



Publication Analysis 1996-2007

Reproductive Biomedicine

As in most other life science disciplines, England also dominates reproduction research in terms of publication and citation numbers. Top cited, in particular, are papers and authors addressing the manifold causes of fertility problems.

In February 2008, the European Parliament (EP) issued a recommendation that research on reproduction should become a priority for the life sciences. The unquestionably growing public and scientific interest in reproduction issues was the reason given. This, in turn, hasn't come as a real surprise considering current catchwords from reproductive biomedicine such as fertility decay, sperm density decline, assisted reproduction, embryo transfer, nuclear transfer and cloning, stem cell research, reproductive toxicology, endocrine disruptors of reproduction and reproductive diseases like preeclampsia or endometriosis.

Good arguments, indeed. Alas, according to a *Nature Medicine* article from November 2008 by reproductive immunologist Gérard Chaouat from the Université Paris sud Orsay, such a commitment of the EP has not yet been translated into appropriate funds for European reproduction research (vol. 14: 1218-20). However, in the light of the slow-moving wheels of European research bureaucracy, perhaps Chaouat was a little too impatient at that time.

Big words but little action

Anyway, another obvious question is how the presumed growth of interest in research on reproduction during the last couple of years is reflected by the publication output of European laboratories? Therefore, as usual in this ranking column, we compared the European countries' publication performances in more than 60 specialist journals exclusively devoted to research on reproduction-relevant issues during the period 1996 to 2007 (for a complete list see journal listing "Reproductive Medicine" at www.medbioworld.com).

Regrettably, articles on reproduction which appeared in multidisciplinary journals such as *Nature* or *The Lancet* had to be excluded from this comparison because Thomson Scientific's database *Web of Science*, used for this analysis, doesn't provide any tools to extract reproduction-relevant articles from them with sufficient reliability. Of course, in this way some of the most prominent papers in the field might have been omitted from this part of the analysis. Nevertheless, we believe a survey, restricted to the expert journals, certainly provides sufficiently valid indicators for the productivity of the individual European countries (see tables next page). For the rankings of the most-cited researchers and papers in reproductive biomedicine, however, publications in all journals could be included (see tables on page 40).

Belgium far better 'than usual'

So, now for the results. Between 1996 and 2007, the analysed expert journals in reproductive biomedicine altogether published 53,700 research articles and reviews, which in total were cited 707,600 times up until May 2009. That means, on average each article received 13.2 citations.

As in most other life science disciplines the pan-European leader in reproductive medicine is England. More than 4,250 articles that appeared in the reproduction journals between 1996 and 2007 had at least one researcher from an English lab included in the author's list. This way, England outperformed Germany, second with 3,136 articles, by more than one thousand items. The following gap, however, is much narrower: France and Italy arrived at third and fourth place with a mere 200 and 220 articles less than Germany, respectively.

In terms of citations, England could even extend its lead: more than 69,000 citations altogether are clearly ahead of Germany's 45,600 as well as France's 42,000 and Italy's 38,000. The reason, of course, is England's excellent citations-per-article ratio: each article with at least one English (co-)author has been cited 16.2 times on average to-date.

This value, however, gave England 'only' a fifth place within Europe. As is often the case, some smaller research countries performed better in terms of citations per article. Thus, the leaders in reproductive biomedicine are Scotland (19.6), Belgium (18.1), Ireland (17.3) and Denmark (17.0). In particular, Belgium might be regarded as the most positive surprise since it performed considerably better in this analysis than in almost all other life science disciplines. Clearly 'lower than usual' was Switzerland's research output in reproductive biomedicine.

Fertility problems, of course

In total, European authors beat their colleagues from the US by almost 10,000 articles (25,900 vs. 16,300) as well as almost 100,000 citations (345,700 vs. 249,800). However, articles involving labs from the US collected two citations more on average than papers including European (co-)authors. Also worth mentioning, when looking beyond Europe's borders, is Australia's clearly above-average performance in reproduction research.

The list of the five most-cited papers from 1996 to 2007 (yellow table on next page) instantly reveals one hot topic of reproductive biomedicine: the causes for severe reduction or complete loss of fertility. Places 1, 3 and 4 went to papers addressing this problem.

The first two of the "most-cited authors"-list (blue table on next page) can also be counted to this field: John Sumpter (1st) from Uxbridge, UK, and Niels Erik Skakkebaek (2nd) from Copenhagen, S. Together with Richard Sharpe (9th) from Edinburgh they pioneered the field of endocrine disruption of reproduction by chemicals in the environment mimicking human hormones. Skakkebaek and Sharpe were the first to provide evidence that, in particular, oestrogen-like chemicals could have a devastating impact on male sexual development, mainly resulting in dramatic decline of sperm production. Sumpter, on the other hand showed for the first time the hermaphroditism-inducing effects of oestrogen-like compounds in fish.

New hot topics on the horizon

André van Steirteghem (3rd) and Paul Devroey (6th) from Brussels are regarded as the 'fathers' of intracytoplasmic sperm injection (ICSI), which, in the meantime, has helped many males producing defective sperm to become real fathers. Together, their two corresponding 1993 papers in *Human Reproduction* together have been cited almost 1,300 times to-date.

However, are those still the red-hot topics of reproductive biomedicine today? Last November, at least *Nature Medicine* in a special issue on reproductive medicine identified different ones. Prime examples were the description of kisspeptin as the neuroendocrine switch for puberty onset in 2003, as well as the 2006 discovery that germline-specific small RNAs are critical regulators of spermatogenesis.

Those discoveries came too recently to have a considerable impact within the 1996-2007 time interval of our publication analysis. However, it won't take sheer crystal ball-gazing to predict that some European protagonists from those fields might well enter a future follow-up analysis.

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Europe...

| Country | Citations | Articles | Cit./Art. |
|-----------------|-----------|----------|-----------|
| 1. England | 69,309 | 4,268 | 16.2 |
| 2. Germany | 45,587 | 3,136 | 14.5 |
| 3. France | 41,647 | 2,933 | 14.2 |
| 4. Italy | 37,906 | 2,914 | 13.0 |
| 5. Netherlands | 30,543 | 1,957 | 15.6 |
| 6. Belgium | 26,669 | 1,475 | 18.1 |
| 7. Spain | 23,625 | 1,817 | 13.0 |
| 8. Scotland | 21,181 | 1,079 | 19.6 |
| 9. Sweden | 20,835 | 1,416 | 14.7 |
| 10. Israel | 18,022 | 1,539 | 11.7 |
| 11. Denmark | 14,342 | 844 | 17.0 |
| 12. Finland | 11,488 | 739 | 15.5 |
| 13. Switzerland | 9,704 | 622 | 15.6 |
| 14. Turkey | 8,232 | 1,169 | 7.0 |
| 15. Austria | 7,818 | 581 | 13.5 |
| 16. Ireland | 6,633 | 383 | 17.3 |
| 17. Greece | 5,411 | 609 | 8.9 |
| 18. Poland | 4,892 | 580 | 9.6 |
| 19. Czech Rep. | 3,494 | 279 | 12.5 |
| 20. Norway | 3,342 | 251 | 13.3 |

Articles appearing between 1996 and 2007 in reproductive biology journals as listed by Thomson Scientific's *Web of Science*. The numbers of citations are accurate as of 15 May 2009. 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 and programmes (EMBO, FP7 of the EU...).

... and the World

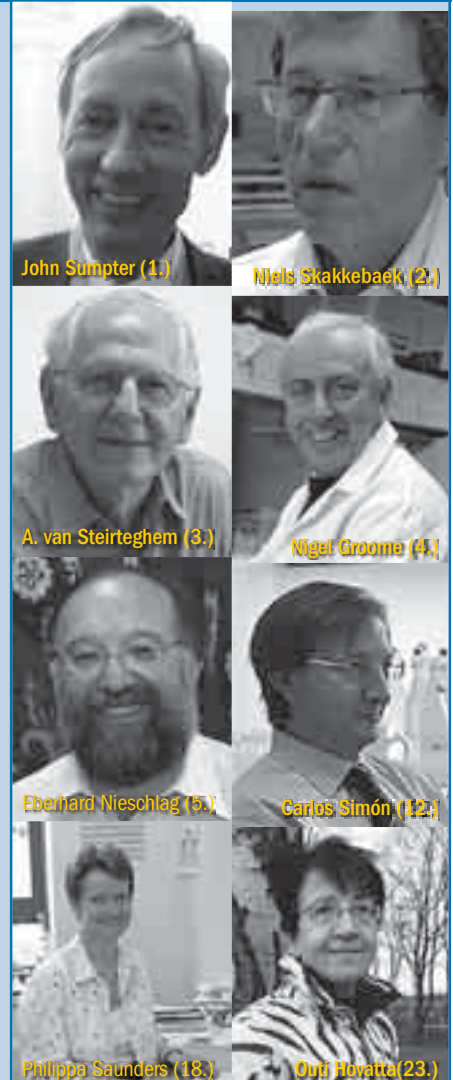
| | Citations | Articles | Cit./Art. |
|-----------|-----------|----------|-----------|
| Europe | 345,686 | 25,901 | 13.3 |
| USA | 249,806 | 16,339 | 15.3 |
| Australia | 51,044 | 4,383 | 11.6 |
| Brazil | 41,174 | 2,577 | 16.0 |
| Canada | 34,757 | 2,219 | 15.7 |
| Japan | 13,691 | 1,554 | 8.8 |
| Kenya | 7,520 | 748 | 10.1 |



Publication Analysis 1996-2007 – Reproductive Biomedicine

Most Cited Authors...

| | Cit-ations | Art-icles |
|---|------------|-----------|
| 1. John P. Sumpter , Inst. Environm. Brunel Univ. Uxbridge (UK) | 10,968 | 98 |
| 2. Niels Erik Skakkebaek , Dep. Growth & Reprod. Univ. Copenhagen | 9,378 | 285 |
| 3. André van Steirteghem , Ctr. Reprod. Med. Free Univ. Brussels | 7,866 | 268 |
| 4. Nigel P. Groome , Sch. Biol. & Molec. Sci. Oxford Brookes Univ. | 7,834 | 224 |
| 5. Eberhard Nieschlag , Ctr. Reprod. Med. & Androl. Univ. Muenster | 7,386 | 259 |
| 6. Paul Devroey , Ctr. Reprod. Med. Free Univ. Brussels | 6,941 | 263 |
| 7. Eckhard Wolf , Mol. Animal Breeding Gene Ctr. Univ. Munich | 6,405 | 198 |
| 8. Andrea R. Genazzani , Obstet. & Gynecol. Univ. Pisa | 4,676 | 273 |
| 9. Richard M. Sharpe , Ctr. Reprod. Biol. Univ. Edinburgh | 4,621 | 85 |
| 10. Bart C.J.M. Fauser , Ctr. Reprod. Med. Erasmus Univ. Rotterdam | 4,572 | 139 |
| 11. Antonio Pellicer , Inst. Valenciano Infertil. (IVI) Univ. Valencia | 4,315 | 208 |
| 12. Carlos Simón , Inst. Valenciano Infertil. (IVI) Univ. Valencia | 4,004 | 174 |
| 13. Inge Liebaers , Ctr. Med. Genet. Univ. Brussels | 3,974 | 133 |
| 14. Wolfgang Engel , Hum. Gen. & Anthropol. Univ. Goettingen | 3,915 | 119 |
| 15. Fabio Parazzini , Mario Negri Inst. Pharmacol. Res. Milan | 3,870 | 228 |
| 16. Felice Petraglia , Obstet. & Gynecol. Univ. Siena | 3,864 | 275 |
| 17. Jorma Toppari , Physiol. & Pediat. Univ. Turku | 3,817 | 131 |
| 18. Philippa Saunders , Ctr. Reprod. Biol. Univ. Edinburgh | 3,702 | 93 |
| 19. Jacques Donnez , Gynecol. Univ. Catholique Louvain | 3,563 | 146 |
| 20. Ilpo Huhtaniemi , Reprod. Biol. Imperial Coll. London | 3,555 | 170 |
| 21. Aleksander Giwercman , Fertil. Ctr. Univ. Lund | 3,420 | 119 |
| 22. Stephen Franks , Obstet. & Gynecol. St. Mary Hosp. Imperial Coll. London | 3,389 | 92 |
| 23. Outi Hovatta , Obstet. & Gynecol. Karolinska Univ. Hosp. Huddinge (SWE) | 3,364 | 110 |
| 24. Herman Tournaye , Ctr. Reprod. Med. Free Univ. Brussels | 3,362 | 134 |
| 25. Stephen K. Smith , Reprod. & Dev. Biol. Imperial Coll. London | 3,325 | 94 |
| 26. Klaus Diedrich , Obstet. & Gynecol. Univ. Luebeck Hosp. | 3,318 | 316 |
| 27. Wolfgang Holzgreve , Obstet. & Gynecol. Univ. Basel Hosp. | 3,317 | 252 |
| 28. José Remohi , Inst. Valenciano Infertil. (IVI) Univ. Valencia | 3,291 | 140 |
| 29. Gottfried Brem , Animal Breeding & Genet. Univ. Vet. Med. Vienna | 3,155 | 155 |
| 30. Rene Frydman , Genet. & Reprod. Hosp. Antoine Beclere Clamart (F) | 3,140 | 194 |



Citations of articles published between 1996 and 2007 were recorded until May 2009 using the Web of Science database from Thomson Scientific. The "most cited papers" had correspondence addresses in Europe or Israel.

... and Papers

| | Citations |
|---|-----------|
| 1. Vogt, PH; Edelmann, A; Kirsch, S; ...; Nieschlag, E; ...; Engel, W; Haidl, G Human Y chromosome azoospermia factors (AZF) mapped to different subregions in Yq11. <i>HUMAN MOLECULAR GENETICS</i> , 5 (7): 933-943 (1996) | 565 |
| 2. Groome, NP; Illingworth, PJ; OBrien, M; Pai, R; Rodger, FE; Mather, JP; McNeilly, AS Measurement of dimeric inhibin B throughout the human menstrual cycle. <i>JOURNAL OF CLINICAL ENDOCRINOLOGY & METABOLISM</i> , 81 (4): 1401-1405 (1996) | 546 |
| 3. Ormandy, CJ; Camus, A; Barra, J; Damotte, JD; ...; Edery, M; Brousse, N; Babinet, C; Binart, N; Kelly, PA Null mutation of the prolactin receptor gene produces multiple reproductive defects in the mouse. <i>GENES & DEVELOPMENT</i> , 11 (2): 167-178 (1997) | 349 |
| 4. Blendy, JA; Kaestner, KH; Weinbauer, GF; Nieschlag, E; Schutz, G Severe impairment of spermatogenesis in mice lacking the CREM gene. <i>NATURE</i> , 380 (6570): 162-165 (1996) | 303 |
| 5. Vajta, G; Holm, P; Kuwayama, M; Booth, PJ; Jacobsen, H; Greve, T; Callesen, H Open Pulled Straw (OPS) vitrification: A new way to reduce cryoinjuries of bovine ova and embryos. <i>MOLECULAR REPRODUCTION AND DEVELOPMENT</i> , 51 (1): 53-58 (1998) | 296 |