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A virtual model for biofabrication of vascularized bone matrix

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Increasingly, biofabrication is seen as a promising strategy in the tissue engineering and regenerative medicine field. It proves to be a good alternative for drug and cosmetics testing and even for transplantation tissues and organs in humans. However, long before we dream with, science impacting our daily lives, we need to know it more on a smaller scale - the cellular interactions involved, the biomolecules, the transcription factors, the differentiation phases - is all highly correlated, sensitive and complex. With the aim of reducing the investments of large sums of money and time with *in-vitro* experiments, this work proposes the creation of a predictive model to the biological structures that will be biofabricated. From the use of mathematical and computational methods, simulations of biological phenomena are made through the translation of the biological processes described in the literature into logical processes written in programming languages. These *in-silico* strategies make it possible to iteratively refine physical and biochemical parameters before the *in-vitro* stage. To exemplify this approach, an osteogenesis and angiogenesis implementation is shown in a virtual tissue spheroid (the bioprinting basic unit) - from the mesenchymal and endothelial cells to a vascularized bone matrix.

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