QUALITY BY DESIGN (QbD) AND NEW ICH GUIDELINES
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In the scope of pharmaceutical quality; FDA announced proposed amendments to "Current Good Manufacturing Practices" (cGMP) in 2002, with an emphasis on establishing a 21st century outlook on pharmaceutical manufacturing with the aspiration to utilize advances in science and technology in order to establish a more systematic science and risk based approach to the development of pharmaceutical products. The initiation of the cGMPs for the 21st Century Initiative and the publication of the Process Analytical Technology guidance in 2004 by the FDA paved the way for the modernization of the pharmaceutical industry.

The concept of “Quality by Design” (QbD) was defined as an approach which covers a better scientific understanding of critical process and product qualities, designing controls and tests based on the scientific limits of understanding during the development phase and using the knowledge obtained during the life-cycle of the product to work on a constant improvement environment. QbD describes a pharmaceutical development approach referring to formulation design and development and manufacturing processes to maintain the prescribed product quality. Guidelines and mathematical models are used to ensure the establishment and use of the knowledge on the subject in an independent and integrated way. Within this vision, the key framework guidance documents ICH Q8 Pharmaceutical Development and ICH Q9 Quality Risk Management were published in 2005 and ICH Q10 Pharmaceutical Quality System followed these documents in 2008.

Q8 Pharmaceutical Development focuses on the content of the Module 3.2.P.2 of the Common Technical Document (CTD) and promotes the concept of QbD. Final guideline Q8(R)2 was published in 2008. It supports knowledge gained through the lifecycle of a product and using scientific approaches and quality risk management principles. Within the scope of Q8 Pharmaceutical Development, an important step in the QbD approach to the development of drug products requires a distinction between critical and non-critical product attributes and process parameters. Additionally, the quality target product profile (QTTP) is defined as a summary of the quality characteristics or attributes of a product that ideally will be achieved and is related to quality, safety and efficacy, considering e.g., the route of administration, dosage form, bioavailability, strength, and stability.

Q9 Quality Risk Management defines risk and offers a systematic approach to quality risk management via describing how to conduct risk assessments and to manage the risks defined providing guidance on the principles and some of the tools of quality risk management. It can be a guide as a resource document that is independent of, yet supporting, other ICH Quality documents and complementing existing quality practices, requirements, standards, and guidlines within the pharmaceutical industry and regulatory framework.

The ICH guideline Q10 describes a model for an effective pharmaceutical quality system that is based on International Standards Organisation (ISO) quality concepts, includes applicable GMP regulations and complements ICH Q8 and ICH Q9, and is applicable for a lifecycle of a product. This guideline focuses on regulating the quality management systems of drug manufacturers, where by any changes to manufacturing processes would be managed by appropriate change control procedures have been developed.

Although the initial focus of the science and risk based agenda was linked primarily to drug product, greater emphasis is now being placed on drug substance with the evolution of ICH Q11 dedicated to the manufacture of drug raw materials. Recent regulatory initiatives such as Quality-by-Design provided unprecedented opportunities to go beyond what was done in the past. The guideline focuses on development and manufacturing process of both chemical and biotechnological/biological drug substances and is intended to provide guidance in the scope of ICH Guideline Q6A and Q6B.

If the principles described in the ICH Q8, Q9 and Q10 guidance documents are implemented together in a holistic manner, then an effective system that emphasizes a harmonized science and risk-based approach to product development and maintenance is in place. This provides an even greater (quality) assurance that the patient will receive product that meets the critical quality attributes (CQA).