H. pylori* was an example, but this article was not focused on *H. pylori* research. In the article "C-reactive protein in wealthy subjects: Associations with obesity, insulin resistance, and endothelial dysfunction — A potential role for cytokines originating from adipose tissue?" [33], cytokines constituted the main research topic, but *H. pylori* was mentioned in passing. Similarly, in the article "The genome sequence of the food-borne pathogen *Campylobacter jejuni* reveals hypervariable sequences" [34], *Campylobacter pylori* was mentioned, but *Campylobacter jejuni* was the focus of the research. Associations between baseline values of four different circulating markers of inflammation, future risk of coronary heart disease, potential triggers of systemic inflammation, and other markers of inflammation were presented in "Low-grade inflammation and coronary heart disease: Prospective study and updated meta-analyses" [35]. We concluded that no strong associations of these factors with *Helicobacter pylori* were observed. In total, 18 classic *H. pylori* publications, including 15 articles, two reviews, one note, and one proceedings paper were further studied.

3.1 *Language of Publication and Document Type*

We found that 18 classic *H. pylori* publications ($TC_{2016} \geq 1{,}000$) were published in SCI-EXPANDED between 1991 and 2007. All classic publications were published in English. The average value of TC_{2016} was 1,543 and the maximal value TC_{2016} was 2,964. The 18

classic publications were found within four Web of Science document types. Table 1 lists characteristics of document types. Most documents (83% of the 18 classic publications) were articles. The average number of authors per publication (*APP*) was 12; the average number of citations per publication (CPP_{2016}) was 1,558. Since the discovery of *H. pylori* in the human stomach, infection by these bacteria has been shown to be strongly associated with gastric lesions, including chronic atrophic gastritis [36,37], intestinal metaplasia [38,39], and gastric cancer [39]. Epidemiological studies, in combination with results from animal models, confirm that eradication of *H. pylori* effectively prevents gastric carcinogenesis [40,41], and mild gastritis without severe atrophy or intestinal metaplasia [41]. The classic proceedings paper entitled "*Helicobacter pylori* infection and the development of gastric cancer" [39] in *New England Journal of Medicine* by Uemura and other eight coauthors from Kure Kyosai Hospital and Fukuoka University in Japan had the highest CPP_{2016}. In this proceedings paper, the authors concluded "Gastric cancer develops in persons infected with *H. pylori* but not in uninfected persons." But the CPP_{2016} values of the reviews were found to be lower than those of any other document type. The *APP* values of the reviews were also much lower than those of other documents.

3.2 *Publication Outputs*

Starting in 2014, Ho's group proposed a relationship between the annual number of highly cited articles and their citations per publication ($CPP_{year} = TC_{year}/TP$) by decades [42,43] and years [44]. Figure 1 depicts the aforementioned relationship, which indicates that four classic *H. pylori* publications were found in 1991 whereas no classic publications were found in 1998, 2003, 2004, and 2005. The highest CPP_{2016} for the publications occurred in 1997. This was attributed to the publication entitled "The complete genome sequence of the gastric pathogen *Helicobacter pylori*" [45] with a TC_{2016} of 2,606. This paper published the first complete genome of *H. pylor*i, which had been cultured from a gastritis patient in the United Kingdom. It general, time is typically required to accumulate citations for highly cited articles [24,46]. However time was not related to the accumulation of citations for classic *H. pylori* publications. The striking and creative ideas of a classic publication might cause it to have a high TC_{2016}.

3.3 *Journal and Web of Science Category*

Table 2 characterizes 18 classic *H. pylori* papers in 10 journals in five Web of Science categories in SCI-EXPANDED, including general and internal medicine (9 papers; 50% of 18 publications), multidisciplinary sciences (4; 22%), oncology (3; 17%), one in biochemistry and molecular biology, and one in gastroenterology and hepatology. The *New England Journal of Medicine* published the highest number of classic *Helicobacter pylori* papers, namely five papers (28% of the 18 publications), including four articles, one proceedings

paper, and one review. The *New England Journal of Medicine* also had the highest CPP_{2016}, namely 1881, and an IF_{2016} of 72.406. As expected, the classic publications were published in journals with high impact factors [47]. The *Journal of Biological Chemistry* had the lowest impact factor (IF_{2016} = 4.125).

3.4 *Collaborations*

Among the classic *Helicobacter pylori* publications, seven publications (39% of 18 publications) were international collaborations by 13 countries and 11 (61%) were not international. Papers that were not international were published by researchers in advanced countries (the USA, the UK, Japan, and Italy). The average citations per publication (CPP_{2016} = 1,550) for the seven international publications was slightly higher than that for the 11 noninternational publications (CPP_{2016} = 1,539). The average number of authors for the international publications (16 authors) was greater than that for the noninternational publications (8.1 authors). Ho reported that a high percentage of the classic articles in SCI-EXPANDED had been published by single authors [15]. Similarly, few classic reviews in SCI-EXPANDED had multiple authors [17]. The USA had the highest rank in all six of these indicators, namely total publications (11 publications), country-independent publications (6), international publications (5), first-author publications (10), corresponding-author publications (10), and single-author publications (1). The UK ranked second in five indicators.

In total, 14 publications (78% of 18 publications) were interinstitutional collaborations by 56 institutions and four (22%) were institutionally independent publications by four institutions, namely Louisiana State University in the USA, Chiron Vaccines in Italy, University College and Middlesex School of Medicine in the UK, and University of Oxford in the UK. Vanderbilt University in USA published the most classic *H. pylori* publications (with four articles) and also ranked top in interinstitutional collaborations (4 articles) and first-author papers (3 articles). Only four institutions (including Vanderbilt University and Stanford University in the USA) published two corresponding-author papers.

3.5 *Authors of the 18 Classic Helicobacter pylori Publications*

In total, 18 classic *H. pylori* publications were authored by 164 authors from 60 institutions in 14 countries, including 16 first authors from 8 institutions in the USA, four in the UK, two in Germany, and one in each of Japan and Italy, respectively as well as 16 corresponding authors from eight institutions in the USA, four in the UK, and one in each of Germany, Italy, Japan, and Switzerland. Blaser from Vanderbilt University in the USA was the only classic author who published three classic *H. pylori* articles, including one first-author article and one corresponding-author article. Only two classic *H. pylori* papers were published by single authors, namely the article entitled "Human gastric carcinogenesis: A

multistep and multifactorial process — First American Cancer Society Award Lecture on Cancer Epidemiology and Prevention" [48] in *Cancer Research* by Correa of Louisiana State University in the USA, and the review entitled "The global health burden of infection-associated cancers in the year 2002" [49] in *International Journal of Cancer* by Parkin of the University of Oxford in the UK. Table 3 shows that Vanderbilt University in the USA had four classic authors (first authors or corresponding authors): Blaser and Nomura each had one first-author classic article and one corresponding-author classic article; Cover had one corresponding-author classic article; and Atherton had one first-author classic article. Chiron Vaccines in Italy and University College London in the UK had two classic authors. Parsonnet from Stanford University in the USA was the only classic author who published two first-author and corresponding-author classic articles. Both Wotherspoon and Isaacson from University College London in the UK published one classic article and one classic note as first author and corresponding author.

3.6 *The Lifespan of the 18 Classic Helicobacter pylori Publications*

Table 4 lists 18 classic *H. pylori* publications (15 articles, 2 reviews, 1 proceedings paper, and 1 note). *H. pylori* infection is the paramount risk factor for the development of gastric cancer [39]. Seven of classic *H. pylori* publications study the relation between *H. pylori* and gastric cancer. In addition, *H. pylori* colonization is strongly associated with mucosa-associated lymphoid tumors [50,51], and eradication of *H. pylori* often leads to improvement in tumor histology [52]. Three classic *H. pylori* publications explore the relation between *H. pylori* infection and low-grade gastric lymphoma [50,51,53].

Three classic publications report the role of cytotoxin-associated antigen A (*CagA*) in the pathogenesis of *H. pylori* [54,55,56]. Infection with strains of *H. pylori* that carrying the *CagA* gene is associated with gastric carcinoma [57]. Many of the alterations in gastric epithelial cells caused by *H. pylori* are attributable to *CagA*, which is secreted and translocated into cells through a type IV secretion system [58].

Figure 2 lists the histories of citations of the top ten high-impact classic *H. pylori* publications in SCI-EXPANDED in 2016 ($C_{2016} \geq 36$). Only four of the 18 classic *H.pylori* publications, namely Uemura et al., [39] with a C_{2016} of 163, Parkin [49] with a C_{2016} of 130, Correa [48] with a C_{2016} of 105, and Suerbaum and Michetti [59] with a C_{2016} of 101 had high impact values in the most recent year. All these studies discussed chronic infection with *H. pylori* as a cause of gastric cancer. The discovery of *H. pylori* in 1983 [60,61] and subsequent demonstration that it was the main cause of gastritis culminated the long search for the cause of gastritis, which had long been known to be closely associated with gastric atrophy and with gastric cancer [39]. *H. pylori* was the first bacterium linked to human cancer [62] and was classified as a group 1 carcinogen by the International Agency for Research on Cancer in 1994 (IARC *Helicobacter pylori* Working Group, 2014) [63].

Figure 3 shows the top ten highly cited *H. pylori* classic publications in SCI-EXPANDED, with TC_{2016} > 1,360. Since the classic article entitled "The complete genome sequence of the gastric pathogen *Helicobacter pylori*" [45] was published in 1997, the number of citations of this article have increased rapidly; the rate of new citations reached a peak in 1998. The publication of the genome sequences of *H. pylori* opened new avenues for research in the molecular biology of this gastric pathogen, and much attention has been paid to topics related to genomic and postgenomic analysis, which has contributed enormously to our understanding of the pathogenesis of *H. pylori* infection [64].

Classic articles entitled "*Helicobacter pylori* infection and the development of gastric cancer" [39], "Human gastric carcinogenesis: A multistep and multifactorial process — First American Cancer Society Award Lecture on Cancer Epidemiology and Prevention" [48], and "*Helicobacter pylori* infection and the risk of gastric carcinoma" [37] were rankedin the top five for both TC_{2016} and C_{2016}. These articles had high impact values in 2016 and were highly cited classic articles. The study topic of gastric cancer increased gradually and did not fluctuate notably in the study periods, which implies that the development of *H. pylori* research in gastric cancer was basically steady and concentrated over the past 16 years.

4. Conclusion

In total, 18 classic *H. pylori* publications were reviewed in this study. They were mainly published in the *New England Journal of Medicine*; for most of them, the Web of Science category was "general," and the research area was "internal medicine." English was the only language used in these publications. The USA published the most classic publications, followed by the UK. Vanderbilt University in the USA held the highest rank. Blaser from Vanderbilt University was the only classic author who published three classic papers. The most three common research fields of class *H. pylori* publications were gastric cancer, low-grade gastric lymphoma, and the *CagA* gene. It can be concluded that research on these topics will remain a crucial direction of *H. pylori* research in the future.

Table 1

Characteristics of document type

Document type	*TP*	%	*AU*	*APP*	TC_{2016}	CPP_{2016}
Article	15	83	173	12	23,824	1,588
Review	2	11	3	1.5	2,603	1,302
Note	1	5.6	4	4.0	1,350	1,350
Proceedings paper	1	5.6	9	9.0	2,182	2,182

TP: number of publications; *AU*: number of authors; *APP*: number of authors per publication; TC_{2016}: the total number of citations from Web of Science Core Collection since publication to the end of 2016; CPP_{2016}: number of citations (TC_{2016}) per publication (*TP*).

Table 2

Characteristics of 10 journals.

Journal	*TP* (%)	TC_{2016}	CPP_{2016}	IF_{2016}	Web of Science category	Research area
New England Journal of Medicine	5 (28)	9405	1881	72.406	general and internal medicine	general and internal medicine
Nature	3 (17)	5412	1804	40.137	multidisciplinary sciences	science and technology - other topics
Cancer Research	2 (11)	2906	1453	9.122	Oncology	oncology
Lancet	2 (11)	2924	1462	47.831	general and internal medicine	general and internal medicine
British Medical Journal	1 (5.6)	1091	1091	20.785	general and internal medicine	general and internal medicine
Gut	1 (5.6)	1110	1110	16.658	gastroenterology and hepatology	gastroenterology and hepatology
International Journal of Cancer	1 (5.6)	1238	1238	6.513	Oncology	oncology
JAMA-Journal of the American Medical Association	1 (5.6)	1264	1264	44.405	general and internal medicine	general and internal medicine
Journal of Biological Chemistry	1 (5.6)	1066	1066	4.125	biochemistry and molecular biology	biochemistry and molecular biology
Proceedings of the National Academy of Sciences of the United States of America	1 (5.6)	1361	1361	9.661	multidisciplinary sciences	science and technology - other topics

TP: total number of classic papers; TC_{2016}: the total number of citations from Web of Science Core Collection since publication to the end of 2016; CPP_{2016}: number of citations (TC_{2016}) per publication (*TP*); IF_{2016}: impact factor in 2016.

Table 3

First authors and corresponding authors of the 18 classic *Helicobacter pylori* publications.

Authors	*TP*	*FP*	*RP*	Affiliation
M.J. Blaser	3	1	1	Vanderbilt University, USA
T.L. Cover	2	0	1	Vanderbilt University, USA
P.G. Isaacson	2	0	2	University College London, UK
A. Nomura	2	1	1	Vanderbilt University, USA
J. Parsonnet	2	2	2	Stanford University, USA
A.C. Wotherspoon	2	2	0	University College London, UK
R.A. Alm	1	1	1	Astra Research Center Boston, USA
J.C. Atherton	1	1	0	Vanderbilt University, USA
S. Censini	1	1	0	Chiron Vaccines, Italy
P. Correa	1	1	1	Louisiana State University, USA
A. Covacci	1	0	1	Chiron Vaccines, Italy
E.M. El-Omar	1	1	1	National Cancer Institute, USA
D. Forman	1	1	1	Llandough Hospital, UK
P. Malfertheiner	1	1	1	University of Magdeburg, Germany
P. Michetti	1	0	1	Centre Hospitalier Universitaire Vaudois, Switzerland
D.M. Parkin	1	1	1	University of Oxford, UK
S. Suerbaum	1	1	0	University of Wurzburg, Germany
J.F. Tomb	1	1	1	Washington University, USA
N. Uemura	1	1	1	Kure Kyosai Hospital, Japan
T. Yamada	1	1	0	University of Michigan, USA

TP: total number of classic publications; *FP*: number of first-author classic publications; *RP*: number of corresponding-author classic publications.

Table 4

The 18 classic *Helicobacter pylori* publications in Science Citation Index Expanded

Rank (TC_{2016})	Rank (C_{2016})	Document type	Publication information
1 (2,964)	5 (73)	Article	[37] Parsonnet, J., Friedman, G.D., Vandersteen, D.P., Chang, Y., Vogelman, J.H., Orentreich, N. and Sibley, R.K. (1991), *Helicobacter pylori* infection and the risk of gastric carcinoma. *New England Journal of Medicine*, **325** (16), 1127-1131.
2 (2,606)	6 (61)	Article	[45] Tomb, J.F., White, O., Kerlavage, A.R., Clayton, R.A., Sutton, G.G., Fleischmann, R.D., Ketchum, K.A., Klenk, H.P., Gill, S., Dougherty, B.A., Nelson, K., Quackenbush, J., Zhou, L.X., Kirkness, E.F., Peterson, S., Loftus, B., Richardson, D., Dodson, R., Khalak, H.G., Glodek, A., McKenney, K., Fitzegerald, L.M., Lee, N., Adams, M.D., Hickey, E.K., Berg, D.E., Gocayne, J.D., Utterback, T.R., Peterson, J.D., Kelley, J.M., Cotton, M.D., Weldman, J.M., Fujii, C., Bowman, C., Watthey, L., Wallin, E., Hayes, W.S., Weidman, J.M., Fujii, C., Borodovsky, M., Karp, P.D., Smith, H.O., Fraser, C.M. and Venter, J.C. (1997), The complete genome sequence of the gastric pathogen Helicobacter pylori. *Nature*, **388** (6642), 539-547.
3 (2,182)	1 (163)	Article Proceedings paper	[39] Uemura, N., Okamoto, S., Yamamoto, S., Matsumura, N., Yamaguchi, S., Yamakido, M., Taniyama, K., Sasaki, N. and Schlemper, R.J. (2001), Helicobacter pylori infection and the development of gastric cancer. *New England Journal of Medicine*, **345** (11), 784-789.
4 (1,776)	3 (105)	Article	[48] Correa, P. (1992), Human gastric carcinogenesis: A multistep and multifactorial process - First American Cancer Society Award Lecture on Cancer Epidemiology and Prevention. *Cancer Research*, **52** (24), 6735-6740.
5 (1,574)	10 (36)	Article	[50] Wotherspoon, A.C., Doglioni, C., Diss, T.C., Pan, L.X., Moschini, A., Deboni, M. and Isaacson, P.G. (1993), Regression of primary low-grade B-cell gastric lymphoma of mucosa-associated lymphoid tissue type after eradication of Helicobacter pylori. *Lancet*, **342** (8871), 575-577.
6 (1,507)	16 (25)	Article	[69] Nomura, A., Stemmermann, G.N., Chyou, P.H., Kato, I., Perezperez, G.I. and Blaser, M.J. (1991), *Helicobacter pylori* infection and gastric carcinoma among Japanese Americans in Hawaii. *New England Journal of Medicine*, **325** (16), 1132-1136.
7 (1,480)	7 (57)	Article	[66] El-Omar, E.M., Carrington, M., Chow, W.H., Mccoll, K.E.L., Bream, J.H., Young, H.A., Herrera, J., Lissowska, J., Yuan, C.C., Rothman, N., Lanyon, G., Martin, M., Fraumeni, J.F. and Rabkin, C.S. (2000), Interleukin-1 polymorphisms associated with increased risk of gastric cancer. *Nature*, **404** (6776), 398-402.

Contd...

8 (1,387)	14 (33)	Article	[51] Parsonnet, J., Hansen, S., Rodriguez, L., Gelb, A.B., Warnke, R.A., Jellum, E., Orentreich, N., Vogelman, J.H. and Friedman, G.D. (1994), *Helicobacter pylori* infection and gastric lymphoma. *New England Journal of Medicine*, **330** (18), 1267-1271.
9 (1,365)	4 (101)	Review	[59] Suerbaum, S. and Michetti, P. (2002), Medical progress: *Helicobacter pylori* infection. *New England Journal of Medicine*, **347** (15), 1175-1186.
10 (1,361)	10 (36)	Article	[54] Censini, S., Lange, C., Xiang, Z.Y., Crabtree, J.E., Ghiara, P., Borodovsky, M., Rappuoli, R. and Covacci, A. (1996), cag, a pathogenicity island of Helicobacter pylori, encodes type I-specific and disease-associated virulence factors. *Proceedings of the National Academy of Sciences of the United States of America*, **93** (25), 14648-14653.
11 (1,350)	14 (33)	Note	[53] Wotherspoon, A.C., Ortizhidalgo, C., Falzon, M.R. and Isaacson, P.G. (1991), *Helicobacter pylori*-associated gastritis and primary B-cell gastric lymphoma. *Lancet*, **338** (8776), 1175-1176.
12 (1,326)	13 (34)	Article	[65] Alm, R.A., Ling, L.S.L., Moir, D.T., King, B.L., Brown, E.D., Doig, P.C., Smith, D.R., Noonan, B., Guild, B.C., deJonge, B.L., Carmel, G., Tummino, P.J., Caruso, A., Uria-Nickelsen, M., Mills, D.M., Ives, C., Gibson, R., Merberg, D., Mills, S.D., Jiang, Q., Taylor, D.E., Vovis, G.F. and Trost, T.J. (1999), Genomic-sequence comparison of two unrelated isolates of the human gastric pathogen Helicobacter pylori. *Nature*, **397** (6715), 176-180.
13 (1,264)	18 (13)	Article	[70] Yamada, T., Ahnen, D., Alpers, D.H., Greenberg, H.B., Gray, L., Joscelyn, K.B., Kauffman, G., Podolsky, D.K., Ray, W.A., Schaberg, D., Silverstein, F.E., Sivak, M.V., Williams, A.L.B. and Yolken, R. (1994), Helicobacter pylori in peptic ulcer disease. *JAMA-Journal of the American Medical Association*, **272** (1), 65-69.
14 (1,238)	2 (130)	Review	[49] Parkin, D.M. (2006), The global health burden of infection-associated cancers in the year 2002. *International Journal of Cancer*, **118** (12), 3030-3044.
15 (1,130)	12 (35)	Article	[55] Blaser, M.J., Perezperez, G.I., Kleanthous, H., Cover, T.L., Peek, R.M., Chyou, P.H., Stemmermann, G.N. and Nomura, A. (1995), Infection with Helicobacter pylori strains possessing cagA is associated with an increased risk of developing adenocarcinoma of the stomach. *Cancer Research*, **55** (10), 2111-2115.
16 (1,110)	8 (55)	Article	[68] Malfertheiner, P., Megraud, F., O'Morain, C., Bazzoli, F., El-Omar, E., Graham, D., Hunt, R., Rokkas, T., Vakil, N. and Kuipers, E.J. (2007), Current concepts in the management of Helicobacter pylori infection: The maastricht III consensus report. *Gut*, **56** (6), 772-781.

17 (1,091)	16 (25)	Article	[67] Forman, D., Newell, D.G., Fullerton, F., Yarnell, J.W.G., Stacey, A.R., Wald, N. and Sitas, F. (1991), Association between infection with Helicobacter pylori and risk of gastric cancer: Evidence from a prospective investigation. *British Medical Journal*, **302** (6788), 1302-1305.
18 (1,066)	9 (46)	Article	[56] Atherton, J.C., Cao, P., Peek, R.M., Tummuru, M.K.R., Blaser, M.J. and Cover, T.L. (1995), Mosaicism in vacuolating cytotoxin alleles of Helicobacter-pylori: Association of specific vacA types with cytotoxin production and peptic-ulceration. *Journal of Biological Chemistry*, **270** (30), 17771-17777.

TC_{2016}: the total number of citations from Web of Science Core Collection since its date of publication to the end of 2016; C_{2016}: the total number of citations in 2016 only.

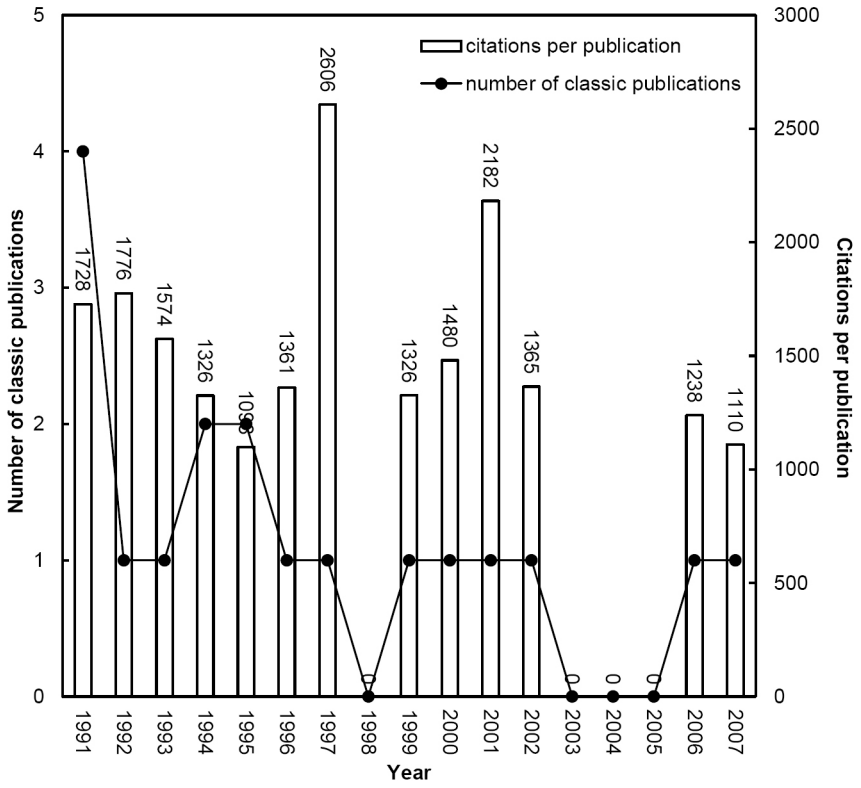

Figure 1

Distribution of number of classic publications and their citations per publication by year.

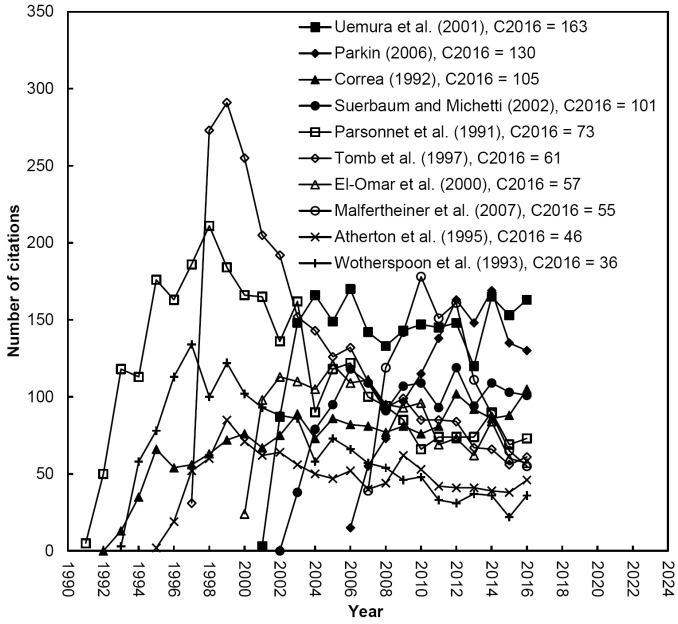

Figure 2

The top ten high impact *Helicobacter pylori* classic publications in SCI-EXPANDED in 2016

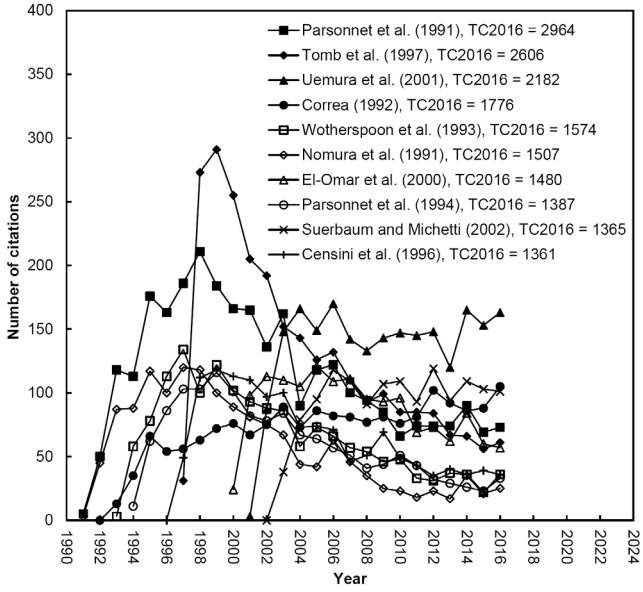

Figure 3

The top ten highly cited *Helicobacter pylori* classic publications in SCI-EXPANDED with TC_{2016} > 1,360

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