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Topological Analysis, Modeling, and Imaging of Gelatin-Based Hydrogels MAHO KOGA, Ward Melville High School, CLEMENT MARMORAT, MIRIAM RAFAILOVICH, Stony Brook University, YISHAI TALMON, EYAL ZUSSMAN, ARKADII ARINSTEIN, Technion Institute of Technology — Gelatin is a component of natural biocompatible scaffolds used in tissue engineering constructs. However, due its supra-molecular structure, the mesh size is drastically larger compared to synthetic polymers having the same moduli, and therefore the Rubber Elastic Theory cannot be used to describe properties of gelatin. Gelatin forms distinct fibrils, bundles of triple helix chains, which form rigid areas. We experimented with two different gel moduli, made possible by varying the concentration of microbial transglutaminase (mTG). mTG forms permanent cross links and affects the morphology of the gelatin by changing the number of fibrils formed. Thus, the mesh size calculated from the Rubber Elastic Theory was much smaller than the actual size of the mesh, as measured from cryoscanning electron microscopy images and fluorescent bead particle migration. We also observed the en-mass migration behavior of dermal fibroblast cells as a function of the substrate rheological response. Our results will present the ability of the cells to sense the structure of the underlying substrate, as well as the absolute value of the modulus. Furthermore, the data will be interpreted in terms of a modified theoretical model, which takes into account the structure and mesh size of the gel.

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