

# Computational Analysis of Unknown DNA Sequences Using Integrated Bioinformatics Tools

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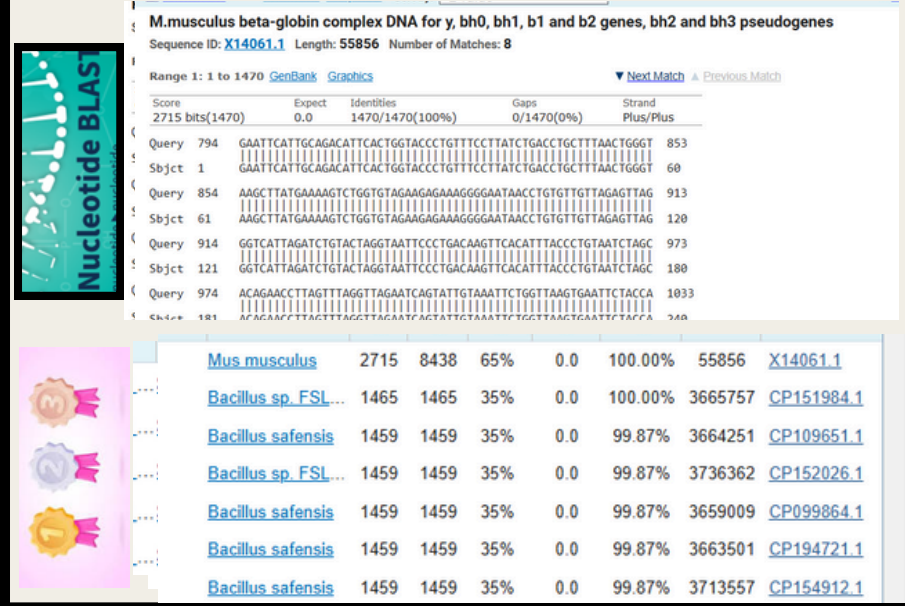
**Official name:** M.musculus beta-globin complex  
DNA for  $\gamma$ , bh0, bh1, b1 and b2 genes, bh2 and bh3 pseudogenes  
**Gene type:** protein coding  
**Organism:** Mus musculus

## Tools

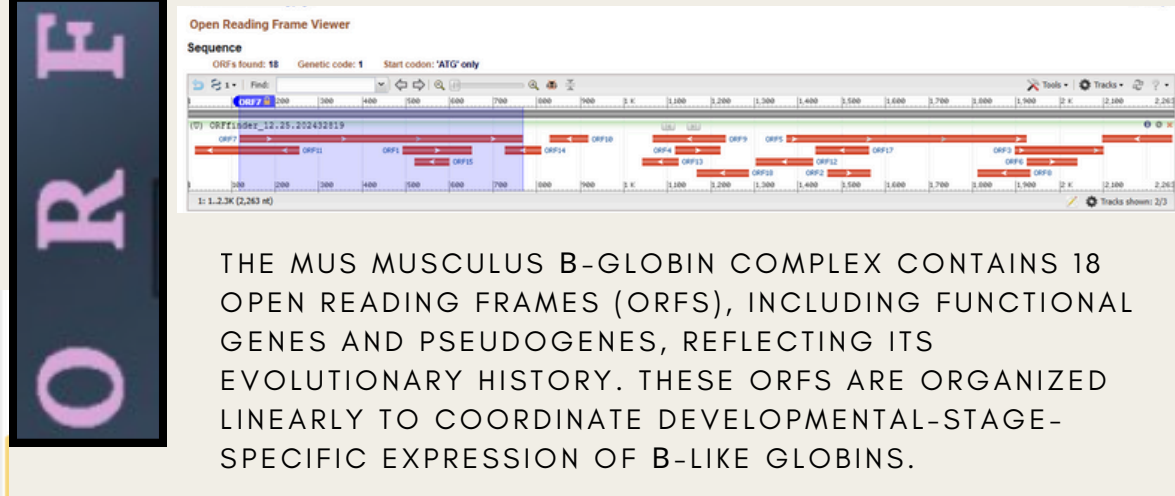
The Mus musculus  $\beta$ -globin complex consists of  $\gamma$ , bh0, bh1, b1, and b2 genes, which are functionally expressed at different developmental stages, along with bh2 and bh3 pseudogenes, which are nonfunctional. Its linear arrangement ensures coordinated temporal regulation of globin gene expression during erythropoiesis.

## 1 DNA ANALYSIS

### 1.1 BLAST



### 1.2 ORF FINDER



### 1.3 DNA TO PROTEIN TRANSLATION

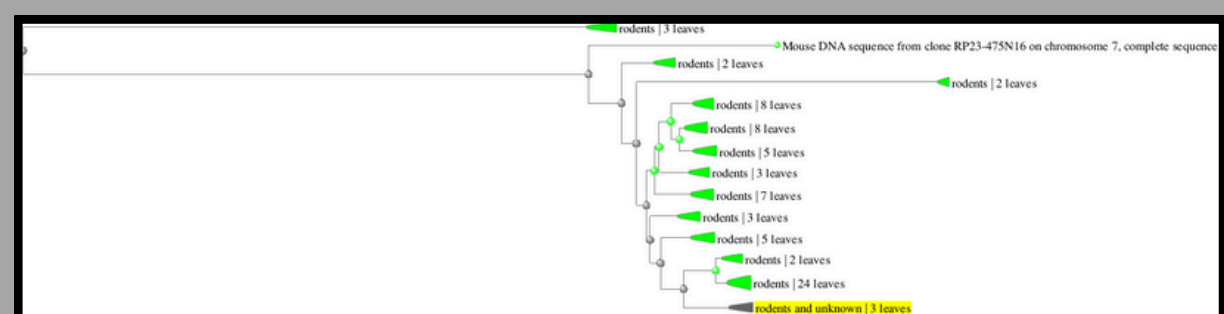


## 2. RNA Analysis



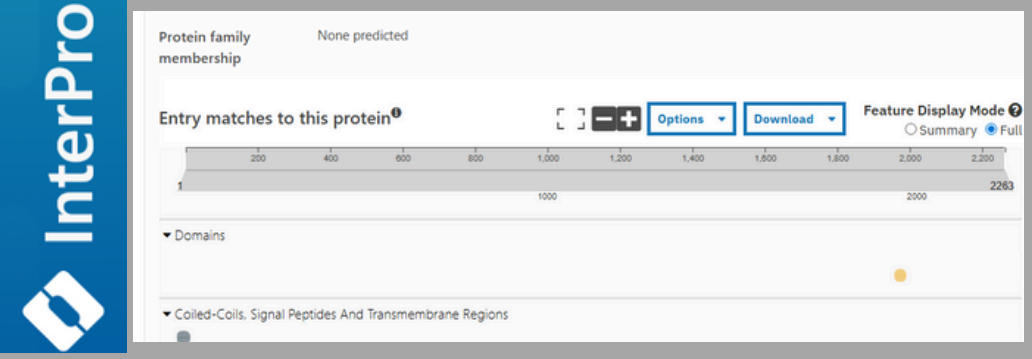
## 3 PHYLOGENETIC ANALYSIS

### 3.1 MSA



## 4 Protein Analysis (Structure & Properties)

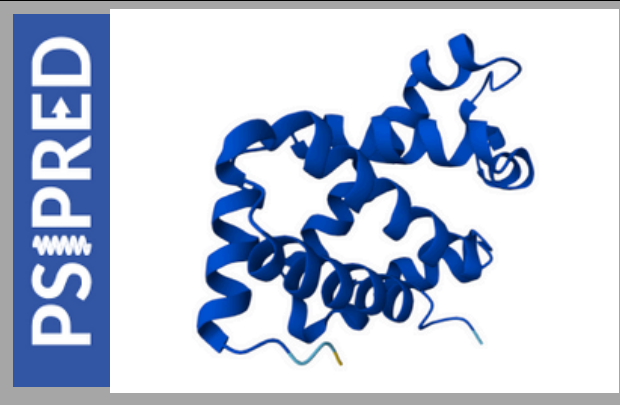
### 4.1 DOMAIN AND MOTIFS



### 4.2 TABLE OF PROTEIN PROPERTIES

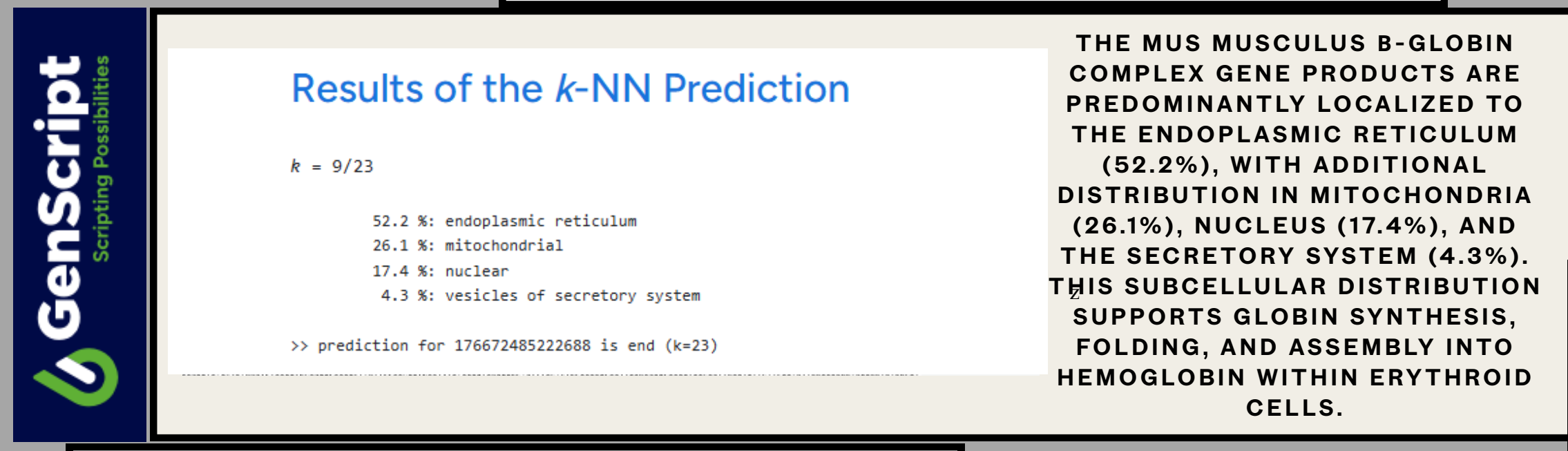
Parameter	Value
Number of amino acids	146
Molecular weight (Da)	15,708.99
Theoretical pI	7.26

### 4.3 PROTEIN SEC. STRUCTURE



4.4 Summary of predicted function:  
The Mus musculus  $\beta$ -globin complex regulates the production of  $\beta$ -like globin chains essential for oxygen transport during different developmental stages.

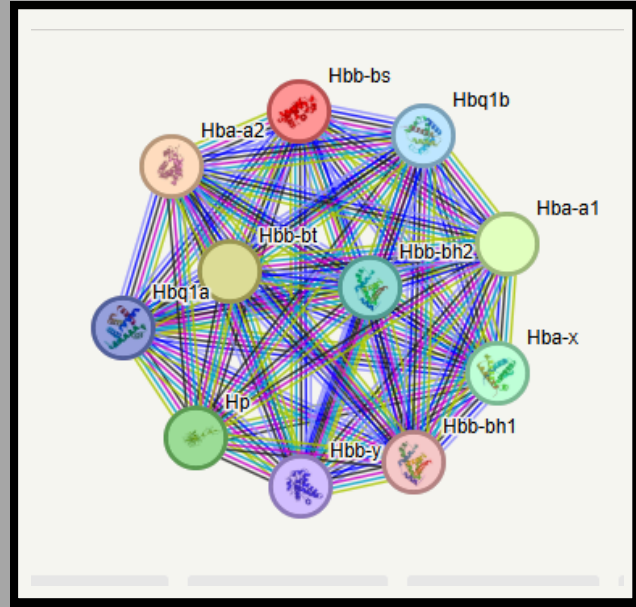
## 5 SUBCELLULAR LOCALIZATION



## 6 Protein-Protein Interaction

### 6.1 Biological Significance

The  $\beta$ -globin proteins of the Mus musculus  $\beta$ -globin complex are essential for forming functional hemoglobin, which transports oxygen from the lungs to tissues and facilitates carbon dioxide removal. Their developmental-stage-specific expression ensures proper oxygen delivery during embryonic, fetal, and adult stages, supporting growth, metabolism, and survival.



**Conclusion**  
In this project, we used different bioinformatics tools to study a DNA sequence and its protein with its function. We found the longest coding region, looked for its similar sequences, tried to find its localization and evolutionary relation.

### References

- Runck, A. M., Moriyama, H., & Storz, J. F. (2009). Evolution of duplicated  $\beta$ -globin genes and the structural basis of hemoglobin isoform differentiation in Mus. Molecular Biology and Evolution, 26(11), 2521–2532. This study investigates the evolutionary history and functional divergence of duplicated adult  $\beta$ -globin paralogs in house mice
- Hardison, R. C., Miller, W., & others. (1984). DNA sequence organization of the  $\beta$ -globin complex in the BALB/c mouse. Journal of Molecular Biology (classic reference on cluster organization and gene order).