# “CELL CULTURE ENGINEERING” AND WHAT THIS MEANS FOR THE FUTURE OF MEDICINE

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Since the earliest days of the study of medicine, scientists and physicians have been fascinated by the ability to sustain life. The concept of “cells” was articulated in 1839 and the idea of keeping cells alive outside the body emerged in the 1880s. The ability to derive a cell line, providing a significant advantage to the study and use of cells in culture began in the 1950s, and the introduction of recombinant biology in the 1970s began a stunning new chapter in the use, manipulation and then industrialization of cell cultures for the purpose of studying and producing medicines. Many of the earliest approved medicines to be manufactured from mammalian cells are still important medicines today, e.g. Epogen and Activase, but in the decades since the licensure of these products our ability to harness the opportunity of cell biology, and engineer dramatic improvements in product design, reproducibility, safety, scale and cost have grown enormously. In the current chapter of the evolution of medicine, cell culture engineering has taken on a powerful new dimension as we not only engineer cells and cell cultures for the production of medicines, but we engineer cells and cell cultures to become medicines themselves. This should not be considered an ultimate deliverable but rather an interesting branch of the expanding field of cell culture engineering and the convergence of highly emergent technologies around these new medicinal opportunities enable powerful reflection and advancement of all aspects of the field.