We define “hydrogel” as: “A shape-retentive polymeric network swollen with a high percentage of water.” It may or may not be fully swollen when applied and it may or may not dissolve in more water. [1] Our working definition of tissue engineering is: “The generation, regeneration, augmentation or limitation of the structure and function of living tissues by the application of scientific and engineering principles.”[1] It is broad in scope, encompassing many functional approaches beyond “cells in scaffolds” and, very basically, involves controlling cells and matrices in tissues. A wide range of commercially successful products falls within its scope. In this context, regenerative therapies comprise a subgroup of tissue engineering. In the narrow interpretations of tissue engineering, which mandate preparing cellular constructs outside the body, with or without scaffolds, and transplanting them, topically or internally, tissue engineering products have not generally been financially successful. Most commercial tissue engineering products have remained on the market, however, and research and development continues at a significant level worldwide. [2]

Hydrogels formed from natural or synthetic polymers find important applications in medical devices and drug delivery. Early medical uses of hydrogels included soft contact lenses and wound dressings, with the latter exemplifying one form of tissue engineering, guided tissue regeneration, promoted by moist healing.[2] Subsequently, implantable hydrogel products were developed, including surgical sealants, tissue adhesives, hemostats, cell scaffolds and drug delivery systems.[1] Hydrogels induce beneficial tissue responses based on their physical and chemical properties. Because of their high water content, they are generally quite compatible with cells and may enter into specific or non-specific binding with cell receptors. Proteins and polysaccharides that form hydrogels contain ligands for specific binding to certain cells and form useful scaffolds for cell incorporation. Synthetic hydrogels generally do not support the anchorage that matrix-forming cells require, but encapsulate cells effectively, and can be modified for cell attachment and delivery. [3]

We have developed several cell and hydrogel-based products and have two proprietary hydrogel platforms, one based on modified hyaluronan polysaccharide, the other comprised of poly(oxyethylene)-based resorbable hydrogels. They have demonstrated features which exemplify many of the broad-based manifestations of tissue engineering, providing realized as well as potential commercial value. [2]