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Patient specific reconstruction of skeletal defects in the maxillo-facial region using magnesium implants produced with selective laser melting (SLM) technique- An *in vitro* study

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Skeletal critical size defects can occur due to tumor resections, infections or trauma. Autologous bone grafts are still the gold standard for the reconstruction of skeletal defects, having an excellent combination of osteoconduction, osteoinduction and osteogenesis properties. However, the use of autologous bone grafts has certain limitations, since their use requires surgical procedure for harvest, the amount and size is limited and is associated with donor site morbidities. Because every skeletal defect has a unique form, any implant that is created to fill the defect has to be patient specific. Rapid manufacturing methods are a favorable possibility to overcome this problem. In our study we combined the principles of rapid manufacturing with a degradable implant material having good mechanical properties. Recently the production of magnesium structure using Selective Laser Melting (SLM) could be established. This material has the potential to create a patient specific, absorbable implant that meets physiological requirements. Especially in critical size defects an early and fast vascularization of implants is of great importance. Porous scaffolds enable vessel in growth and thus support bone ingrowth. Using SLM technique interconnected pores of the implant can be produced. To control the degradation of absorbable magnesium implants we examined different polymer coatings.

Primary osteoblasts and mesenchymal stem cells, as cell with vital importance for vascularization and bone growth, were seeded on these different coatings and analyzed by means of proliferation and viability assays. To support angiogenesis proangiogenic factors were incorporated into the polymers and examined. We used live cell imaging to follow osteoblasts and mesenchymal stem cells seeded on the SLM produced magnesium constructs coated with polymers for seven days to show cell morphology and migration. Osteoblasts showed a flattened cell shape even one week after seeding. Next steps are *in vivo* tests to examine osseointegration and angiogenesis.

## **Biography**

Julia Matena has completed her studies of veterinary medicine at the age of 25 from University of Veterinary Medicine, Foundation, Hanover. Now she is PhD student at Small Animal Clinic, University of Veterinary Medicine, Foundation, Hanover. She participates in research training group "biomedical engineering", sfb 599.

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