



TAU iGEM Team 2023: Fine-tuning Plasmid copy numbers

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Plasmid copy number (PCN) refers to the number of plasmid copies that can be found in a single cell. In synthetic biology, plasmids are commonly used to transfer and express genes of interest in various organisms. PCN can be correlated with gene expression, but the relationship is complex and depends on various factors. For example, overexpressing a gene can lead to higher levels of protein production, but too much expression can be toxic. Therefore, controlling PCN is important for designing and optimizing synthetic biology systems. For instance, if a synthetic biology system involves the expression of a toxic protein, it may be necessary to tightly control the PCN to prevent overexpression and toxicity. On the other hand, if the system requires high levels of expression of a particular gene, it may be beneficial to increase the PCN to maximize the number of copies of the gene.

We are working on a novel approach to control and fine-tune plasmid copy number, **entirely based on modifications made to the plasmid's origin of replication sequence**. Utilizing biological data gathered for decades about colE1 plasmids, alongside state-of-the-art computational methods, we can predict the effect that modifications made to the plasmid's origin of replication will have on the plasmid's copy number.