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Letters

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# Opportunities to apply manufacturing systems analysis techniques in genetic manufacturing systems

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## Abstract

Breakthroughs in molecular and synthetic biology are pivotal to understanding the function of cells and creating new pharmaceutical applications. These advances in biological processing present a new class of manufacturing systems, defined here as genetic manufacturing systems, which produce a final product with a genetic construct. Genetic manufacturing systems rely on molecular events for success, and this aspect is a key difference from traditional manufacturing systems. Analysis techniques for manufacturing systems have been successful in providing valuable insights for complex manufacturing environments and have the potential to transform how genetic constructs are currently produced. This paper provides an introduction to the interdisciplinary field of genetic manufacturing systems and outlines the similarities and primary differences between traditional manufacturing systems and genetic manufacturing systems. Mathematical modeling and simulation opportunities are presented as they relate to reducing cost and time as well as increasing efficiency in genetic manufacturing systems. Finally, several challenges for genetic manufacturing systems are presented.

*Keywords:* Advanced manufacturing systems, Genetic manufacturing systems, Gene synthesis, Mathematical modeling, Quality control, Simulation modeling, Synthetic biology

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