Title:	Bioengineered in Vitro Tissue Models to Study SARS-CoV-2 Pathogenesis and Therapeutic Validation
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Abstract:	Given the various viral outbreaks in the 21st century, specifically the present pandemic situation arising from SARS-CoV-2 or the coronavirus, of unknown magnitude, there is an unmet clinical need to develop effective therapeutic and diagnostic strategies to combat this infectious disease worldwide. To develop precise anticoronavirus drugs and prophylactics, tissue engineering and biomaterial research strategies can serve as a suitable alternative to the conventional treatment options. Therefore, in this Review, we have highlighted various tissue engineering-based diagnostic systems for SARS-CoV-2 and suggested how these strategies involving organ-on-a-chip, organoids, 3D bioprinting, and advanced bioreactor models can be employed to develop in vitro human tissue models, for more efficient diagnosis, drug/vaccine development, and focusing on the need for patient-specific therapy. We believe that combining the basics of virology with tissue engineering techniques can help the researchers to understand the molecular mechanism underlying viral infection, which is critical for effective drug design. In addition, it can also serve to be a suitable platform for drug testing and delivery of small molecules that can lead to therapeutic tools in this dreaded pandemic situation. Additionally, we have also discussed the essential biomaterial properties which polarize the immune system, including dendritic cells and macrophages, toward their inflammatory phenotype, which can thus serve as a reference for exhibiting the role of biomaterial in influencing the adaptive immune response involving B and T lymphocytes to foster a regenerative tissue microenvironment. The situation arising from SARS-CoV-2 poses a challenge to scientists from almost all disciplines, and we feel that tissue engineers can thus provide new translational opportunities in this dreadful pandemic situation.
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