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Mathematical modelling of polychromatic light photokinetics

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The quantification of photokinetics by robust mathematical models has represented a challenge thus far despite the regulatory status of the photostability testing of drugs as stipulated by the ICH in its Q1b section. The lack of clarity in the ICH recommendations makes it necessary to develop concise and rational approaches to quantify the photodegradation of drugs. In this study, we present for the first time, a mathematical framework that describes the photokinetics performed under polychromatic light and its validation by experimental results for several APIs. Our approach demonstrates the importance of the wavelength dependence of the absorption coefficient, the radiant power and the photochemical quantum yields in the evaluation of photodegradation. Furthermore, the mathematical formulation proves that the classical kinetic treatments based on therma l 0th, 1st and 2nd order reactions should not be used for photodegradation investigations. Evidence of an important photostabilization of drug is provided and attributed to the increase of the initial drug concentration. These findings explain the usually low photodegradation observed for relatively highly concentrated pharmaceutical formulations but also underlines the importance of such studies for in vivo (low concentrated) drugs photostability. Our work can help standardize and amend the ICH procedures and recommendations for photostability testing.

Biography

Mohammed Alqarni is a PhD student in Pharmaceutical Analysis (2nd year) under supervision of Dr. Mounir Maafi at the Leicester School of Pharmacy

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