

## **Lyosecretome: the new component for regenerative bio-inks?**

Elia BARI - *University of Piemonte Orientale*

Advanced bioinks for 3D printing are intended to improve the functionality of printed scaffolds outside the traditional paradigm of the “biofabrication window”: in addition to high print fidelity, shear-thinning characteristics and high mechanical strength, high cytocompatibility and the ability to modulate cellular functions are also required. For this purpose, bio-ink materials can be enriched with chemicals that encourage cells to communicate and grow. However, identify the right mixture of chemicals replicating the complex biochemical environment is a steep challenge. The secretome from Mesenchymal Stem Cells (MSC), well studied and tested as therapeutic in regenerative medicine, can be the solution. Indeed, MSC-secretome consists of many biosignals secreted as soluble proteins, oligonucleotides and extracellular vesicles that allow proper cell adhesion, proliferation, differentiation and cellular crosstalk, thus regulating many biological functions. In this regard, our first challenge consisted of formulating MSC-secretome into a high-quality, safe, and effective freeze-dried and “ready-off-the-shelf” powder – the lyosecretome. This allows for the adoption of secretome as a bio-ink component easily. Then, we demonstrated that lyosecretome sustains bone regeneration, significantly improving osteogenesis and the deposition of a mineralized matrix, thus leading to the formation of well-organized bone tissue. Finally, 3D printed scaffolds were designed to control the release of secretome components, and their efficacy in bone regeneration has been assessed.