From oral bioavailability to targeting Cancer tumor and cell internalization: what is the importance of size in development of nano drug delivery systems?

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Abstract. :

Although Nanotechnology has been defined as the science of engineering particles with sizes less than 100 nm, the progress made in this field, especially in the development of nano-drug delivery systems (NDDS) has widened this definition to cover the particles with larger sizes up to 500 nm. The biological system of a human body with natural defenses against pathogens acts as a barrier on the way of NDDS in a variety of application routes from local to systemic treatments. Intestinal absorption, efflux pumps, mononuclear phagocytic system (MPS), blood-brain barrier (BBB), the resistance of the cell membrane against nanoparticle internalization and many other barriers prevent the body from benefiting from the payload of NDDS. Although the shape and the surface charge of particles are important factors, it is the size of NDDS which mainly defines the success of these vehicles in delivering drug molecules to their targets. Particles with sizes larger than 200 nm are neither able to be absorbed from the intestinal membrane nor can target cancer tumors via Enhanced Permeability and Retention (EPR) Effect. This is where NDDS with sizes less than 100 nm can successfully internalize to the cells, those with diameters below 40 nm can enter the cell nucleus, and those that are smaller than 35 nm can pass through the BBB. Some studies have also shown that MPS is unable to remove nano-particles with sizes larger than 100 nm via phagocytosis, while, other studies mention that successful treatment of cancer by co-application of nano-chemotherapeutics with anti-angiogenetic drugs requires employing particles with sizes smaller than 50 nm. Thus, it could be concluded that the disease defines the size and the size affects the disease.

Biography:

Fatemeh Bahadori graduated with the Ph.D. degree in Organic Chemistry from Istanbul Technical University in 2011. She was granted by the University of Illinois at Chicago with a one year scholarship for studying targeted cancer therapy using nano drug delivery systems during the course of her Ph.D. studies. She became an Assist. Prof. at Bezmialem Vakif University, Faculty of Pharmacy, Department of Pharmaceutical Biotechnology in May 2012. She has 23 publications in the peer-reviewed international journals, 1 National and 2 International Patent Applications, has presented more than 20 International Oral Presentations and has contributed in publications of 2 National and 3 International Book Chapters.

Speaker Publications:

1. "Antioxidant phenolic compounds from the leaves of Erica Arborea (Ericaceae)"; Natural Product Research 22 (16), 1385-1392

2. "Antigenotoxic and antioxidant potentials of newly derivatized compound naringenin-oxime relative to naringenin on human mononuclear cells"; Drug and chemical toxicology 39 (1), 66-73

3. "Tricetin 4′-O-α-L-rhamnopyranoside: A new flavonoid from the aerial parts of Erica arborea"; Chemistry of Natural Compounds 44 (2), 174.

4. "Investigation of anticholinesterase activity of a series of Salvia extracts and the constituents of Salvia staminea"; The Natural Products Journal 3 (1), 3-9

5. "Cytotoxic, genotoxic and apoptotic effects of naringenin-oxime relative to naringenin on normal and cancer cell lines"; Asian Pacific journal of tropical biomedicine 6 (10), 872-880

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