

Gel slicing and dicing: a recipe for disaster

“The most dangerous of all falsehoods is a slightly distorted truth.”
G.C. Lichtenberg (1742–1799)

“Now is the winter of our discontent.”

In context: “Now is the winter of our discontent / Made glorious summer by this son of York.”

William Shakespeare (Richard III)

THE HORIZONTAL DIMENSION

Everyone knows of their favourite incident concerning an out-of-context quote temporarily derailing the flow of facts from the source, via the press, to the reader. One would hope that such events belong largely to the realm of the tabloid press and the creationist literature. However, an increasing number for examples are to be found in the inner sanctum of factual reporting: the research paper.

Removal of unnecessary clutter focuses the eye of the reader to where, and only where, the author wants it. However, overzealous disciples of this common practice can easily obscure their exciting data: gel bands outside of their native environment can end up dramatically reducing the information content of the displayed data. We would argue that taken to this extreme, it would be more informative to simply display such naked bands as quantitative data in histogram form.

So why cut at all? The argument often cited is that editors value their journal space more than gold, forcing significant figure compaction. Well, editors do endeavour to make constructive suggestions to keep articles finite in length. It is noteworthy that the explicit aim is not so much to save the rainforest, but to ensure that papers are readable by avoiding redundancy and tangential discussion. Readability is a complex issue, as it is evidently eroded just as much by too expansive, as too tight, a format. In the absence of some rationalization of the data displayed, the simultaneous assessment of multiple proteins in a single experiment would grow to unwieldy sizes, easily surpassing the straight-jacket of A4. In addition, complex patterns of background bands, or an overpowering IgG band on a western blot, can easily distract the hurried eye. Occasionally, there may also be good reasons for using cropped membranes for western blotting (for example, scarcity of reagents).

Thus, the rational distillation of displayed data into a coherent unit is most desirable. However, it is not acceptable to subvert this widely accepted practice to remove ugly, unexplainable or confusing areas of gels/blots for cosmetic reasons. Not only can it mislead the editor, referee, and ultimately the reader, but it can also hide important information pointing to real biological insight. At best, it may lead to a false impression of antibody specificity, and hence the level of controls required to establish band identity. On occasion, it may be tempting to crop away enticing data that may form the basis of future projects. We would, however, argue that any relevant data should be included, even if it is not dwelled upon further. At the very least, such data must be submitted for evaluation by referees and editors.

THE VERTICAL DIMENSION

A common data display technique is to splice together data from different gels, aligning the appropriate bands. Evidently this is usually less than ideal, not only because quantitative information across splices is often tenuous, but because distortions such as ‘gel smiling’ make the proper alignment a task that requires too many degrees of ‘creative freedom’.

We appreciate that it is not always a trivial matter to run involved experiments on a single gel, especially if samples are numerous or limited. However, splice sites should be clearly visible in such cases.

CONTROLLING CONTROLS

Controls seem to have fallen somewhat out of fashion on occasion, and again we sometimes hear the argument of format limitations. However, proper negative-, positive-, specificity-, loading- and molecular-weight-controls are essential in each experiment, even if they have been described before in other contexts. We will discuss controls in more detail in the near future. For the record, we state here that we never enforce the removal of essential controls to conserve journal space. Indeed, we actively encourage the display of appropriate controls (if not in the main figure, then as Supplementary Information).

A NEW DIMENSION OF DATA DISPLAY

So what constitutes best practice in data display? Here are our recommendations:

- Display conservatively cropped versions of gels in the primary paper. A reasonable guide is to retain about five bandwidths of background above and below. Crop only when no essential information is at stake.
- As far as possible, include essential controls and molecular-weight markers; either in the main figure or as Supplementary Information.
- Avoid splicing different gels together. If unavoidable, clearly demark the point of splicing and avoid overextending quantitative interpretations across splices.
- Display all of the key data involving cropped gels as a full and unedited version with appropriate labelling in Supplementary Information; please display all panels as a single figure and refer to this data in the relevant figure legends. As a minimum, provide uncropped data at the submission stage to facilitate peer review.

Note in particular the last point, which uncovers an extremely useful way to exploit the advantages of online publication. As an example, please view this approach applied successfully in Wada T. *et al.* (*Nature Cell Biol.* 6, 215–226 (2004); Supplementary Information, Figs S3 and S4).

We post these notes as suggestions pending further feedback from the community, whose comments we invite. However, the referees and editors will increasingly police the display of data at this journal to ensure that our papers provide the wealth of solid information that the reader rightly expects. We hope that these suggestions are deemed constructive, and we are certainly keen to refine our sense of data display through active dialogue with our authors. □