CHAPTER 1

INTRODUCTION

1.1 General Introduction

Aerosol inhalation is preferred route of drug delivery to the respiratory tract since it confers many distinct advantages over delivery via other routes. Inhalation technology has to date been based around three broaded delivery systems; pressurized metered dose inhalers (pMDI), nebulisers and dry powder inhalers. The pMDI technique is using compressed propellants as driving force for driven drug formulation in a container. This device delivers the contents of small metering chamber each time it is actuated. The main advantages for this technique are reliable, portable and convenient to use. However, the highly velocity moving propellant droplet from aerosol provide high oropharynx deposition by inertial impaction that require spacer and patient education for reduce drug loss via inertial impaction. Also, the propellant is chlorofluorocarbon (CFC) that known as unfriendly with the environment (Smith and Parry, 2002). A nebulizer is an atomizer technique which can generate small droplets of fluids commonly use in hospital. This technique commonly use in long term and controllable dose while administration to unconscious patient. But relatively long nebulisation time provides need of routine device maintenance, most side effects and also can lead to poor patient compliance (Boyter and Carter, 2005).

Dry powder inhaler (DPI) device is aimed to deliver drug particle to the pulmonary system. It is served as target drug delivery system for treatment the pulmonary disease and also as a novel pathway of drug delivery to the systemic system. All DPIs have four basic features: (1) a dose-metering

mechanism, (2) an aerosolization mechanism, (3) a deaggregation mechanism, and (4) an adaptor to direct the aerosol into a patient's mouth. Drug particles are theoretically stripped from the surface of the inert carrier particles, to which they are loosely attached, during the generation process. Thus, the drug particles are dispersed and can traverse the upper respiratory tract while the excipient particles do not pass beyond the mouthpiece of the device or the mouth and throat of the patient (Dalby and Tiano, 1996). The administration performance of this technique based on 3 factors includes patient, formulation and device while the patient factor is related with patient's inspiratory performance and operating education. Available devices in the market today are not easy to use; furthermore, they showed low efficiency in delivery of drug to target site which is about 10-30% in vitro and around 10% deposition in vivo (Srichana *et al*., 1998; Smith and Parry, 2002). At present, all of DPIs in Thailand are manufactured and imported from foreign countries. From lacking of knowledge and technology in dry powder inhaler we cannot provide our own products.

The goals of this study include obtaining simple operation device; by employing tobacco pipe as a dry powder inhaler device. Under the concept of narrow passage and the curved shape of tube may increase the turbulence flow which will lead to increase fine particle (<5 μm) that can distribute into the lung (Prime *et al*., 1997; Voss and Finlay, 2002), and the curved of mouth piece may reduce drug loss by inertial impaction at the oral cavity (Surender and Peter, 1998). This study focused mainly on the device whereas other factors such as formulation design and patient's performance were limited.

1.2 Objectives of the Thesis

The aims of this study were as follows :

1. To measure resistance of tobacco pipes as compared with commercially available DPI devices and related to device dimensions.
2. To compare factors relating to device performance in delivery salbutamol sulfate inhaler such as flow-rates, formulations.

1.3 Structure of the Thesis

In Chapter 1, the problems in the pulmonary drug delivery are addressed. The potential factors to the problems are described and used to define the aim and specific objectives of the thesis. A general review of literature is presented in Chapter 2.

Chapter 3 contains materials and methods for dry powder inhaler device evaluation including tobacco pipes and commercial devices.

Chapter 4 give results and discussion from this thesis. The conclusion of the thesis is in Chapter 5.