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Opinion Article

Liquid Transport Coated Pharmaceutical Tablets and Analytical Techniques Formulations

Jun Xin*

Department of Pharmaceutical Sciences, University of Connecticut, Storrs, United States of America

DESCRIPTION

The process of dissolving pharmaceutical tablets is difficult, especially when the tablets are coated, where multilayer structures create an extra barrier to liquid entry into the porous tablet matrix. The formulation design and production efficiency can be improved by having a better understanding of the coating structures role in the mass transport mechanisms that control drug release, beginning with the wetting of the coating layer by the dissolving medium. The ability of dissolution media to permeate coated tablets was examined using terahertz pulsed imaging. The model system based instant release coating blend, in order to concentrate on the basic process. Vacuum compression molding was used to apply the coating to the flat-faced tablets one side. The coating layer's hydration and the consequent liquid intrusion into the dry tablet core could be solved.

The research showed that there was a discontinuity in density where the coating met the core, allowing coating polymer to penetrate the pore space at the immediate surface of the tablet cores during coating. The dissolving medium's liquid transfer into the core was impacted by this structure. Indication that a gel layer formed after the coated polymer hydrated. The performance of the tablet's dissolving was determined by the coating's quality and the porosity of the tablet's core. A methodology that can help with a deeper comprehension of the impact of coating on tablet disintegration.

As most decades previously, oral solid dosage forms have had their functionality modified and increased by applying film coatings to the tablets. Film coatings can be used for a variety of things, such as to conceal tastes, enhance aesthetics, block light, or even alter or regulate how quickly active chemicals are released. Dissolution testing continues to be the industry standard approach to assess the efficacy of aesthetic coatings on tablets while aesthetic coatings may only be visually assessed. When conducting a dissolving test, the total amount of medication released from a sample of the dosage form is calculated as a function of time.

The dissolution test gives an apparently simple and practical measure of the overall drug release kinetics, but the underlying physics chemical processes are complicated, especially in the case of a layered structure like a coated tablet. Before the first drug molecule from the core dissolves and is released from the tablet into the dissolution media, several physical processes take place. It has also been evaluated how film coating affects tablet tensile strength. A thorough investigation of the procedure is missing because it is generally believed that the quick release coating layer has little effect on the disintegration, drug release, and dissolution of the product. Only a small amount of information is available to help with the logical design of formulation and process, even for advanced functional coatings. The development of Quality by Design (QBD) strategies and Process Analytical Techniques (PAT) for pharmaceutical coating processes has advanced significantly during the past ten years. Despite the significant progress that has been made, there is still plenty of room to improve our mechanistic knowledge of how coated pills dissolve.

More effective coating formulations can be made with a greater understanding of how the dissolving medium interacts with the coating structure, as well as which parts of the coating process need to be precisely controlled to produce the highest possible product quality. A relatively new technology called terahertz spectroscopy and imaging adds information to the results of the dissolution tests and the methods mentioned before. It has mostly been utilized thus far for in-line sensing, detailed off-line coating investigation, and monitoring the entrance of dissolution medium into uncoated quick release tablets during disintegration. Since terahertz radiation is inherently safe, non-destructive to samples, and can penetrate a variety of pharmaceutical ingredients to examine intermolecular vibrations of a particular chemical as well as the microstructure of the solid dosage form, research on terahertz Time-Domain Spectroscopy (THz-TDS) and Terahertz Pulsed Imaging (TPI) applications in the pharmaceutical industry has increased over the past 20 years.

Correspondence to: Jun Xin, Department of Pharmaceutical Sciences, University of Connecticut, Storrs, United States of America, E-mail: xin.lu.ck.jun@email.com

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