

Spanish scientific output on *Helicobacter pylori*. A study through Medline

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ABSTRACT

Objectives: to analyze scientific output from Spanish hospitals in relation to *Helicobacter pylori* infection.

Methods: papers collected from the Medline database between January 1988 and December 2003 were selected. Our search strategy was: "*Helicobacter pylori*" [MeSH] AND ((Spain [AD] OR Espana [AD] OR Spanien [AD] OR Espagne [AD] OR Espanha [AD]) OR (Spanish [LA]) OR Spain). The following was analyzed: geographic area, Spanish or foreign publication, topic, and year of publication. Output and impact bibliometric markers were evaluated.

Results: in all, 691 papers were identified, of which 241 were excluded. Number of papers went from 2 in 1988 to 47 in 2002 and 13 in 2003. There were more reports in Spanish versus foreign journals (58 vs. 42%). In the first 5 years the areas with greater output were associated with diagnosis and microbiology (33 and 20%), whereas therapy was the predominating subject during the last 5 years (27%). Original papers were most common among publications (69%). Hospitals with highest output included La Princesa (24%) and Ramón y Cajal (17.6%) in Madrid, and Parc Taulí in Barcelona (6.4%). Mean impact factor progressively increased from 1.826 in 1988 to 2.142 in 2002 and 2.493 in 2003.

Conclusions: the production and impact of documents published by Spanish scientists regarding *H. pylori* infection considerably increased during the past two decades.

Key words: *Helicobacter pylori*. Spain. Scientific information.

Trapero-Marugán M, Gisbert JP, Pajares JM. Spanish scientific output on *Helicobacter pylori*. A study through Medline. *Rev Esp Enferm Dig* 2006; 98: 255-264.

Recibido: 09-01-04.
Aceptado: 17-02-04.

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INTRODUCTION

Medline, the database most widely used by medicine practitioners, includes almost 4,000 journals, 35 of which are published in Spain (1-4). Bibliometric studies have been ongoing for more than twenty years in order to assess the scientific activities of professionals in the various scientific settings. In the medical setting numerous studies analyze the production, circulation, spread, and impact of publications in the various fields of specialization (5-11).

Helicobacter pylori (*H. pylori*) was initially identified in 1992 (12), and was subsequently shown to be the etiologic agent responsible for most gastritis and gastroduodenal ulcer cases (13), as well as an essential factor for the development of gastric cancer (14). Following the characterization of *H. pylori* numerous investigators, including Spanish researchers, began their reports on this new bacterium. *H. pylori* infection represents a significant public health challenge because of its high prevalence, potential for ulcerative complications (especially gastrointestinal bleeding), and potential risk for gastric adenocarcinoma or lymphoma development (15). These determinants represented a relevant scientific drive, and entailed the adoption of numerous resources for the investigation of *H. pylori* infection and its consequences. As with other diseases, the number of reports related to *H. pylori* has progressively increased over the last few decades, and areas of report have evolved according to knowledge gained.

Following a review of the literature, no study has assessed publications by Spanish authors regarding *H. pylori* infection yet. Therefore, the goal of this study was to analyze the scientific output of Spanish professionals on *H. pylori* in national institutions, from early 1988 to August 2003. To this end, bibliographic references in the Medline database were evaluated.

PATIENTS AND METHODS

Documents classified as original papers, clinical reports, letters, editorials, and reviews of publications included in Medline from 1988 to December 2003 were analyzed using the PubMed search engine. For this search we based ourselves on a previously published paper on Spanish scientific output regarding human immunodeficiency virus (6).

Search strategy

Our search strategy was based on two fields: MeSH (*Medical Subject Headings*) and AD (*Affiliation*).

1. To find publications on *H. pylori* the term "*Helicobacter pylori*" [MeSH] was used in the MESH field.
2. To find Spanish publications, that is, publications where the first undersigned was of Spanish nationality, the following terms were used in the AD field: ((Spain [AD] OR Espana [AD] OR Spanien [AD] OR Espagne [AD] OR Espanha [AD]) OR (Spanish [LA]) OR Spain).
3. Therefore, the overall strategy was as follows: "*Helicobacter pylori*" [MeSH] AND ((Spain [AD] OR Espana [AD] OR Spanien [AD] OR Espagne [AD] OR Espanha [AD]) OR (Spanish [LA]) OR Spain).

Exclusion criteria

1. Papers with a PT (*Publication Type*) field containing: letter, editorial, carta, or news.
2. Papers including *H. pylori* infection as an exclusion criterion.
3. Works by Spanish authors in foreign centers, or with non-Spanish authors.
4. Papers with "Port of Spain" in the AD field.

Data collection

The following data were collected from all papers: a) journal nationality; b) paper language; c) paper type, according to three categories: clinical report (letter, news or editorial), review or original article (those not included in the former two); d) journal title; e) journal impact factor [according to JCR (*Journal Citation Report*) for 2001]; f) paper publication year; g) first undersigned's center or institution; h) center's province and Autonomous Community; i) exclusion criteria; and j) topic area (see the following section).

Topic areas

1. Epidemiology, transmission and prevention of *H. pylori* infection; prevalence studies for geographic areas were included.

2. Microbiology and immunology.
3. Dyspepsia.
4. Ulcer and complications (bleeding, stenosis, perforation).
5. Gastric neoplasms (adenocarcinoma and lymphoma).
6. Diagnostic methods: histologic, microbiologic, immunologic and molecular.
7. Treatment: all drug duration and dosage variations are included. Treatment adverse effects.
8. Extra-gastrointestinal manifestations of *H. pylori* infection.
9. Other topics not included in any of the previous sections.

Statistical analysis

Data collected were recorded in a database developed to this end, and statically analyzed using the SPSS 11.0 for Windows program (SPSS Inc, Illinois, USA). For quantitative variables mean and standard deviation (SD) values were estimated, as was percentage for qualitative variables.

RESULTS

Excluded documents

Using the search strategy described in the Methods section 691 documents were initially identified, 241 of which were excluded. Reasons for exclusion are listed in table I. Of 241 documents excluded, 83% had been published in national journals, and 17% in foreign journals. Most common among excluded documents were original papers (44%), followed by clinical notes (40%). Most common among reasons for exclusion was the author's foreign nationality (64%). The journal with a higher number of excluded publications was *Acta Gastroenterológica Latinoamericana*, for a total of 40 documents (17%).

Table I. Reasons for the exclusion of papers initially identified by our search strategy

Reason	Number
Documents with PT including: "Letter", "Editorial", "News" or "Carta"	75 (31%)
Documents where <i>H. pylori</i> infection was an exclusion criterion	0 (0%)
Documents from foreign centers	157 (65%)
Documents unrelated to <i>H. pylori</i>	9 (3.7%)
Total	241 (100%)

PT: Publication Type (MedLine field identifying documents by publication type).

Table II. First five national and foreign journals with the highest number of papers on *H. pylori*

National journal	No. documents	Foreign journal	No. documents
Rev Esp Enferm Dig	61 (14.1%)	Aliment Pharmacol Ther	24 (5.4%)
Gastroenterol Hepatol	39 (9%)	Eur J Gastroenterol Hepatol	19 (4.4%)
Med Clin (Barc)	35 (8.1%)	Am J Gastroenterol	13 (3%)
Enferm Infecc Microbiol Clin	28 (6.5%)	Helicobacter	9 (2%)
Rev Clin Esp	22 (5.1%)	Scand J Gastroenterol	9 (2%)

Percentage refers to total of analyzed documents (national plus foreign).

Journal type

The scientific output of Spanish authors spread across 93 journals: 58% were Spanish, 42% were non-Spanish. Table II shows the 10 journals with more papers identified—42% of documents were published by the 5 Spanish journals with higher print runs. Regarding foreign journals, all 5 with higher print runs included 17% of total publications.

Document type

The predominating document type was the original paper, for a total of 311 articles (69%), followed by reviews—123 (27%)—and clinical notes—16 (3.6%). The chronological evolution of document types was different during the first five years *versus* the last five years, as can be seen in figure 1. Original papers were most common both in the initial (74%) and the last 5 years (69%). Reviews percentage remained stable for the first and last five years (26 and 28%, respectively); and clinical notes increased by 1988 (0% during the 80s *versus* 3.8% for the last five years).

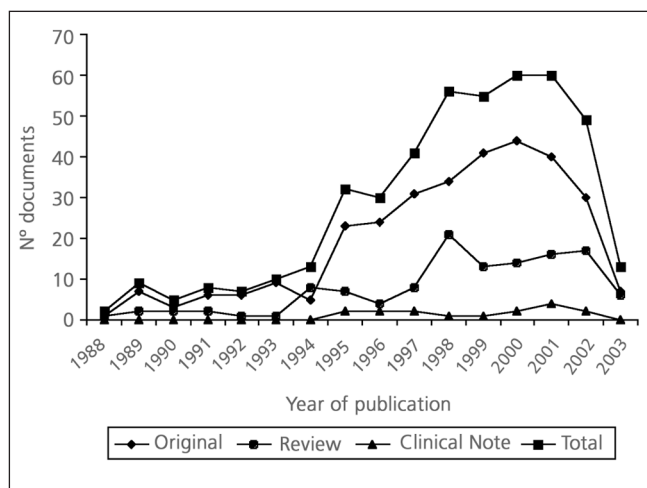


Fig. 1.- Evolution of papers published over time.
Evolución cronológica del tipo de documento publicado.

Bibliometric production and impact indicators

Figure 1 shows the chronological evolution of publication output over the years. In 1988 2 papers on *H. pylori* were published, whereas in 2002 Spanish authors published 42 papers, plus 13 documents in 2003. The growth pattern of scientific output follows an abnormal distribution, being rather asymmetric with an irregular ascending phase peaking in 2000 and 2001, and a subsequent decline in 2002 and 2003.

Table III. Eight Spanish centers with the highest mean impact factor

Institution	IF \pm SD
Hospital Ntra. Sra. de Aránzazu, San Sebastián	5.39 \pm 5.4
Hospital Clínic, Barcelona	5.25 \pm 4.9
Hospital Lozano Blesa, Saragossa	3.86 \pm 3.9
Hospital Mutua de Terrasa, Barcelona	3.55 \pm 0
Hospital Parc Taulí, Barcelona	2.95 \pm 1.4
Hospital de La Princesa, Madrid	1.7 \pm 1.2
Hospital La Fe, Valencia	1.34 \pm 1.3
Hospital Ramón y Cajal, Madrid	1.12 \pm 1.7

IF: Impact factor. SD: Standard deviation.

The impact of Spanish scientific output on *H. pylori* infection as a whole has also increased over the years (Fig. 2). Mean overall impact factor was 1.95 ± 2 . Mean impact factor for 1988 was 1.82 ± 0 , and increased to 2.49 ± 1.4 by 2003. According to Centers, the highest mean IF corresponded to Nuestra Señora de Aránzazu Hospital (Guipúzcoa), with a mean IF of 5.39 ± 5.4 . Regarding Autonomous Communities, those with a higher mean IF were the Basque Country (3.89 ± 4), Catalonia (3.14 ± 2.6), and Aragon (2.9 ± 3.2).

Topic areas

Among the total 449 documents collected and included, 123 (27%) were related to *H. pylori* infection therapy. These were followed by 79 papers (18%) on diagnostic methods, 67 (15%) on bacteriologic, genetic, and immunologic issues, 42 (9.4%) on extra-gastrointestinal manifestations, 39 (8.7%) on ulcer and related complications, and

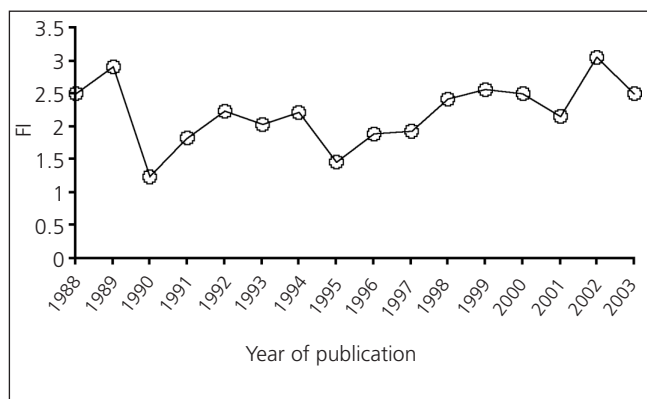


Fig. 2.- Evolution of mean impact factor (IF) over time.
Evolución cronológica del factor de impacto (FI) medio.

34 (7.6%) on dyspepsia. Topic areas with a highest output included: therapy, diagnostic methods/bacteriology, genetics, and immunology. From 1996 on the microbiology topic area considerably declined, whereas therapy accounted for the majority of scientific output.

Institutions

The center with the highest amount of publications was Hospital de La Princesa, Madrid, with a total of 108 (24%). Table IV lists all 8 centers with a higher amount of papers. The number of papers published varied over follow-up time; thus, centers such as Hospital de La Princesa, Madrid, Parc Taulí, Barcelona, and Lozano Blesa, Saragossa, increased their scientific output over the last 5 years, while centers such as Hospital Ramón y Cajal or La Paz, both in Madrid, or Nuestra Señora de Aránzazu, in Guipúzcoa, declined during the latter period.

Table IV. Eight Spanish centers with the highest number of papers

Institution	No. of publications (% of total)
Hospital de La Princesa, Madrid	108 (24.1%)
Hospital Ramón y Cajal, Madrid	79 (17.6%)
Hospital Parc Taulí, Barcelona	29 (6.4%)
Hospital Lozano Blesa, Saragossa	20 (4.5%)
Hospital Clínic, Barcelona	15 (3.3%)
Hospital Miguel Servet, Saragossa	13 (3%)
Hospital La Paz, Madrid	9 (2%)
Hospital Ntra. Sra. Aránzazu, San Sebastián	8 (1.8%)

Autonomous Community and Province

Regarding geographic origin, Autonomous Communities with a higher number of publications included

Madrid with 215 papers (48%), Catalonia with 89 (20%), Aragon with 39 (8.7%), Andalusia with 25 (5.6%), and the Basque Country with 13 (2.9%). By province, Madrid was most prolific with 215 (48%), followed by Barcelona with 84 (19%) and Saragossa with 35 (7.8%).

DISCUSSION

For more than two decades now bibliometric studies have been performed to assess professionals' scientific output in various scientific settings. While numerous studies discuss paper production, circulation, spread, and impact in a number of specialties, no single study has ever assessed publications by Spanish authors on *H. pylori* infection. The relevance of this organism, which was first isolated some two decades ago, results from its etiologic role in various gastroduodenal conditions, including chronic gastritis, peptic ulcer, and gastric cancer.

Thus, we deemed it interesting to analyze scientific output on *H. pylori* by Spanish professionals in national institutions from early 1988 to this day by evaluating bibliography references included in the Medline database. A progressive increase in overall Spanish scientific production has been seen since the 1980's, which also involves Gastroenterology. As *H. pylori* was first isolated only a few years ago, this is a field where chronologic changes in publication numbers can be most clearly identified. Thus, only two papers were published on *H. pylori* in 1988, whereas 42 papers by Spanish authors saw the light in 2002. From a different standpoint, mean impact factor was 1.82 in 1988, and had increased to 2.49 by 2003.

Number of publications grew initially until 2000 and 2001, and then declined in 2002 and 2003; such descending trend may reflect an actual decrease in Spanish scientific output, but this needs confirmation in the next few years. Nevertheless, explanations for decreased publication numbers in a given scientific field may be diverse; thus, for instance, difficulties in performing further quality, novel, and increasingly complex studies after an initial, truly explosive publishing phase may considerably restrict scientific output. In this respect, while topic areas with a higher output included therapy, diagnostic methods and bacteriology, genetics, and immunology, microbiology was seen to considerably decline starting in 1996, whereas therapy monopolized most scientific production. On the other hand, Healthcare research budgets have been decreased and, while the quality of scientific production by Spanish investigators keeps growing (as reflected by the increasing mean impact factor of publications), a decrease in scientific output is to be expected following the restricted research project numbers.

As occurs with other specialties, the Autonomous Communities of Madrid and Catalonia are responsible for most National scientific production. Regarding *H. pylori* infection, almost one half of papers were from Madrid, while Barcelona accounted for 20% of publica-

tions. While both Autonomous Communities have substantial R&D budgets, in addition to greater numbers of institutions and hospitals, the fact that scientific output was concentrated almost exclusively in two centers in Madrid (Hospitals La Princesa and Ramón y Cajal) and two centers in Barcelona (Hospitals Parc Taulí and Clínic) should be highlighted. These findings underscore the importance of "local" research groups with a specific focus on *H. pylori* infection.

The mean impact factor of Spanish publications on *H. pylori* was 1.95, which represents a figure above those of other medical fields, including respiratory system (5), HIV infection (6), nutrition (7), substance abuse (8), pharmacy (9), and rheumatology (10). However, there is a number of specialties, including neuroscience, where publications have a higher mean impact factor (11) when compared to gastroenterology.

This study has, however, some limitations. First, bibliometric studies have a number of restrictions, as they are based on documents from an information collection database such as Medline containing biases. Medline was selected for being most widely used by both Spanish and foreign physicians, for including not only indexed journals with an impact factor on the Science Citation Index (SCI), but also less relevant papers, and for being easily accessible (1-4). This database has been used for bibliometric studies in other medical areas regarding scientific output by Spanish authors (5-11). A further Medline limitation is that it does not include full data on documents classified as clinical notes or editorials, but this bias was corrected by excluding such papers from the study. Finally, we may have missed a number of papers by Spanish authors not included as first underlined, as Medline only includes demographic data the latter group.

In summary, findings in the present study demonstrate that the production and impact of documents published by Spanish authors regarding *H. pylori* infection have considerably increased during the last two decades. A greater quality has also been attained, with papers having a higher mean impact factor. Autonomous Communities with the highest output and impact rates still include Madrid and Catalonia. Regarding topic area, therapy is most relevant nowadays, in contrast to diagnosis and microbiology, which were more significant in initial years.

ACKNOWLEDGMENTS

This study was partly supported by a grant from Instituto de Salud Carlos III (C03/02).

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