

Publication Analysis 1999-2005

Pharmacology & Pharmacy

Authors from Germany co-signed the most articles in European “pharmacology and pharmacy” publications. Most cited, however, were their English colleagues. The hottest topics were cardiovascular regulation, pharmacogenetics and HIV.

First a little history. Not about ancient Egyptians or Aztecs using plant extracts in healing or as poisons but on the birth of modern experimental pharmacology. That is generally associated with the work of the French physiologist, Francois Magendie, who in the early 19th century claimed that toxic or medicinal action of natural drugs depends on the chemical substances they contain and that it should be possible to obtain these substances in their pure state. Furthermore, Magendie clearly established that the action of strychnine-containing plant extracts could be located to the spinal cord. These results provided evidence to support the view that drugs and poisons must be absorbed into the bloodstream and carried to the site of action before producing their effects.

It wasn't until three decades later, however, that pharmacology really began to emerge as a well-defined discipline. The main pioneer was Rudolf Buchheim who, at that time, taught *materia medica* at the German speaking University of Dorpat in Estonia. *Materia medica* was concerned largely with questions about the origins, constituents, preparation and traditional therapeutic uses of drugs. Buchheim, however, called for an independent experimental science of pharmacology, involving the study of the physiological action of drugs. He subsequently established the first Institute of Pharmacology at the University of Dorpat in 1847.

An umbrella discipline

Today, pharmacology is frequently described as the study of how chemical agents, both natural and synthetic, affect biological systems and “translate” such knowledge into the rational development of therapeutics. In this context, on the one hand, pharmacology has developed into an umbrella discipline incorporating knowledge and skills from a number of basic disciplines including physiology, biochemistry and cell and molecular biology; on the other hand, pharmacologists have, at the same time, diversified into several sub-disciplines including molecular or biochemical pharmacology, neuropharmacology, behavioral phar-

macology, chemotherapy or clinical pharmacology and a few more.

Nevertheless, a number of objectives have become more prominent in experimental pharmacology during recent decades. Examples include the molecular understanding of signal perception and transmission events that regulate and interfere with specific cell functions; the development of therapeutic strategies by using specific gene-directed approaches; or the understanding of human genetic factors involved in the variability of responses to drugs, an objective mainly represented by the rather new class of pharmacogeneticists.

Disappearing borders

What about pharmacy? One is frequently warned not to confuse pharmacology with pharmacy. The latter, for example, is defined as the *profession* responsible for the preparation, dispensing and appropriate use of medication, thus providing services to achieve optimal therapeutic results. In *research*, however, no sharp border is visible. You'll find fairly comparable projects and experimental techniques in pharmaceutical as well as in pharmacological research institutes, leading to a large extent to publication of results in the same journals.

Apparently, for the same reason, Thomson Scientific combines both disciplines into one research category “pharmacology and pharmacy” in its citation database “Web of Science”. Therefore, the specialist journals listed in that category also served as sources for our comparison of national publication performances in pharmacology and pharmacy research.

Once again, we had to exclude multi-disciplinary journals such as *Nature* or *The Lancet* from the analysis since “Web of Science” provides no tools to reliably extract only articles pertaining to pharmacology and pharmacy. Indeed, the most prominent papers in the field might thus have been omitted from this part of the analysis. However, we believe that their performance in the specialist journals leads to a feasible comparison between countries' productivity in pharmacology and pharmacy.

Applying these criteria to publications in pharmacology and pharmacy journals between 1999 and 2005, Germany emerges as the European leader by number of articles. Their English colleagues, however, collected the most citations. The reason being that articles with English (co-)authorship were cited about two times more on average than articles (co-)signed by researchers from German institutes (8.8 versus 6.7).

The best citations per article-ratios, though, were achieved by Switzerland (11.4), Sweden (10.0), Scotland (9.88) and France (9.80), who reached a strong third place in the overall citation numbers. Comparably strong by citation number was Italy in fourth place.

Fruitful clinical studies

Between 1999 and 2005 all European researchers (including Israel) co-authored 31.6% more articles in pharmacology and pharmacy journals than their colleagues in the USA. These articles however attracted only 12.8% more citations than their US counterparts. The logical conclusion dictates that US articles were better cited on average (9.8 versus a European 7.7). The same is true, by the way, for Canada (9.6) and Australia (8.2)

Europe...

Country	Citations	Articles	Cit./Art.
1. England	159,320	18,050	8.83
2. Germany	125,090	18,693	6.69
3. France	103,222	10,526	9.80
4. Italy	83,883	10,192	8.23
5. Netherlands	48,019	5,419	8.86
6. Spain	46,000	5,947	7.73
7. Switzerland	45,414	3,982	11.40
8. Sweden	40,166	4,006	10.03
9. Belgium	29,379	3,261	9.01
10. Scotland	24,738	2,505	9.88
11. Denmark	18,426	1,963	9.39
12. Finland	15,886	1,797	8.84
13. Israel	14,904	1,836	8.12
14. Austria	14,457	2,085	6.93
15. Poland	14,357	2,617	5.49
16. Turkey	10,327	2,568	4.02
17. Hungary	9,757	1,422	6.86
18. Ireland	8,800	1,105	7.96
19. Greece	7,503	1,409	5.33
20. Norway	7,279	817	8.91

Articles appeared between 1999 and 2005 in pharmacology & pharmacy journals as listed by Thomson Scientific. Their citation numbers were recorded up until February 2007. A country's figures are derived from articles where at least one author working in the respective European nation is included in the author's list. Israel is included because it is a member of many European research organisations (EMBO, FEBS etc.), as well as participating in the EU Research Framework Programmes.

... and the world

	Citations	Articles	Cit./Art.
Europe	751,980	97,702	7.70
USA	655,387	66,875	9.80
Japan	143,975	24,508	5.87
Canada	77,195	8,072	9.56
Australia	37,694	4,622	8.16
China	34,942	6,763	5.17

The two most-cited European pharmacology and pharmacy papers from 1999-2005 were clinical studies in cardiology and hypertension, both coordinated by pharmacologists from Paris and London respectively (see table next page). On the one hand, this impressively demonstrates the fact that irrespective of discipline you can collect a lot of citations by participating in clinical studies. On the other hand, however, it reflects what an incredibly hot field cardiovascular pharmacology currently represents.

The same is true for the topics of the next three of the five top-cited articles: genetic causes for variability of individual responses to drugs (3), mechanisms of action of neuronal receptors (4), and the cellular processes during apoptosis (5).

Another hot topic is represented by the most-cited European researcher in pharmacology and pharmacy (see table next page), Erik de Clercq from the Rega Institute for Medical Research at the Catholic University of Leuven. His research activities are focussed on the design and development of antiviral agents against human pathogens, particularly against HIV. Among de Clercq's "success stories" are the development of Stavudine, a thymidine analogue reverse transcriptase inhibitor against HIV, approved by the US Food and Drug Administration (FDA) in 1994; or the nucleotide analogue tenofovir disoproxil fumarate, approved in the USA and the EU and marketed under the brand name Viread since 2002.

Sheer quantity


De Clercq's record of more than 8.500 citations, however, was largely down to sheer quantity. Between 1999 and 2005 his name appeared in the author's line of 688 publications, resulting in an average of 12.4 citations per paper. Thus, De Clercq must have co-authored two articles every week!

Second from the top, Vincenzo di Marzo from the CNR institute of Biomolecular Chemistry in Naples, needed longer intervals; he co-wrote one paper every 15.3 days. In his institute di Marzo leads the "Endocannabinoid Group" which investigates the regulation of endocannabinoid levels and their multi-faceted mechanisms of action. His citation per article ratio was 43.1.

In third place was the first of six non-academic researchers among the top 30, Renaud Capdeville from Novartis Pharma AG in Basel. He is one of the co-developers of Gleevec (Gleevec in the US), the first selective tyrosine-kinase inhibitor approved for the treatment of a cancer.

On a final note, only two female researchers made it into the "Pharmacology and Pharmacy" Top 30, Elisabeth Buchdunger (7th) and Amanda Proudfoot (27th). Interestingly they both work at pharma companies, too.

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►  Publication Analysis 1999-2005 – Pharmacology & Pharmacy

Most Cited Authors...

	Cit-ations	Art-icles
1. Erik de Clercq, Virol. and Chemother. Kathol. Univ. Leuven	8,542	688
2. Vincenzo di Marzo, CNR Inst. Biomol. Chem. Naples	7,202	167
3. Renaud Capdeville, Oncol. Res. Novartis Pharma AG Basel	6,882	80
4. Csaba Szabó, Semmelweis Univ. Budapest / Intek Pharmaceut.	5,402	405
5. Geoffrey Burnstock, Neurosci. Ctr. Univ. Coll. Med. Sch. London	5,386	256
6. Jos H. Beijnen, Pharmacol. Slotervaart Hosp. Amsterdam	5,091	417
7. Elisabeth Buchdunger, Oncol. Res. Novartis Pharma AG Basel	4,897	58
8. Franz Hofmann, Pharmacol. Tech. Univ. Munich	4,387	214
9. Gianni Tognoni, Mario Negri Inst. Pharmacol. Res. Milan	4,385	137
10. Michel Eichelbaum, Dr. M. Fischer-Bosch-Inst. Stuttgart	4,355	148
11. Dick de Zeeuw, Clin. Pharmacol. Univ. Groningen	4,354	212
12. Ivar Roots, Clin. Pharmacol. Univ. Med. Ctr. Charité Berlin	4,260	212
13. Peter J. Meier, Clin. Pharmacol. Univ. Hosp. Zurich / Univ. Basel	4,256	166
14. Salvatore Cuzzocrea, Pharmacol. Inst. Univ. Messina	4,103	256
15. Michel Lazdunski, CNRS Unit Mol. & Cell. Pharmacol. Valbonne	3,967	104
16. Maurizio Prato, Pharmaceut. Sci. Univ. Trieste	3,793	142
17. Jürgen Brockmöller, Clin. Pharmacol. Univ. Göttingen	3,752	153
18. Neil R. Poulter, Clin. Pharmacol. Imperial Coll. Sch. Med. London	3,531	69
19. Jan Balzarini, Virol. and Chemother. Kathol. Univ. Leuven	3,523	382
20. Gunther Hartmann, Clin. Pharmacol. Univ. Munich	3,420	79
21. Jan H. Schellens, Clin. Pharm. The Netherl. Canc. Inst. Amsterdam	3,298	239
22. Bernard P. Roques, INSERM & CNRS Unit Pharmacochem. Paris	3,015	161
23. Günter Schultz, Pharmacol. Univ. Med. Ctr. Charité Berlin	2,994	75
24. John B. Davis, Neurosci. Glaxo SmithKline Harlow	2,965	54
25. Achille P. Caputi, Pharmacol. Inst. Univ. Messina	2,963	178
26. Per Magne Ueland, Pharmacol. Univ. Bergen	2,954	96
27. Amanda Proudfoot, SeroPharmaceut. Res. Inst. Geneva	2,897	75
28. Jean Marc Fritschy, Pharmacol. Swiss Fed Inst. Technol Zurich	2,889	92
29. Ingolf Cascorbi, Pharmacol. Univ. Kiel	2,806	132
30. Patrick Vallance, Drug Discovery Glaxo SmithKline Greenford	2,801	138



Citations of articles published between 1999-2005 were recorded until February 2007. The "most cited papers" had corresponding addresses in Europe or Israel.

... and Papers

	Citations
1. Lechat P, Brunhuber KW, Hofmann R, <i>et al.</i> The Cardiac Insufficiency Bisoprolol Study II (CIBIS-II): a randomised trial. <i>LANCET</i> , 353 (9146): 9-13 JAN 2 1999	1.478
2. Sever PS, Dahlof B, Poulter NR, Wedel H, <i>et al.</i> Prevention of coronary and stroke events with atorvastatin in hypertensive patients who have average or lower-than-average cholesterol concentrations, in the Anglo-Scandinavian Cardiac Outcomes Trial-Lipid Lowering Arm (ASCOT-LLA): a multicentre randomised controlled trial. <i>LANCET</i> , 361 (9364): 1149-1158 APR 5 2003	739
3. Hoffmeyer S, Burk O, von Richter O, Arnold HP, Brockmöller J, Johne A, Cascorbi I, Gerloff T, Roots I, Eichelbaum M, Brinkmann U Functional polymorphisms of the human multidrug-resistance gene: Multiple sequence variations and correlation of one allele with P-glycoprotein expression and activity in vivo. <i>PROC NATIONAL ACAD SCI USA</i> , 97 (7): 3473-3478 MAR 28 2000	698
4. Zygmunt PM, Petersson J, Andersson DA, Chuang HH, Sorgard M, Di Marzo V, Julius D, Hogestatt ED Vanilloid receptors on sensory nerves mediate the vasodilator action of anandamide. <i>NATURE</i> , 400 (6743): 452-457 JUL 29 1999	645
5. Desagher S, Osen-Sand A, Nichols A, Eskes R, Montessuit S, Lauper S, Maundrell K, Antonsson B, Martinou JC Bid-induced conformational change of Bax is responsible for mitochondrial cytochrome c release during apoptosis. <i>JOURNAL OF CELL BIOLOGY</i> , 144 (5): 891-901 MAR 8 1999	581