

Reduction Of Thymine in mRNA Sequence Of Tumor Protein

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Abstract

The order and content of thymine in protein coding frames of mRNAs are playing a major role in translating proteins with adequate hydrophobic residues. Importantly the frame1 (second nucleotide of codon) prefers to have 27% of thymine, which corresponds to the amount of large hydrophobic residues in the proteins. To understand this further at single gene or protein level, this work has been taken up here. The gene sequence of tumor protein has been chosen for this study. The study includes the thymine content in gene and mRNA sequences of tumor protein of different species. That is the total amount of thymine in introns and exons are counted separately. The results indicate that the gene contain almost equal amount of thymine and adenine while it is not so in mRNA. The coding mRNA sequence contains less thymine than adenine. The introns on the other hand contain greater amount of thymine than adenine. The reduction in thymine content in coding frames leads to reduction in number of large hydrophobic residues in the corresponding protein. So the loss in hydrophobicity leads to reduction in activity. This is in agreement with our earlier results. Further investigation on carbon content analysis also supports this result.

Keywords: thymine reduction; mRNA sequence; tumor suppressor; large hydrophobic residue.

Introduction

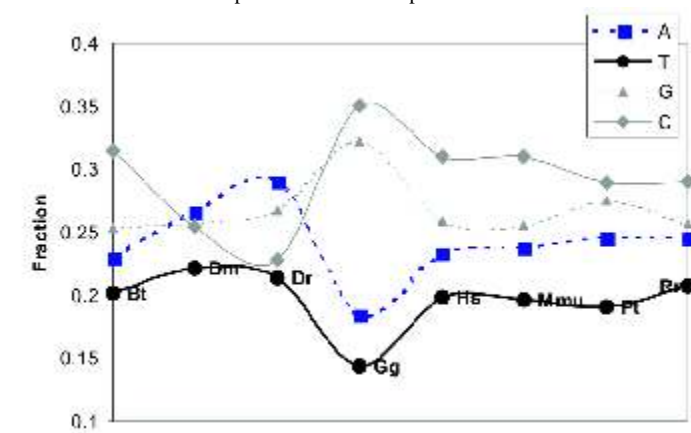
Thymine is the only residue got changed to uracil in the base upon transcription. Any codons that contain uracil as second nucleotide that code for large hydrophobic residues (LHR) such as phenylalanine, isoleucine, leucine, methionine and valine [1]. The distribution of this uracil (or thymine in gene) in protein coding mRNA sequences and its relationship with protein stability [2-4] and function [5] are the main focus of this work, assuming that the understandings from these analyses will pave the way for solving the long-standing issue of genetic diseases.

Jayaram *et al.*, studied and documented the atomic level understanding of DNA in aqueous solutions [6]. We have studied the role of thymine in protein coding frames of mRNA sequences by taking entire mRNA in different species [7]. This paper studies further at single gene or mRNA level. That is the order and content of thymine in proteins coding frames of mRNA sequences analysed with mRNA and gene sequence of tumor protein of 8 different species.

Materials And Methodology

The mRNA and gene sequences of different species are taken from www.ncbi.nlm.nih.gov website. The species include *Bos Taurus (Bt)*, *Drosophila melanogaster (Dm)*, *Danio rerio (Dr)*, *Gallus gallus (Gg)*, *Homo sapiens (Hs)*, *Macaca mulatta (Mmu)*, *Pan troglodytes (Pt)* and *Rattus norvegicus (Rn)*. The gene and mRNA sequences of these species are collected separately. The thymine content in each gene and mRNA sequences are counted using program written in C. The results are plotted and tabulated for comparison.

Fig 1: Note the reduction of thymine (T) in mRNA sequence of tumor protein in different species.



Results And Discussion

Figure 1 shows the fraction of individual nucleotides, A, T, G and C in mRNA sequence of tumor protein in different species. As can be seen here the amount of thymine is the least in all species. It so in majority of the mRNA sequences in different species that causes disease. This is severe in heterosexual species. That is during evolution the thymine gets reduced. This is due to cell preference over the mRNA sequence of less thymine than its counterpart with higher one.

The amount of A, T, G and C in gene sequence of tumor protein in different species are given in Table 1. The adenine and thymine together found to be less than the total amount of G and C together. This is very much clear in higher organisms including human and other heterosexual. One thing is clear from this study that when competition arises during reproduction, the sequence with less thymine gets the priority provided the translated protein is stable and active. Here in tumor protein is also

Table 1: Number of individual nucleotides in genes of tumor protein in different species.

S.No	Species	A	T	G	C	Total
1	Bt (Cow)	485	531	516	643	2175
2	Dm (Fruitfly)	510	462	454	450	1876
3	Dr (Fish)	614	599	488	404	2105
4	Gg (Chicken)	275	254	424	602	1555
5	Hs (Human)	543	663	644	736	2586
6	Mmu (Rhesus)	529	563	600	671	2363
7	Pt Chimpanzee)	494	608	555	612	2269
8	Rn (Rat)	436	424	411	521	1792

same but gone one step ahead of producing lease thymine content that produces unstable protein with less number 'large hydrophobic residues'. That is less amount of carbon in the protein for its survival. Adding additional thymine in appropriate place of mRNA and gene sequence will produce stable and active protein that will be passed on to the child.

Conclusion

Thymine content in protein coding frames of tumor protein of 8 different species has been studied here. The results indicate that the gene contain almost equal amount of thymine and adenine (thymine in strand2) while it is not so in mRNA. The coding mRNA sequence contains less thymine than adenine. The introns on the other hand contain greater amount of thymine than adenine. The reduction in thymine content in coding frames leads to reduction in number of large hydrophobic residues in the corresponding protein. So the loss in hydrophobicity leads to reduction in activity. This is in agreement with our earlier results. Further investigation on carbon content analysis also supports this result. Adding additional thymine in appropriate place of mRNA and gene sequence will produce stable and active protein that could be passed on to the

daughter cell.

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