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Survival of the Fittest: Comparing Synthetic and Clincial Variants of TEM Beta-Lactamase

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Survival of the Fittest: Comparing Synthetic and Clinical Variants of TEM Beta-lactamase

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TEM beta-lactamase is an enzyme produced by bacteria that confers resistance to a number of common antibiotics, such as penicillins. Many variants of TEM exist. Some are seen clinically, while some are synthetic and seen only in laboratory settings. *In vitro* and *in vivo* studies show similar function in synthetic variants as in natural variants. We hypothesize that small differences in fitness are responsible for the synthetic variants not appearing clinically, so we are developing an assay in order to measure these small differences. We are constructing bacterial strains in which TEM expression is linked to expression of a fluorescent protein in order to compete them head-to-head and determine which variants have a competitive advantage. Using strains that express different colors of fluorescent proteins and different TEM variants, we can compare growth by comparing the fluorescent intensity of the different colors. We would like to follow up this study with a series of directed evolution experiments on TEM, using several different variants as starting points. This may shed more light on why some variants are not seen clinically—for example, they may be evolutionary dead ends. We may also encounter novel mutations.