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INTRODUCTION

Generic product development aims at the formulation of a product bioequivalent and/or pharmaceutically equivalent to a specific reference listed drug (RLD). The regulatory authorities expect the product to have a robust, reproducible, and validateable manufacturing process consistently meeting critical finished product attributes throughout the product lifecycle. The formulation and manufacturing process developed by scientists, at a laboratory or pilot scale, must be scalable to large-scale production batches. Scale-up and technology transfer are crucial steps in pharmaceutical product development process. During this stage, Process Performance Qualification (PPQ) activities demonstrate the robustness and process capability of the manufacturing process and assure that the manufacturing process is capable of producing product that consistently meets predetermined quality attributes. Critical Materials, Critical Material Attributes (CMAs), Critical Process Steps (CPS), Critical Process Parameters (CPPs), Critical In-Process Controls, and Critical Quality Attributes (CQAs) are thoroughly examined during product development and the PPQ exercise. The process is scaled up to a batch size close to the biobatch or production batch after the initial development work. Design of Experiments (DOEs) and Quality Risk Management (QRM) principles should be employed to identify and understand critical parameters and their ranges and target settings. Depending on the complexity of manufacturing processes involved, such as dry blending, wet granulation, roller compaction, tableting, encapsulation, and coating, appropriate process parameters are carefully monitored and viable ranges are established. The process is evaluated at "bookend" of CPP ranges to set up appropriate controls for the manufacturing process.

The manufacturing process is transferred to production typically before product approval and launch. This may involve further scale-up of the batch size and other changes in the manufacturing process. These changes may be considered minor or major in a regulatory review and may require additional work, as per the "scale-up and post-approval changes" guidelines.

This chapter will focus on several issues related to these essential processes in generic drug development. All topics related to process characterization, equipment installation and operational testing, documentation, computer systems validation (CSV), and PPQ are discussed.