

## CHAPTER 1

### INTRODUCTION

Shrimp culture is an important agro-industry in many countries in the world. However, the growth of this industry has resulted in an associated and marked increase of infectious diseases in shrimps, in particular those caused by viruses and bacteria. In the past decade, intensive studies have progressed knowledge on shrimp immunity. Immune effectors have been identified and characterized (Söderhäll and Cerenius, 1992; Bachere et al., 1995; Bachere, 2000; Holmbald and Söderhäll, 1999; Roch, 1999; Arala-Chaves and Sequeira, 2000; Johanson et al., 2000; Vargas-Albores and Yepiz-Plascencia, 2000; Lee and Söderhäll, 2002). Determination of the EST sequences from various species of shrimp, including *Penaeus vanamei* (Gross et al., 2001), *Penaeus monodon* (Supungul et al., 2002) and *Penaeus japonicus* (Rojtinnakorn et al., 2002) has accelerated the knowledge by identifying numerous genes that can be classified as being potentially involved in the defense mechanism. These genes are now being tested both in vitro and in vivo for their actual functions (Wongpanya et al., 2004; Vega-Jiménez et al., 2005).

However, there are numbers of genes with unknown functions. The next challenge is to study the functions of these genes and their regulatory pathways. Several technologies have been implemented in functional genomics studies, i.e., oligonucleotide chips (Fodor et al., 1991; Pease et al., 1994), SAGE (Velculescu et al., 1995), DNA microarrays (Schena et al., 1995), and the two-hybrid system in yeast (Fields and Song, 1989; Chien et al., 1991). We realize that identification of protein-protein interactions in target proteins and the establishment of a comprehensive shrimp proteins interaction map will provide important information to functional genomic studies in this economically important species.

In our previous work, a human homologue, syntenin-like protein namely Pm-syntenin was isolated from *P. monodon*. We performed RT-PCR on total RNA extracted from saline-injected and WSSV injected shrimp using specific primers designed from Pm-syntenin. The results demonstrated that Pm-syntenin message was upregulated in infected shrimp and declined rapidly when the infection progressed (Bangrak et al., 2002). We hypothesized that increased Pm-syntenin was associated with a viral infection and might be linked to a mechanism in shrimp that protected against viral infections. Pm-

syntenin was proposed to be indirectly involved with a signaling pathway by serving as an adapter or scaffolding protein to attach other proteins to signaling components. Human syntenin is a conserved cytosolic protein with diverse biological functions due to its interaction with numerous targets. The putative binding partners reported for syntenin include syndecan (Grootjans et al., 1997), Sox4, IL5R $\alpha$  (Geijsen et al., 2001), neuroglian, neurofascin (Koroll et al., 2001), proTGF- $\beta$  (Femandez-Larrea et al., 1999), glutamate receptors (Hirbec et al., 2002), ephrin B (Torres et al., 1998; Lin et al., 1999), ephrin A7 (Torres et al., 1998), PTP- $\eta$  (Iuliano et al., 2001), neurexin 1 (Grootjans et al., 2000) and merlin (Jannatipour et al., 2001). All the binding partners of syntenin are receptors except for merlin, a cytosolic tumor repressor (Evans et al., 2000) and eukaryotic translation initiation factor 5A (Li et al., 2004).

The goal of the present investigation is to identify any Pm-syntenin binding protein from the haemocyte of WSSV infected shrimp by using the yeast two-hybrid screen. Our results here demonstrate the binding of the N-terminal of Pm-syntenin to the C-terminal of  $\alpha_2$ M. This first finding of such a binding is important for establishing the function of both proteins in the shrimp immune system.