A lipid-supported gene-networking hydrogel as an artificial chromatin nucleus mimicry

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Recent biomimetic engineering have principally studied a cellular engineering system mimicking its natural multi-components representing each organelle. For instance, a mimicry of a nuclear pore transporter, a virus-like particle for drug delivery or a tunable immune system has been developed in the field. Inspired by these advances, we have demonstrated a gene-networking hydrogel(G-net-gel) as a biomimetics of an organized chromatin in the cell nucleus. Spherodical G-net-gels were manufactured onto the superhydrophobic layer using both simple lithography and DNA engineering methods. The G-net-gel was optimized in various parameters to improve the enhanced protein levels in in vitro. The stable gene cross-networks were fused into lipid molecules, finally leading to lipid-supported g-net-gel networks resembling the living nucleus which be capable of producing the higher level of messenger RNAs as compared with solution phase vector.
The artificial chromatin nucleus biomimicry would be a substitute to the conventional gene therapy, provided that it replace malfunctional but pre-located nucleus.