

# British Journal of Pharmacy

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## Editorial

## New Generation Therapeutic Modalities: The Importance of Pharmacy and Pharmaceutical Science

I spend quite a bit of time collating information from pharmaceutical company press releases and news feeds to compile review articles describing the latest advances in therapeutic approaches (novel targets, growth in options for treatment of rare diseases, emerging modalities such as CAR-T, new drug delivery technologies, etc.). Based on what I have seen over the last few years, looking at the evolution in this space, I sense there may be potential impacts for pharmacy we ought to consider, if we are not already doing so, for the profession and the science of pharmacy and in the education and training of future pharmacists and pharmaceutical scientists. My most recent review of information showed that a significant amount of new research collaborations involving pharmaceutical companies and of early phase clinical research highlighted gene delivery, oligonucleotide therapeutics, CAR-T therapeutics, and novel treatments for rare diseases.

Starting with what is a development out of existing therapeutics, rather than something totally novel, we need to ensure our future pharmacists can themselves understand and are able to help other health professionals understand what is similar about a biosimilar, and what is different relative to the innovator? How does the difference manifest? What should be expected in terms of quality, stability, handling and use, therapeutic equivalence, etc? Plus having the ability to do that from an underpinning knowledge perspective, so it can be applied to every new product brought into practice from first principles, not just reading it from a manufacturer's data sheet for a specific product.

Gene delivery to treat or cure genetically-based diseases has been the subject of around two decades of research and, after some problematic clinical starts, has evolved, particularly with the use of adenovirus and lentivirus vectors, to seeing commercial products

arriving. There is a growing late stage clinical portfolio across start-ups and small enterprises as well as large established pharmaceutical companies, and a burgeoning early stage clinical and pre-clinical landscape marked by acquisition deals, with for example around half a dozen gene therapy deals announced in July alone this year (2018). Pharmacy needs to equip its future pharmacists and pharmaceutical scientists with adequate underpinning knowledge about the manufacture, control of quality, stability, handling and storage and administration of gene therapy products. Consequently, in dealing with the products themselves, confidently and competently answering questions from other health professionals on these products, and where required assuring patients and carers the expertise in medicines that is the hallmark of the profession of pharmacy can be demonstrated in the case of these emerging products.

Also, now CAR-T therapeutics have emerged as approved medicines, with clinical research underway for additional products in the future. This immunotherapy approach is an adoptive cell transfer technology. The patient to be treated donates blood from which T-cells are harvested and then genetically modified via a viral vector delivery of genetic material which results in the cells expressing a novel receptor on their surface that allows them to recognize a specific protein expressed by tumour cells and so "home in" in them. Then the cells are cultured to expand number and constituted into an infusion solution for administration to the patient. This work is done on the approved manufacturing site of the clinical trial sponsor, the Marketing Authorisation holder or the holder of the approved New Drug Application, as appropriate. It is this final infusion that is received back at the clinic or hospital where the patient is being treated. It is a perfect example of personalised medicine. Where is pharmacy in this? A

knowledge of how this process works is key to the experts in medicines having the understanding of the challenges in controlling the quality of CAR-T therapeutics, how they should be handled and stored, and managing the logistics of their provision, from original cell donation to receipt, handling and use of the finished product ready for infusion. Being confident and competent in explaining these therapies to other health professionals is achieved by having a good foundation of underpinning knowledge. Then we have to consider that these are expensive products too, and let alone the cost impact that pharmacy will help manage, explaining why they are expensive - due to the complexity of the development and subsequent manufacturing effort that is required to deliver a product where one dose is an entire batch of product - might be where the professional and scientific knowledge that pharmacy provides can be effective.

Oligonucleotide therapeutics are now with us, both as recently launched commercial products and as a growing pipeline of products in clinical trials, from early phase right through to pivotal studies (interestingly a number of these aimed to tackle rare diseases). The unique biopharmaceutical, physicochemical and stability properties of oligonucleotides represent the kinds of challenges we need to equip our emerging pharmacists and pharmaceutical scientists to be able to handle. For example, the reliable and reproducible targeted delivery of an orally administered oligonucleotide therapeutic to reach a target in the distal small intestine and colon in the treatment of inflammatory bowel disease might not be as simple as just making an enteric coated dosage form, and the right knowledge and skills to fit drug delivery into a bigger picture of disease and individual patient need is going to be key.

The development of new therapeutics for the treatment of rare diseases is a growing area, perhaps because the treatment of more common diseases such as hypertension is already well served with effective, safe, largely generic medicines and in sustaining itself, the research-based pharmaceutical industry needs to identify new areas in addressing unmet or poorly-met medical needs. With use of (possibly unlicensed) cannabis-derived agents in the treatment of rare forms of childhood epilepsy in the news recently, the lack of well characterised, properly quality controlled, high

quality effective medicines in such rare disease has come to public attention. Well-defined, properly characterised and controlled entities for the treatment of childhood epilepsies such as Dravet syndrome are in ongoing clinical trials. How will pharmacy be involved in the provision of products that will not be routinely stocked in dispensaries or wholesalers? What knowledge needs to be in place about the quality, handling, and use or administration of products that may not be frequently seen? What information to health professionals and carers needs to be offered? How to explain the value of these emerging agents against unlicensed products whose effectiveness is based on anecdote rather than proper clinical evaluation?

I think the evolving landscape of novel therapeutic modalities however represents a continuum rather than a step change, so the need is to make sure that we always refresh the training and the development opportunities we give to our future professionals, and also not to forget the updating of our established professionals in pharmacy and pharmaceutical science. Giving professionals a strong base of underpinning knowledge, with encouragement of the mind-set of keeping up to date remains very important to providing pharmacy and pharmaceutical science with the capability it requires to support the appropriate use of the newer generation of medicines.

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