CHAPTER I
INTRODUCTION

The routes of drug introducing into the body are oral, injection, and transdermal administration. The benefit of oral and injection routes is to provide the maximum tolerable dose, however the dose level decreases over a short period (Im *et al.*, 2010).

Transdermal drug delivery system (TDDS) is a candidate when the frequent administration is required (Kim *et al.*, 2006). Besides, TDDS provides the advantages of avoiding of first-pass metabolism, maintaining of blood level for a long period of time, and reducing side effects with a painless and simple application.

Hydrogels are a unique class of macromolecular networks that may contain a large fraction of an aqueous solvent within their structure (Ganji *et al.*, 2008; Hosseinkhani *et al.*, 2006, 2009). They are particularly suitable for biomedical and tissue engineering applications because of their ability to simulate biological tissues. The hydrophilicity of the network is due to the presence of chemical residues such as hydroxylic (–OH), carboxylic (–COOH), amidic (–CONH–), primary amidic (–$CONH_2$), sulphonic (–SO_3H), and others that can be found within the polymer backbone or as lateral chains (Ganjil *et al.*, 2010). Hydrogels have been widely studied in the application of the controlled drug release because they are three-dimensional crosslinked structures through water-soluble polymers. Many hydrogel forms are available to fabricate, for examples, slabs, microparticles, nanoparticles, coatings, and films. Their properties strongly depend on their building blocks and the preparation procedures. Biopolymers are also available to form hydrogels by physically or chemically crosslinking reaction, especially like gelatin that is a kind of well-defined hydrogel matrix (Schacht *et al.*, 2004).

Gelatin is mainly extracted from mammals, poultries, and fish in which they are primarily consisted of polydisperse polypeptides obtained from either acid or alkaline collagens. The well-known sources are bovine hides, pig and fish skins (Deiber *et al.*, 2009). Recently, the bovine bone gelatin has been raised on a special issue regarding to a risk of contracting bovine spongiform encephalopathy (BSE), even if the possibility could be controlled by safe manufacturing steps (Hidaka *et al.*,

2003) and foot-and-mouth (FMD) (Songchotikunpan *et al.,* 2008). Thus, the gelatin products from a porcine and fish are candidates to avoid the problem of BSE and FMD. Normally, gelatin is a soluble polymer. Thus it has to be modified to obtain a hydrophilic polymer insoluble at 37°C for drug delivery field. To modify the chemical crosslinking has been used to forming the macromolecular chain (Vandeli *et al.,* 2001). It is widely accepted that the cross-linking of gelatin is easily fabricated by glutaraldehyde by the unprotonated ε-amino groups of lysine and hydroxylysine, and the amino groups of the N-terminal amino acid in gelatin structure (Farris *et al.,* 2010).

The aim of this work includes the preparation, the characterization and the comparison properties of porcine and fish gelatin hydrogel for the controlled drug release with different drug size and the investigation of the morphology, the swelling, the diffusion, and the drug releasing rate in the effects of matrix crosslinking ratio.