Comprehensive Sequence Analysis of the Human TNF Gene

1. Retrieval of biological Sequence from NCBI

TNF gene FASTA sequence

- Accessed NCBI, searched for 'human TNF gene', downloaded FASTA format, and opened in BioEdit.
- The gene sequence from NCBI provides detailed information about the gene's structure, regulatory elements, and variations. This data aids in understanding function, regulation, and role in biological processes.

2. Translation of DNA to amino acid sequence

BioEdit's 'Translate' feature to translate DNA to amino acid sequence

- Translating the TNF gene's DNA sequence to its corresponding amino acid sequence is crucial for understanding its protein-level function. The TNF gene encodes a cytokine involved in inflammation and immune system regulation.

- In the analysis of the TNF gene, the DNA sequence is initially opened using the BioEdit software. Subsequently, the 'Translate' function within BioEdit is utilized to convert the DNA sequence into an amino acid sequence.

Step.3. ORFs IN DNA Sequence

BioEdit's ORF Finder

Results: Identified ORFs in the TNF gene sequence with start/stop positions, lengths, and protein translations.

- Identifying ORFs is crucial for understanding TNF gene coding regions, gene annotation, and analyzing mutation effects on protein production to understand biological processes and their implications for health and disease.

4. Nucleotide composition

BioEdit to calculate nucleotide frequencies and GC content

Results: Frequencies of each nucleotide and overall GC content in the TNF gene sequence.

Importance:

- Reveals nucleotide distribution.
- Indicates DNA stability (GC content).

- Aids in understanding gene function.
- Supports experimental design.

5. Transcription factor binding sites

PROMO tool

- Selected 'Homo sapiens'; inputted TNF promoter or entire gene sequence.

Results: Identified potential transcription factor binding sites in the TNF gene promoter region.

Importance:

- Reveals regulatory binding sites.
- Enhances understanding of gene regulation.
- Supports targeted research on transcription factors.
- Guides experimental design and validation.
- Contributes to functional analysis of the TNF gene.

6. Finding the functional motifs

MEME Suite

- uploaded sequence in FASTA format; applied default settings.

Results: Identified functional motifs in the TNF gene sequence.

Importance:

- Reveals key biological motifs.
- Aids in understanding gene regulation.
- Highlights potential protein interaction sites.
- Guides experimental design.
- Enhances gene functional annotation.

7. Introns and exons identification

GENSCAN tool

Results: Predicts coding regions (exons) and non-coding regions (introns, UTRs) in the TNF gene.

Importance:

- Identifies which parts of the gene code for proteins.
- Reveals regulatory elements and non-coding regions.
- Enhances gene annotation and functional understanding.
- Guides experimental design and validation.