



Perspective

The novelty bubble

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1. Novelty and significance

Publishing research articles has never been as simple and straightforward as nowadays. New journals sprout every day and our mailboxes are spilling over with e-mail solicitations to submit manuscripts. Paradoxically, getting papers sent out for peer review in high profile periodicals (both specialized and non-specialized) has become increasingly challenging, at least in the field of pharmaceutical technology. One of the hurdles to overcome is the novelty aspect. In the guidelines for authors, this requirement is expressed in a variety of shades, but in practice, it is frequently and erroneously assimilated to reporting findings of high significance. If the content of a paper is not judged as novel enough by an editor, it is expeditiously returned to its authors, generally with a polite generic response, such as: “*Our journal declines a substantial proportion of papers without sending them for peer review. These decisions are made when the manuscripts do not fulfill the criteria for publication in the journal of ...*”. As an author and a former associate editor, I know what this sentence means. One of those “*criteria for publication*” is novelty, but what does novelty really mean in pharmaceutical technology? This is a complex question as there are different levels at which findings can be regarded as novel.

2. Novelty has become hype

The aim of this perspective is not to define novelty but rather highlight the fact that this word alone is becoming the main incentive for many drug delivery scientists to publish their work in top-tier journals. If publishers want novelty, researchers will deliver it, but at what cost? I recently stumbled upon a manuscript published in a reputable journal in which calcium phosphate nanoparticles containing gold nanorods, DNA origami and two drugs were described. In terms of novelty, that may be certainly novel, as no such things were reported before. However, what is the significance and impact of this study? The particles were insufficiently characterized, the rationale for combining all these components was unclear, and the data interpretation disputable. I do not intend to stigmatize the authors of this article; this is only one example among countless excessively creative drug delivery systems (even from my own group, I admit) bulking up the pharmaceutical scientific literature.

I doubt that this trend can be reversed in the near future. Yet, it is particularly worrying that, in the meantime, many robust and

significant studies lack visibility because they are deemed less novel. I recently had a paper on liposomes rejected from a nanotechnology journal not for scientific reasons, but mainly because liposomal formulations have “*already largely described and studied in the literature*”. While I can only concur with this comment, it omits the fact that ground-breaking drug delivery systems are, in reality, seldom discovered. Although my article may not have been novel enough for the journal, I was left with the impression that it would have been better judged, if instead of liposomes I had used, for instance, “*dual-responsive Janus nanocarriers*” or “*targeted intelligent nanosheets*”. In my opinion, an incremental but true gain in knowledge is often more meaningful than winning the race for novelty (which has become equivalent to hype with fancy terms), especially when all other important considerations, such as the scientific pertinence, are being ignored.

3. Novelty often results in more complexity

Publishing a concept that seems novel is now the game plan for many scientists, and this poses a serious problem for the future. Novelty is too often paired with complexity, and formulations that are too complicated are rarely translated into the clinic [1]. It is true that a certain level of complexity is sometimes necessary to produce a given effect. However, each additional layer of complexity should fulfil an essential task. In the late 1980s, humanized monoclonal antibodies were viewed as complex entities [2], mainly in terms of their large-scale production and characterization. Nevertheless, the science underlying their therapeutic value (targetability and reduction of host response to the drug) was solid, and nowadays such biologics are mainstream therapeutics. A similar argument holds today with the chimeric antigen receptor (CAR) T cell therapy [3]. This is a sophisticated and expensive technology, but it was judiciously designed to produce an anticancer immune response that cannot be achieved with conventional drugs and vaccines. As in those two examples, a drug formulation should be primarily designed to address a particular medical or biopharmaceutical need rather than be conceived with the sole objective of being multifunctional. Aside from potentially lacking any therapeutic advantages, overly complex systems bear a greater risk of generating irreproducible data, another issue that was discussed in a previous editorial [1].

Fulfilling the “*novelty*” criterion only for the beauty of being the first to describe a glittering concept can momentarily boost one's career,

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but does it really serve science? The answer is no, if we recall many novelty-based articles published in reputable journals. The progress in terms of producing drug delivery systems that significantly help patients has been little for the last few decades despite numerous seemingly elegant and highly complicated systems. We as researchers share responsibility in this drift in publication practices. Unfortunately, we cannot rely on professional non-academic editors to correct this problem. They are generally too remote from the daily laboratory work, their educational background is not always in the field they are judging, and their interests may differ from those of researchers.

4. Flaws in promoting novelty and the future of drug delivery research

Under the current environment, training good scientists in drug delivery is rather difficult. Many promising young researchers want to publish as many papers as possible in top-tier journals, and one way to achieve the goal is to exaggerate the potential value of the findings. This is why so many manuscripts enlarge seemingly trivial results to make them appear particularly innovative. This cycle will continue as long as the researchers will strive to obtain funding, and will need to publish at a steady pace to progress in their career. This vicious circle is, however, not sustainable, and may ultimately damage our reputation. As drug delivery experts, it is our duty to better exercise our critical judgment. We should not measure the quality and impact of a study by only looking at the journal in which it was published or by being impressed by the fact that it appeared on the journal's front cover. Young scientists embarking into graduate studies may experience difficulties separating the wheat from the chaff as they mainly see the hype that attracts the public attention.

Contributing to an ambitious, yet realistic idea that will later serve patients either directly or indirectly, is probably more tedious and less glowing than reporting a fancy drug formulation, but it is certainly more rewarding on a long-term perspective. Fortunately, there are examples of emerging and robust drug delivery approaches that are making their way to the clinic [4]. They could inspire graduate students in their desire to positively impact our field. One could cite dosage forms incorporating electronic sensors (for monitoring compliance and/or precisely adjusting dosing) [5], 3D-printed patient tailored pharmaceuticals [6], or ultrasound-based methods to render poorly accessible tissues more permeable to drugs (e.g., brain parenchyma, and pancreatic cancer) [7,8]. Of course, impactful innovation usually stems from strong and meaningful fundamental research, requiring efforts that do not lead to immediately measurable benefits.

The concept of publishing peer-reviewed research articles as we

know it was implemented by prominent and visionary scientists in the 17th century, at a time where the scientific community was small, and sharing discoveries was the primary motivation to disclose findings [9]. Four hundred years later, this *modus operandi* is losing touch with its roots [10], and gradually becoming obsolete. It is highly driven by the level of citations, and regardless of its relevance, often considers novelty as benchmark for citability. In today's connected society, we have the opportunity to reinvent this system. Such an endeavour should begin with the willingness to change our mindset, and be fuelled by the desire to transmit healthier values to the next generation of pharmaceutical scientists. This will not be an easy task, because the current publishing habits have been nurturing us for too long already. Until then, we will continue to deal with the consequences of a scientific practice we contributed to create... and try to remain intelligently innovative.

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