PHYSICOCHEMICAL CHARACTERIZATION OF RABBIT FOLLICLE STIMULATING HORMONE (FSH) USING IN SILICO METHODS

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ABSTRACT

The objective of this study was to determine the molecular structure of Follicle Stimulating Hormone (FSH) in rabbits using computational methods. Protparam server was used to predict the physico-chemical structure. The secondary structure and trans-membrane protein structure were predicted using phyre 2 server. The result indicated a total of 559 amino acids with molecular weight of 62753.56. Instability index of 47.13 and aliphatic index of 100.82 were obtained. The secondary structure indicated alpha helix (33%), beta helix (9%), trans-membrane helix (17%) and disordered (19%). The predicted instability index showed that Follicle Stimulating Hormone (FSH) in rabbits is an unstable protein. High aliphatic index indicated that the protein is thermally stable. Studies of molecular structure of proteins may provide better understanding of functions and mechanisms of action of the protein.

Key words: Rabbit, FSH, Prediction, Structure, In silico

INTRODUCTION

Follicle stimulating Hormone (FSH) plays criticals role in female reproduction by regulating follicular growth and development (Xiaoyang *et al*., 2019). The alpha and beta sub units are indispensable in its interaction with follicle stimulating hormone receptor. FSH is biologically activated through its interaction with specific FSH receptors (Swati *et al*., 2022). The effectiveness of follicle stimulating hormone in inducing super ovulation in rabbits have been reported (Shu *et al*., 2007). Follicle stimulating hormone is widely used in induction of ovulation and treatment of hypogonadism and infertility in both sexes (Manuela and Caserina, 2014). Structural changes in FSH is reported to affect FSH production and ovarian response to FSH stimulation (Liedo *et al*., 2013). Genetic variation in FSH encoding gene is associated with changes in circulating follicle stimulating hormone and estradiol (Alexander et al., 201). The relationship between protein structure and functions is well established (Hegyi and Gerstein, 1999). Analysis of the molecular structure of follicle stimulating hormone can lead to better understanding of its mechanisms of action. The main objective of this study was to predict the physicochemical properties of follicle stimulating hormone using computational methods.

MATERIALS AND METHODS

Data on rabbit follicle stimulating hormone, with accession no. XP_008252646.1, was retrieved from database of National Centre for Biotechnology Information (NCBI) for analysis using computational methods. The physicochemical parameters were evaluated using Protparam server as described by (Gasteiger, 2005). Protparam is a tool which allows the computation of various physical and chemical parameters for a given protein stored in Swiss –Prot or TrEMBL or for a user-centered protein sequence. Secondary structure and transmembrane protein structure were predicted using phyre 2 server (Kelley & Sternberg, 2009). Phyre2 uses the alignment of hidden Markov models via HHsearch to significantly improve accuracy of alignment and detection rate (Soding, 2005).

RESULTS AND DISCUSSION

The physicochemical properties of rabbit follicle stimulating hormone are presented in Table 1.

Table 1: Physicochemical properties of Rabbit follicle stimulating hormone

Parameters	Values
Number of amino acids	559
Molecular weight	62753.56
Theoretical PI	6.44
Extinction coefficient	59360
Instability index	47.13
Aliphatic index	100.82

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Extinction coefficient indicate the rate of light absorption by a protein at a given wavelength. The instability index is an estimate of stability of a protein in a test tube. Instability index of less than 40 indicate a stable protein while, values above 40 indicate an unstable protein (Gasteiger, 2005). The result obtained indicated unstable nature of rabbit follicle stimulating hormone. Aliphatic index is the relative volume occupied by aliphatic side chains (alanine, valine, isoleucine and leucine). High aliphatic index indicates thermal stability of a protein (Ikai, 1980).

The secondary structure of rabbit follicle stimulating hormone is presented in Table2.

Table 2: Predicted secondary structure of Rabbit follicle stimulating hormone

Parameters	**Percent (%)**
Alpha helix	33
Beta helix	9
Transmembrane helix	17
Disordered structure	19

The results showed that alpha helix is the predominant sub unit while the least sub unit of rabbit follicle stimulating hormone is the beta strand.It can be concluded that rabbit follicle stimulating hormone is unstable in test tube but it is a thermally stable protein.

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