CHAPTER I

INTRODUCTIONS AND AIMS

The problems for dairy farming in Thailand are the low milk production and short lactating period of indigenous dairy cattle. Many factors can affect milk production e.g. a high environment temperature, a lower genetic potential of dairy cattle and an inadequate supply of forage during the summer. However, these factors can affect the physiological signals received by the mammary gland. The lactating mammary gland receives signals from the rest of body in the forms of nutrients and hormones from blood to sustain milk synthesis. Growth hormone is a major galactopoietic factor during lactation, one of its key effects being greater utilization of nutrients for milk synthesis. Increased milk secretion in response to the treatment of bovine somatotropin (bST) requires partitioning of nutrients to accommodate the increase in rates of milk synthesis, perhaps at the expense of rates of maintenance and (or) growth of other tissues. Milk yield gradually increased over the first few days of bST treatment and reaches a maximum during the first week (Bauman and Vernon, 1993). Glucose uptake in skeletal muscle and adipose tissues decreasd (McDoweel et al., 1987), while mammary uptake of both acetate and glucose increased during bST treatment (Fullerton, 1989).

At the process of milk synthesis, mammary blood flow is a way to carry milk precursors to the mammary gland. However, little is known on the control mechanism involved in regulating mammary blood flow and milk synthesis in responses to bST treatment. Several lines of evidence indicate that exogenous growth hormone does not act directly on the mammary gland. Direct action of bST on the bovine mammary gland during lactation remains unclear. The failure to identify specific growth hormone receptors in mammary tissue is noted (Kazmer et al., 1986), although growth hormone receptor mRNA is present in mammary tissue

(Glimm et al., 1990). In addition, an infusion of growth hormone into the mammary artery of sheep has also been shown not to increase milk yield (Peel and Bauman, 1987).

It has been reported that growth hormone could affect mammary tissue indirectly by its action via insulin-like growth factor-I (IGF-I) (Peel and Bauman, 1987; Gluckman et al., 1987). IGF-I is a single chain peptides of 70 amino acids, synthesized mainly in the liver and other tissues (Granner, 1996). Intra-arterial infusion of IGF-I into the goat mammary gland has been reported to increase mammary blood flow associated to milk secretion (Prosser et al., 1990). In addition, IGF-I has also been detected in milk from a number of species (Prosser et al., 1991a,b) and its concentration varies with situations such as the onset of lactation or growth hormone treatment (Prosser et al., 1989). Furthermore, An increased concentrations of IGF-I in plasma and milk also occurred in response to growth hormone treatment and could be one of the processes involved in stimulating milk synthesis (Faulkner, 1999). It has been shown that milk yield of 87.5% crossbred Holstein cattle decrease rapidly coincided with the reduction of endogenous growth hormone and mammary blood flow during lactation advance to mid and late lactation (Chaiyabutr et al., 2000). It has not been elucidated whether changes in the plasma growth hormone level during late lactation are involved of changes in extra-mammary factors or intra-mammary factors. The present study was carried out to examine both factors during given exogenous growth hormone. Furthermore, the plasma level of IGF-I was also examined.