25th Euro Dentistry Congress

September 20-21, 2017 Dublin, Ireland

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Ectomesenchymal stem cell and artificial ligands for purinergic receptors loaded biomaterials for dental applications

For successful and long-time implant anchorage, a sufficient vertical and transversal bone level is necessary. Several cell types are under investigation for reconstruction of the jaw bone for implant anchorage. Next to mesenchymal stem cells from various sources such as adipose tissue, dental follicle cells and bone particles, both of ectomesenchymal origin are of major interest for non-vascularized bone autografts. Such bone particles are produced during the implant-bed preparation or created by bone ablation with surgical round-drills and can be collected with a bone filter integrated into surgical suction pipe. They are thus, as a side product during surgery available without any additional invasive procedures. Here we show that ectomesenchymal stem cells compared to mesenchymal stem cells are pre-committed towards hard tissues. As ionotrophic P2X and metabotrophic purinergic (P) 2 receptors express a distinct pattern during the development of a tooth in various tissues of the follicle, we investigated the effect of artificial ligands of these receptors on the differentiation process. The administration of the selective P2X7 antagonist A740003 led to an enhanced matrix mineralization, confirming the functional role of P2X7 during late osteogenesis. Interestingly this effect can be focused into collagen scaffold material via drop-on and drop-in only, when based into a petri dish. This mineralization enhancement is correlated to specific chemical scaffold-medium-interactions. Taken together, the use of ectomesenchymal stem cell together with an antagonist for the P2X7 receptor can improve in vitro osteogenesis. This effect can be further enhanced and localized into a collagen sponge. Such a functionalized scaffold might be applied in regenerative dentistry for optimized osseointegration of dental implants.

Biography

Edda Tobiasch is a Molecular Biologist, graduated from Biology department at Technical University Kaiserslautern, Germany. She worked as Post-Doctorate on signal transduction pathways at the German Cancer Research Center (DKFZ) in Heidelberg. She worked as an Instructor at Harvard Medical School, Boston, USA and is now Professor of the Department of Natural Sciences, Bonn-Rhine-Sieg University of Applied Sciences. She was awarded for Outstanding Scientific Research at the DKFZ in 1993.

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