

## The beneficial effects of *in vitro* shock wave treatment on cardiomyogenesis are energy dependent

Christiane Fuchs<sup>1,2</sup>, Anna M. Weihs<sup>1,2</sup>, Dorota Szwarc<sup>1,2</sup>, Philipp Heher<sup>2,3</sup>, Andreas H. Teuschl<sup>1,2</sup> and Dominik Rünzler<sup>1,2</sup>

<sup>1</sup> University of Applied Sciences Technikum Wien, Department of Biochemical Engineering, Vienna, Austria

<sup>2</sup> Austrian Cluster for Tissue Regeneration, Austria

<sup>3</sup> Trauma Care Consult, Vienna, Austria

**Introduction:** In the recent years, more and more evidence for the beneficial effect of shock waves for the treatment of cardiac diseases is arising. Myocardial infarction (MI) and other cardiac diseases are still the number one reason for death as stated by the WHO. In previous experimental and clinical studies it was shown that extracorporeal shock wave treatment (ESWT) significantly improved systolic function, number of blood vessels, angina pectoris symptoms and myocardial blood flow.

Embryoid Bodies (EBs) are commonly used 3D *in vitro* systems to study early embryonic development. Additionally, when using mouse embryonic stem cells, they are used as a feasible tool to study cardiomyogenesis. As stated above, there is evidence that ESWT can augment e.g. regeneration after MI, however the underlying mechanisms are still not fully elucidated.

**Methods:** Therefore we investigated the effects of ESWT on cardiomyogenesis in EBs and analyzed several parameters such as percentage of beating EBs, expression levels of cardiac markers and signaling pathways involved in mechanotransduction, proliferation and differentiation.

**Results:** We could show a dose dependent effect of shock wave treatment on the percentage of beating EBs. Investigating different signaling pathways, we could demonstrate that the ERK signaling pathway was induced upon ESWT. Moreover, on the molecular level ESWT significantly up-regulated lineage specific and cardiac markers compared to untreated controls.

**Discussion:** In current experiments we investigate the signaling and regulatory pathways involved in the beneficial effects of ESWT on cardiomyogenesis. The ultimate goal is to provide *in vivo* researchers and clinicians with a solid base to smooth the way of ESWT into the clinics as an alternative or additive treatment method for various cardiac diseases.

**Device and producing company:** Dermagold® 100 with OP155 applicator, MTS Europe GmbH

**Setup:** cells in suspension or as Embryoid Bodies / Cardiac Bodies placed in a 15 ml polypropylene tube in a waterbath

This work was supported by the FFG COIN Disease Tissue Project (FFG #845443).