# KEY AREAS OF UNDERPINNING SCIENCE

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Advances in tissue engineering and more broadly regenera tive medicine are underpinned by developments in both the physical and biological sciences, building on the classical tissue engineering paradigm ( Figure 4.1 ). An improved understand ing of developmental biology and the cues that direct stem cell fa te have been key to advancement of the field. A better understanding of the stem cell niche has enabled scientists to propose changes to molecular and mechanical properties that could bring about modifi ed cell behaviour . This has been realised by advances in materials science, which have been crit ical in the development of structures (sca ff olds), onto and into used to localise cells and molecules to a specific site within the body . Notwithstanding the potential o ff ered by these therapies, it should be emphasised that the whole field is still at a relatively early stage of development. Although there are examples where tissue engineering and regenerative therapies have already been introduced into clinical practice, for example the repair of damaged cartilage, most potential regenerative ther - apies have not yet entered routine surgical practice as there are considerable barriers to be overcome before this translational step can be achieved. We have divided the chapter into sections r elating to cells, materials and molecules, while recognising the interplay and composite therapeutic solutions that ultimately arise.

Pluripotent cells O O Polymers n CH 3 Ceramics Hydrogel Figure 4.1 The tissue engineering par- adigm in the context of regenerative therapies.

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