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Investigation of pharmacokinetics of orally administered montmorillonit using fluorophore compounds

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Bentonite is a clay consisting of smectite minerals, mainly montmorillonite (MMT). Montmorillonite is a member of the smectite family with a general composition of $(\text{Na,Ca})_{0.33}(\text{Al,Mg})_2(\text{Si}_4\text{O}_{10})(\text{OH})_2\text{nH}_2\text{O}$, where the levels of sodium, calcium, aluminum, magnesium, and water vary with location, both within and between layers. Sodium and calcium are interchangeable ions giving MMT a high ion exchange capacity. MMT has an aluminum-silicate layered structure with a net negative charge generated by isomorphous substitutions. The intrinsic negative charge is compensated with inorganic cations (typically Na^+ or Ca^{2+} ions). The high cationic exchange capacity, high specific surface area and intrinsic negative charge make MMT a favourable adsorbent for cationic synthetic and natural molecules. Interlayer of nano sized montmorillonite is suitable for uploading drug molecules. Nano MMT protects sensitive drug molecules, provides controlled release, site specific drug delivery, minimizes the side effects by using little amounts of the drug. All of these properties makes it advantageous and attractive for oral delivery of molecules such as curcumin with increased bioavailability and increased stability in GIS. In this study the natural product curcumin which has fluorophore structure is uploaded to interlayer of MMT. Curcumin, a natural polyphenol, found in the roots of *Curcuma longa* (turmeric), has effects such as anti-inflammatory, anti-neoplastic, anti-oxidant and chemopreventive activities and is pharmacologically safe even at high doses. It is a hydrophobic molecule and insoluble in aqueous solutions so, its bioavailability is poor in oral administrations and therefore it needs a carrier vehicle to make it water soluble and bio-available. Since curcuminoids possess native fluorescence, fluorescence detection (FD) can be used for curcumin quantification. The obtained nano-composite is orally administrated to 25 rabbits for investigation of its pharmacokinetics. Results of this research shows that this nanocomposite behaves as a controlled release nano-drug system.

Recent Publications:

1. Maxim L D, R Niebo and E E McConnell (2016) Bentonite toxicology and epidemiology: a review. *Inhalation toxicology*. 28(13):591-617.
2. Marco Brown J et al., New insights on crystal violet dye adsorption on montmorillonite: Kinetics and surface complexes studies. *Chemical Engineering Journal*. 333:495-504.
3. Kunwar A et al. (2007) Absorption and fluorescence studies of curcumin bound to liposome and living cells. *BARC Newsletter*, 285: 213.
4. Schiborr C et al. (2010) A validated method for the quantification of curcumin in plasma and brain tissue by fast narrow-bore high-performance liquid chromatography with fluorescence detection. *Analytical and Bioanalytical Chemistry*. 397(5):1917-1925.
5. Cui F et al (2006) Biodegradable nanoparticles loaded with insulin-phospholipid complex for oral delivery: preparation, in vitro characterization and in vivo evaluation. *Journal of controlled release*, 2006. 114(2):242-250.

Biography

Buse Hande Cerci is pursuing her studies in the Department of Pharmacy at the Bezmialem Vakif University. She works and researches on biotechnology, nanocarriers such as nano-clay to enhance bioavailability of given curcumin on the body, for her thesis.

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