BIO: Vuk Uskoković, PhD, is an assistant professor in the Department of Biomedical and Pharmaceutical Sciences at the Chapman University School of Pharmacy and an adjunct assistant professor in the Department of Bioengineering at the University of Illinois in Chicago. Dr. Uskokovic's research program is focused on the application of soft and colloidal chemistry techniques for the purpose of creating nanoscale materials for biomedical applications, including targeted and controlled drug delivery, bone tissue engineering and advanced antimicrobial and anticancer therapies. Dr. Uskokovic is the Director of the Advanced Materials and Nanobiotechnology Laboratory, whose broad aim is to synthesize and understand the fundamental properties of advanced nanomaterials and harness them to address various medical and pharmaceutical needs. The most influential work to have emerged from the Uskokovic Lab to date pertains to the use of calcium phosphate nanoparticles for drug and gene delivery applications. Other materials are also engineered and their interface with the biological systems probed, all with the goal of creating clinically effective therapeutics and diagnostics. Socially responsible, inexpensive materials together with *in vitro* biological assays that substitute for animal testing present an important aspect of research done in the Uskokovic Lab. This social responsibility also comes into play through seeing the lab as an incubator capable of creating high-skilled jobs for knowledge-based economy.

KEYWORDS: Biomaterials, Biomimetics, Bone, Colloid chemistry, Composite nanoparticles, Dental science, Drug delivery, Gene delivery, Infectious disease, Nanomedicine, Tissue engineering.

ABSTRACT: Calcium Phosphate: a David among Goliaths in the Realm of Materials for the Regeneration of Bone

The demand for a new generation of bone replacement materials has never been higher, given that more than 2 million bone graft operations are performed annually worldwide and that this number is on a constant increase due to the aging population on Earth. The age-old principle *similia similibus curantur*, dictating the substitution of like with like, is expected to apply in every aspect of tissue engineering, including the hard tissues province. Correspondingly, despite their ostensible limitations and deficiencies, calcium phosphate nanoparticles are likely to present essential and irreplaceable components for the next generation of biomaterials in bone engineering. Presented will be the results on studies utilizing calcium phosphate and calcium-phosphate/polymer composites as prospective materials for the regeneration of boney tissues. Examples will include the effects of morphology, topography, phase composition, foreign ion inclusion and surface charge on an array of physicochemical and biological properties relevant for the given application. Demonstrated will be the effective use of calcium phosphates for the intracellular delivery of genetic material and antibiotic molecules. In conclusion, reiterated will be the idea that multicomponent, synergetic and multifunctional nanostructures are the most prospective types of materials for tissue engineering in general, although simplicity can often be a key to creating materials that can cross the translational path with ease due to a combination of cost-effectiveness and high therapeutic potency.