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A Statistical Analysis of the Robustness of Alternate Genetic Coding Tables

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The rules that specify how the information contained in DNA is translated into amino acid language during protein synthesis are called the genetic code, commonly called the Standard or Universal Genetic Code Table. As a matter of fact, this coding table is not at all universal: in addition to different genetic code tables used by different organisms, even within the same organism the nuclear and mitochondrial genes may be subject to two different coding tables. Results In an attempt to understand the advantages and disadvantages these coding tables may bring to an organism, we have decided to analyze various coding tables on genes subject to mutations, and have estimated how these genes survive over generations. We have used this as indicative of the evolutionary success of that particular coding table. We find that the standard genetic code is not actually the most robust of all coding tables, and interestingly, Flatworm Mitochondrial Code (FMC) appears to be the highest ranking coding table given our assumptions. Conclusions It is commonly hypothesized that the more robust a genetic code, the better suited it is for maintenance of the genome. Our study shows that, given the assumptions in our model, Standard Genetic Code is quite poor when compared to other alternate code tables in terms of robustness. This brings about the question of why Standard Code has been so widely accepted by a wider variety of organisms instead of FMC, which needs to be addressed for a thorough understanding of genetic code evolution.