Chaudhuri et al. 2015). Therefore, covalently adaptable hydrogels are ideal for studying the influence of matrix viscoelasticity on cell fate processes. For example, Mooney and colleagues utilized alginate hydrogels exhibiting stress-relaxation, a property unique to viscoelastic material, to study spreading and differentiation of mesenchymal stem cells (Chaudhuri et al. 2015). In addition to immobilizing pendant ligand in the presence of cells, one may wish to 'exchange' the ligands to truly recapitulate a dynamic developmental process during tissue morphogenesis. In this regard, an addition-fragmentation-chain transfer reaction was developed to allow controlled and reversible exchange of biochemical ligands within an allyl sulfide functionalized PEG hydrogel (Gandavarapu et al. 2014). This approach allows user-defined introduction of immobilized ligands during cell culture, which may be highly useful in understanding the influence of temporal presentation of selective ligands on tissue development.

Conclusion

In summary, synthetic hydrogels have emerged as a class of powerful and diverse cell culture platform for studying cell biology and for promoting tissue regeneration. In most applications, bioactive motifs are integrated in the design of biomimetic hydrogels for enhancing the utility of the otherwise inert hydrogels. In addition to immobilized ligands, increasing efforts are devoted to understanding the influence of static and dynamic matrix mechanics on cell fate processes in 3D. These efforts have led to the increased recognition of the importance of hydrogels for 3D cell culture, both in basic biological sciences and translation applications. As the design and development of biosynthetic hydrogels continue to improve, it is anticipated that biosynthetic hydrogels will become highly desirable for cellular and molecular biology research, tissue engineering and regenerative medicine, as well as *in vitro* disease models for drug screening and testing.

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