Chapter 6 Critical quality attributes

The attributes of God tell us what He is and who He is.
William Ames

6.1 Background

The demonstration of biosimilarity begins with selecting critical quality attributes (CQAs), which are likely to have a direct impact on the four pillars of the biosimilarity tetrahedron (Chapter 4): identity, purity, potency, and safety. Whereas the importance of immunogenicity, safety, and efficacy (effectiveness) is compared head to head in biosimilarity assessments, it is not possible to provide an equal level of comparison for every quality attribute; it is for this reason that the regulatory agencies require biosimilar developers first to produce a matrix of CQAs. These attributes are selected from a risk-based exercise that identifies these in accordance with guidances such as ICH Guidelines Q8–Q11 that deal in the subjects of variation guidance, concepts, design space, process, design specifications, CQAs, control strategy, and ability to develop. Figure 6.1 provides a schematic representation of how each of the guidance is interrelated with their supporting elements for the quality risk assessment.

The quality target product profile (QTPP) is defined as a "prospective and dynamic summary of the quality characteristics of the molecule that ideally will be achieved to ensure that the desired quality, and thus the safety and efficacy, of a drug product, are realized." Once QTPP is established for the target molecule, it is used for comparative analysis to assist in the development process and final process design. The biosimilar product is designed, developed, and manufactured according to QTPP with specification consistent with the desired in vivo performance of the product, linking process, a product with patient benefit.

The aim of pharmaceutical development is to design a quality product and its manufacturing process to consistently deliver the intended performance of the product. The information and the knowledge gained from pharmaceutical development studies and manufacturing experience provide scientific understanding to support the establishment of the design space, specifications, and manufacturing controls. Figure 6.2 describes the interrelationship among the various distinct steps involved in implementing quality-by-design (QbD) paradigm for biosimilar products.