EDITORIAL

Development of Nanoparticulate Formulations with Biomedical Applications Related to Cancer

Cancer stands as one of the leading causes of death worldwide and affects a wide range of organs and cell types. While incipient cancer tumors often benefit from curative surgical therapy, metastatic cancer requires aggressive therapeutic options. Frequent flaws in cancer chemotherapy are due to non-selective tissue toxicity, drug-resistance and severe systemic side-effects. These limitations can be addressed by a more precisely targeted delivery systems designed to incorporate anticancer agents. Such delivery systems can be provided by nanotechnology which introduces advantages related to high surface/mass ratio and has the potential to enhance the bioavailability of anti-cancer agents and improve their pharmacokinetic profile. Various types of nanoformulations were designed and assessed, revealing the opportunity of targeting selected tissues/regions thus increasing the anti-tumor activity and minimizing the systemic toxic effects. This special issue compiles three review articles that aimed at widening the current knowledge on nanoparticulated formulations with anticancer applications.

Skin cancer is the most common type of carcinoma, Csanyi *et al.* (2019) reveal that in the past three decades the number of skin cancer cases matched the sum of all other cancers combined; therefore, the treatment of skin cancer represents a continuous challenge [1]. The Quality by Design approach is a cost-effective process leading to high-quality products which take into account patient expectations as well as good manufacturing practices, being recommended both by FDA (US) and EMA (EU). The development of nanosized formulations that aim to fight skin cancer by topical application may successfully employ considerations within the Quality by Design approach in order to achieve the necessary quality standard for an effective dermal treatment. The review discusses and summarizes current therapies in terms of active drugs, delivery systems and evaluation methods and highlights several critical points and future therapeutic perspectives.

Alshweiat *et al.* (2019) further emphasize the importance of Quality by Design approaches in the development of nanotechnology-based intranasal delivery, referring to the factors that affect delivery, regulatory aspects, and patient expectations [2]. The nasal cavity may represent a non-invasive yet efficient administration alternative, being already in use for local and systemic delivery. In addition, the nanoparticulated systems may facilitate drug penetration through the mucosal barrier while providing drug protection; peptide delivery into the brain as well as into the systemic circulation are also discussed. Intranasal nanoparticulated systems may include nanosuspensions and polymeric formulations. Within the frame of nanotechnology-based intranasal delivery, a special focus was directed towards brain targeting and vaccine delivery with some promising results; however, nanoparticle-based therapeutic formulations for intranasal delivery are still not available, thus requiring further research.

In their review, Mioc *et al.* (2019) assess the potential of gold nanoparticles to act as anticancer agents or drug carriers [3]. Gold nanoparticles have gained the attention of researchers due to their numerous advantages, related in particular to their shapes and sizes as well as their facile synthesis which includes environmentally-friendly processes. These metallic nanoparticles may accomplish many goals in anticancer therapy such as targeted delivery drug systems; the use of gold nanoparticles as theranostic agents brought significant advances in the bioimaging field. In addition, gold nanoparticles may serve as therapeutic agents due to their intrinsic antiproliferative and pro-apoptotic effects on numerous cell lines, accompanied by an antiangiogenic activity. The *in vivo* data regarding the bioaccumulation and cytotoxicity of gold nanoparticles has also been reported, revealing that a plethora of factors such as morphology, dose and administration route, may influence their biological profile.

REFERENCES

- [1] Csanyi, E.; Bakonyi, M.; Kovács, A.; Budai-Szűcs, M.; Csóka, I.; Berkó, S. Development of topical nanocarriers for skin cancer treatment using quality by design approach. *Curr. Med. Chem.*, **2019**, 26(35), 6440-6458.
- [2] Alshweiat, A.; Ambrus, R.; Csoka, I. Intranasal nanoparticulate systems as alternative route of drug delivery. *Curr. Med. Chem.*, **2019**, 26(35), 6459-6492.
- [3] Mioc, A.; Mioc, M.; Ghiulai, R.; Voicu, M.; Racoviceanu, R.; Trandafirescu, C.; Dehelean, C.; Coricovac, D.; Soica, C.M. Gold nanoparticles as targeted delivery systems and theranostic agents in cancer therapy. *Curr. Med. Chem.*, **2019**, 26(35), 6493-6513.

Codruta Marinela Soica

Guest Editor

Pharmaceutical Chemistry

Faculty of Pharmacy

University of Medicine and Pharmacy "Victor Babes"

Timisoara

Romania

E-mail: codrutasoica@umft.ro