Guest Editorial

Frederic Lagarce*

Nanomedicines: are we lost in translation?

DOI 10.1515/ejnm-2015-0017

This special issue of the *European Journal of Nanomedicine* was set-up after the international meeting, which took place in Angers, France in August 2014. This meeting was entitled “translational nanomedicine”. In fact, the main question that was debated during the meeting was: how to better translate new nano-drug products to the market? Despite thousands of published research articles, there are today only just a few formulations that can be called nanomedicines, and that went through clinical phase III to become available to a large population. So, translation is really an issue that remains to be addressed.

In this special issue, we tried to illustrate different aspects of the translational research in the field of nanomedicine. The first paper from Malhaire et al., is a summary of the key points that were discussed during the meeting. This paper highlights the hurdles to overcome in order to go from bench to bedside, in other words from the fundamental science to the patients. This road is full of pitfalls but if, from the early design of the nanocarrier, translation is taken into account, it might be possible to succeed. It is important also to understand that the drug will be produced using an industrial process, in large batches, but often it is discovered in research labs in universities, this is why a very early close partnership between pharmaceutical companies and small research teams is important to allow a successful and fast translation to the patients.

One way to ease translation to the clinic is to mimic mother nature. The second paper from this issue is a review from Loughran et al., that discuss the strategies to design synthetic peptides which are bio-inspired vectors for gene delivery. This field of research is very promising and opens new possibilities for gene therapy but there are many in vivo barriers to overcome such as endosomal escape or nuclear internalization.

New nanodrug products will reach the market more easily if they are able to provide new features that could really change the outcome of a disease because they display better performances in comparison to the classical drug products. This is, for example, the case if the resistance to an anticancer drug is reversed by a nanocarrier. In this issue, an original research paper presents a strategy to overcome acquired resistance to temozolomide, a reference drug used against gliomas. Messaoudi et al., managed to use silencing RNAs (siRNAs) to reduce the expression of proteins that induce resistance to temozolomide. They show that lipid nanocapsules bearing specific siRNAs can enhance the sensitivity to glioblastoma cells to temozolomide in vitro.

There is currently a great effort to design nanomedicines that are able to cure a disease, but also to display imaging properties, these are called theranostics. Imaging biosensors have to be non toxic. With this aim in mind, Manaia et al., have designed very promising new Mg-doped ZnO quantum dots displaying enhanced luminescence. Another feature that is often claimed for nanomedicines is targeting properties. In cancer therapy, very toxic drugs are used, thus targeting is critical to avoid side effects. Targeting is also important if the cancer cells are difficult to access, for example, in lymph nodes. Pitorre et al., showed that lipid nanocapsules could reach a specific lymph node depending on the subcutaneous injection site. Moreover, subcutaneous administration did not lead to the presence of nanocapsules in the blood stream. If lipid nanocapsules were injected via the intravenous route, lymph node targeting was not achieved. This study shows that a wise choice of the administration route can help to optimize the targeting properties of nanomedicines.

A short communication on the use of companion animals in nanomedicine cancer research concludes this issue. Using companion animals could effectively be a great way to ease the translation to the patients. Henry raises the advantages of using dogs in early preclinical stages, in order to obtain oncology models that do not have the pitfalls of the universally used rodents. In fact, there are spontaneous diseases observed in companion animals that can be good models of human diseases. This offers possibilities to better screen the candidate drug and thus to enter faster into clinical trials.
Translation to the patient is a long road especially for complex drug products such as nanomedicines. But this special issue shows that this field of research is very dynamic. The performances claimed for nanomedicines are now constantly increasing. The hurdles to overcome to reach the market are also increasingly described and understood. We really think that despite the difficulties, these very promising new drugs will be widely used in the future, hopefully to help the patients to be cured more quickly and effectively.

Frederic Lagarce
Inserm U1066 Micro et Nanomédecines biomimétiques
Service Pharmacie, CHU Angers
4 rue Larrey
49033 Angers cedex 9, France
E-mail: frederic.lagarce@univ-angers.fr