Abstract #386 | Invited

# Magnesium as an exogenous growth factor in regulation of skeletal regeneration via upregulation of endogenous growth factors

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**Abstract:**

The world population is aging, with high incidence of age-associated osteoporosis and bone fractures. Our mission focuses on clinical translation by providing innovative and effective treatment for age-associated musculoskeletal disorders. Extensive research has been conducted on aging, coordinated and multidisciplinary research facilitating skeletal regeneration in bone metabolic disorders and fragility injuries, especially in searching for bioactive and biodegradable implantable materials for temporal fixation and stimulating skeletal regeneration, are still highly desirable. We recently identified the unique function of neuronal protein regulating the regeneration of skeletons via sensory nerves; highlighted as an important milestone in biodegradable metals. Our collaborative achievements include identifying the unique biomechanical and biological function of biodegradable metals, especially Magnesium (Mg) as revolutionary biometal. Degradation of Mg releases Mg ions as an exogenous growth factor in regulation of skeletal regeneration via upregulation of endogenous growth factors such as Mg ions stimulate sensory nerve endings in the periosteum and upregulate and release of calcitonin gene-related peptide (CGRP) from dorsal root ganglions. CGRP, an osteogenic neurotransmitter, facilitates differentiation of periosteum-

derived stem cell into osteoblast linage, and thus benefit osteoporotic fracture repair, highlighting Mg as an excellent candidate for facilitating skeletal regeneration in elderlies. The alkaline environment and hydrogen gas may also contribute to new bone formation via regulating local inflammation, reducing oxidative stress, and attenuating cell senescence. However, the underlying mechanisms are not well defined. For this AoE proposal, we have built up a multidisciplinary team to apply advanced biotechnologies to address these scientific questions and further moving towards multi-centre clinical trials for translating our innovative biodegradable implants as Class III medical product for facilitation of bone regeneration, especially in osteoporotic conditions. Further local and international collaborations are essential for enhancing regeneration of challenging musculoskeletal disorders for reducing our healthcare and socio-economic burden of our aging society, including endeavors in establishing TEA-NET (Translational European-Aisa Network for Excellence of Translational Medicine).

**Acknowledgment**

We thank the funding support of Areas of Excellence from the Research Grants Council of Hong Kong (AoE/M-402/20)