Abstract

Many evolutionary conserved proteins and mechanisms have been observed in nature, one of them is insulin and its signal pathway. Importantly, many parts of this pathway in humans are similar to those found in lower organisms, such as fruit fly (*Drosophila melanogaster*). Insulin is one of the most studied complex molecules; it acts primarily as a hormone but it can also act as a growth factor due to its evolutionary congeniality and similarity to the IGF. It has long been unclear how insulin binds to its receptor and how insulin or insulin-like proteins influence regulation of metabolism, cell proliferation, cell growth and also the size of organs and the whole body. Examining insulin-like peptide superfamily and its signal pathway in invertebrates may thus be used to better understand many metabolic processes in vertebrates thanks to high evolutionary conservation.

In this thesis, we tried to prepare an analogue of insulin like peptide 5 (DILP5) of *Drosophila melanogaster* by a total chemical synthesis. This analogue is composed of A-chain of human insulin and B-chain of DILP5. In B-chain all methionins were replaced by amino acid norleucine using a chain combination method through S-sulfonate forms of each chain. The results show that this protein can be successfully prepared, however, the amount was not sufficient and it was not possible to separate the product from the reaction mixture. Nevertheless, the fact that the protein was prepared, for the first time, could be promising for future efforts to prepare insulin-like analogues.

Key words: insulin, insulin-like peptides, *Drosophila melanogaster*, total chemical synthesis, evolutionary conservation, DILP5