Problem of optimal resolution in modeling of microenvironmental restricted cell growth

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Summary

The mesoscopic scale Langevin-type model is particularly modified for treating two types of biological systems based on the estimation of the optimal modeling resolution. The first biological system represents the growth of yeast cells inside the Ca-alginate microbeads, while the second represents the growth of hybridoma cells inside the alginate-poly-L-lysine (alginate-PLL) microcapsules during air-lift bioreactor cultivation.

Two types of restrictive phenomena, i.e. volumetric and surface are considered elucidating the optimal modeling resolution. Finding the optimal resolution of modeling includes the particular reductions of the model. This type of approach represents the attempt for overcoming the difficulties with modeling the complex restrictive phenomena based on the systematic analyze. The better understanding the mechanisms of microenvironmental restrictions are useful for optimizing the microcarrier design in order to achieve higher amounts of immobilized cells.