

The peer-review process for journals in the biomedical sciences; love it or loathe it, it won't go away!

Brian L Furman

All of us who work as scientists have experienced the joys, as well as the trials and tribulations of the peer review process. I would be surprised if there are any among the readership of this editorial who have not received a letter or e-mail from an editor informing them that their paper has not been considered suitable for publication – I certainly have! Such letters evoke the natural response of disappointment, which may turn to rage on subsequent reading of the reviewers' reports. This may be followed by incredulity at the sheer stupidity of the reviewers in their incapacity to understand the manuscript and its importance! While such incompetence on the part of the reviewers is possible, it is relatively unlikely and this editorial attempts to provide a critical appraisal of the process whereby these decisions are taken. The peer review process has been hotly debated, including the 2006 online debate in *Nature*, to which I shall make several references. While trying to be impartial, I must declare that I am part of the process, having been an author since publication of my first paper in 1969, a regular reviewer since around 1975 and a member of several editorial boards. I shall briefly describe the process, then discuss its pitfalls and finally try to suggest how it may be improved.

The process

Following submission of the paper, an editor will be assigned. Depending on the journal, the editor may form an opinion on the suitability of the manuscript for the particular journal but will usually identify and invite a number of suitable reviewers who have the relevant expertise. The number of reviewers will vary depending on the journal but will be at least two, commonly three and sometimes up to five. At the point of invitation, reviewers will receive the title and the abstract of the paper, in order to inform their decision as to whether they wish to undertake the review. After accepting the invitation, reviewers are given a date by which their reviews should be submitted; again this varies among journals but is usually 2 – 4 weeks from the date of accepting the invitation. Reminders are usually issued

a short time before the due date. Once all the reviews have been submitted, the editor will make a decision (acceptance, minor revision, major revision, rejection) based on these reports. Where there is dissent among the reviewers, the editor will sometimes invite additional reviewer. In my experience, such dissent is infrequent and there is usually sufficient agreement with sufficient detail in the comments to inform the editor's decision.

What are reviewers asked to do?

Reviewers are expected to judge the manuscript on the basis of novelty and scientific quality. Commonly, they are asked if the topic is worthy of investigation and asked either to provide an overall score or to suggest if the manuscript quality falls within the top 10%, 20% etc. They are then expected to provide detailed comments covering the methods, experimental design, results and discussion; they are also expected to comment on any ethical issues relating to the use of animals of human subjects. The comments are intended to be constructive, so that manuscripts can be improved through, for example, reinterpretation, additional experiments or rewriting. Reviewers are also invited to make confidential comments to the editor; my view is that this should be used very sparingly and only when the reviewers have concerns relating to plagiarism or other ethical issues. Reviews are independent so that reviewers only see others' comments/recommendations once the editor has made a final decision on the fate of the manuscript.

Is the process necessary?

Following the 2006 *Nature* debate on the peer review process and an article by Smith (2006), one might form the view that because of its flaws, including reviewer bias and lack of transparency, as well as the lack of evidence that it results in the publication of better quality manuscripts, the process should be abandoned and that journals should simply publish all articles received; the scientific community would then judge their quality. Arguments could be developed to support this view;

Emeritus Professor of Pharmacology, University of Strathclyde, Glasgow, UNITED KINGDOM

Address for Correspondence:

Professor Emeritus Brian L Furman, University of Strathclyde, Glasgow, UNITED KINGDOM
Email: b.l.furman@strath.ac.uk

for example, it would allow unhindered repetition of experiments so that observations could be tested more rigorously. It would also allow the publication of negative findings which are just as important as positive results but against which the present process is biased. My own view is that removal of the review process would clutter an already crowded literature with poor quality papers that busy scientists would need to read to gain a balanced view of the literature; improvements to encourage publication of negative results and corroboration of reported observations could be accommodated within the present process by modifying journal policies. Experienced reviewers will have seen the huge number of flawed papers that have been rejected for very good reasons. My experience is that the peer review process eliminates the poorest papers and frequently results in enhancement of those that are eventually published. However, I readily accept that the peer review process does not guarantee the value, validity or importance of a manuscript; these aspects may take many years to emerge.

Pitfalls in the process

Demands on reviewers

When done properly, reviewing a manuscript is a hugely time-consuming activity, requiring detailed reading of the article, including careful scrutiny of the 'materials and methods' section, to ensure that these are appropriate and valid. When looking at the results the reviewer should determine if statements in the text are supported by the data presented in the figures and tables and will consider if these data are of adequate quality and quantity to support/refute the hypothesis being tested. The 'discussion' will then be examined to determine if the results have been interpreted correctly and if additional experiments are essential. I know of no evidence that the time required for a comprehensive review has ever been quantified; I normally allocate half to two working days, depending on the complexity of the manuscript and how close it is to my specific expertise. Wager *et al.*,

(2002) suggested allocating two to five hours, with eight to twelve hours for a first time review but acknowledged that a review may take up to 48 hours. Reviewers are mostly very busy, even those of us who are retired (!) and some may read the paper rather superficially resulting in an inadequate judgement. Variability in review quality was highlighted by a former editor of the BMJ (Smith, 2006).

Reviewer bias

While the authors will not know the identity of the reviewers, the names, laboratories and countries of origin of the authors are clearly stated at the top of the manuscript. This may lead to a prejudiced report on the paper; this prejudice may be either favourable or unfavourable in deciding the manuscript's fate. At one extreme, the reviewer may decide that the paper emanates from a good laboratory with a well-known senior author and may thus be favourably disposed towards the paper before reading one word. At the other extreme, the paper may have come from an unknown laboratory in a developing country. Sometimes, although the paper may have originated in an established laboratory with a well-known senior author, the reviewer may have an adverse view of the work of that particular individual. The anonymity of reviewers is sometimes taken as a right to make comments that would not be made if the reviewers' identities were known.

How might the process be improved?

Blinding of reviewers to the authors

There is no evidence that this improves the quality of the reviews; this may emanate from the difficulty in fully hiding authors' identities.

Open review

There are strong advocates of open peer review, with some journals (the BMJ and the numerous BMC medical journals) operating an entirely transparent peer-review and publication process, whereby authors

and reviewers know each other's names and addresses; moreover, BMC medical journals publish the reviewers' reports. The esteemed journal *Nature*, which rejects 93% of the papers it receives, undertook an experiment whereby in parallel with the standard review process, it displayed submitted papers, if the authors agreed, on an open server and invited public comment, including encouraging relevant scientists to participate (Greaves *et al.*, 2006). No huge enthusiasm for this particular 'open peer review' process emerged from the study and there did not appear to be any evidence that the process offered advantages over the standard system in terms of the quality of the comments posted. However, this was just one experiment that a) was based on an atypical journal and b) involved no papers in the areas of biochemistry, chemical biology, chemistry, genetics/genomics, medical research, or microbiology. The *Nature* debate on peer review highlighted other forms of open peer review (Koonin *et al.*, 2006; Koop and Pöschl, 2006; Sandewall, 2006). Perhaps some version of these processes may become increasingly accepted by the biomedical scientific community. However, while there is no scientific evidence to support the validity of the traditional process, one may equally argue that replacing it by another system should be supported by evidence that it would produce a better outcome.

Rewarding reviewers

Some journals offer financial rewards to reviewers, while others offer a period of access to the journal or to databases such as Scopus. My own view is that as a scientist, one has a responsibility to undertake peer review and that financial and other incentives are unnecessary. Reviewing also offers one opportunity for continuing professional development; indeed, some journals offer formal CME points for good reviews.

Training of reviewers

Learning to review papers should be part of one's training as a scientist. This arises from journal club meetings of research groups, from writing papers and from the feedback one receives from reviewers after submitting a manuscript for publication.

Conclusion

Although far from perfect, peer-review remains an essential part of the scientific publication process. Nevertheless, the scientific community should retain an open mind about how the process could be improved but should seek evidence on the value of any improvements, while acknowledging that we also need evidence for the effectiveness of the current process.

Keywords: peer review; *Nature* debate; reviewer bias; open review; improvements to peer review process; training of reviewers; blinding of reviewers

REFERENCES

- Greaves S, Scott J, Clarke M, Miller L, Hannay T, Thomas A, Campbell P. *Nature's* trial of open peer review. *Nature* 2006 doi:10.1038/nature05535.
- Koonin E, Landweber L, Lipman D, Dignon R. Reviving a culture of scientific debate. *Nature* 2006.doi:10.1038/nature05005.
- Koop T, Pöschl U. An open, two-stage peer-review journal. *Nature*. doi:10.1038/nature04988.
- Sandewall E. A hybrid system of peer review. *Nature* 2006 doi:10.1038/nature04994.
- Smith JR. Peer review: a flawed process at the heart of science and journals. *J R Soc Med* 2006; 99: 178–82.
- Wager E, Godlee F, Jefferson T. How to survive peer review. <http://www.bmj.com/sites/default/files/attachments/resources/2011/07/wager.pdf>