ABSTRACT

Investigation embodied in this thesis entitled “Applications of NMR spectroscopy in Pharmaceutical Industry” divided into five main chapters, which are as follows.

Chapter 1

Introduction

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Introduction to NMR and its applications

This chapter is an introductory summary about NMR spectroscopy and different types of NMR experiments useful for structure elucidation. Further the different applications of NMR spectroscopy in pharmaceutical industry are presented.

Chapter 2

Quantitative NMR spectroscopy

This chapter describes a new method for the quantification of Drug in its salt by evaluating the chemical shift changes observed by ¹H NMR spectroscopy. Chemical shifts are indicators of the chemical surroundings of atoms and hence they can be used to monitor the changes due to intra or inter-molecular interaction through covalent or non-covalent binding. In recent times, quantitative information is obtained based on the chemical shift displacements of selected protons offering quite elegant and reproducible NMR method.
A quick method for estimation of quantity of the drug in presence of its salt is developed and the details are presented. Pioglitazone HCl and Dexlansoprazole Na have been selected for the study where the former represents salt of basic drug while the latter is a salt of acidic drug. This method was evaluated with respect to parameters such as accuracy, precision, linearity and robustness.

**Chapter 3**

**Application of NMR and Mass spectrometry in the characterization of degradation products in Nizatidine**

During the stability study of Nizatidine oral solution at stressed conditions [40 °C/75% RH, for six months], three unknown degradation products (ranging from 0.20% to 1.50%) were detected by HPLC. The degradation products were eluting at 0.93, 1.70 and 1.80 RRT's (DP-I, DP-II and DP-III respectively). Using NMR and Mass spectroscopic data the structure of these three degradation products were elucidated.

**Chapter 4**

**Application of LC-NMR and LC-TOF-MS in the characterization of degradation products of Rabeprazole Sodium tablets**

This chapter deals with the identification and characterization of three degradation products (DP-I, DP-II and DP-III) formed during the stability study of Rabeprazole tablets under stressed conditions [40 °C /75 % RH, 6 months]. Of the three degradation products, the DP-I was isolated by preparative HPLC, but other two degradation products (DP-II and DP-III) could not be isolated due to low resolution, hence hyphenated techniques such as LC-MS and LC-NMR were employed for their structure elucidation.
Chapter 5

Application of LC-NMR for the quick identification of process related impurities in the synthesis of Docetaxel intermediate

For the preparation of Docetaxol, the hydroxyl groups at 7 and 10 positons in 10-DAB III have to be protected. N, N-carbodiimidazole was chosen as protecting group. During the process development / optimization of Docetaxel, few by-products were observed in the preparation of DCT-1. The structure of these by-products were characterized quickly, without resorting to isolation, simply by using LC-MS and LC-NMR techniques. The details of characterization of these by-products are presented in this chapter.