Evidence of Selection for Codon Usage in Antibodies

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Abstract

Antibodies play a key role in the immune system as they bind to potential pathogens and, along with other agents, neutralize them. Therefore, producing engineered antibodies as drugs for disease treatment is vital in medicine. In addition to their therapeutic applications, antibodies serve significant roles in diagnostics, biotechnology, and research, highlighting their importance in diverse fields. Improving the process of antibody production can provide various benefits, such as reducing costs and expanding public access to reliable therapy.

Our study aims to understand whether antibodies undergo selection at the level of codons, not only for a specific amino acid sequence. To this end, we analyzed a database with millions of mammalian antibody sequences.

Our results suggest that antibodies tend to undergo selection to prefer specific codons. Furthermore, we suggest that this bias cannot be explained only by mutation patterns, suggesting that there is a direct selection process driving codon usage in antibodies. This conclusion is further supported by experimental validation.

These findings support the potential of leveraging codon usage patterns as a powerful tool for enhancing antibody engineering, highlighting the importance of further research in this direction.