

# Selenoprotein O Protects Against Oxidative Stress and Incorporates Various Nucleotides in AMPylation

Jaffery, Zehra (School: Plano West Senior High School)

Selenoprotein O (SeIO) is a mitochondrial pseudokinase enzyme that AMPylates, or transfers an AMP molecule to, cellular proteins. However, SeIO's role as an AMPylator in oxidative stress response is largely unknown. It was hypothesized that if SeIO mitigates oxidative stress induced by diamide, a sulfhydryl oxidizer, and attenuates homeostatic dysfunction induced by metal deficiency by 2'2-dipyridyl, then there will be increased viability as compared to the knockout without SeIO present. SeIO conventionally utilizes ATP to conduct AMPylation. However, recent studies have shown that another known mammalian AMPylator, FicD, not only utilizes but also selectively prefers alternative nucleotides called diadenosine polyphosphates (ApnAs) for AMPylation. ApnAs, also termed alarmones, are structurally similar to ATP and are present in high concentrations during oxidative stress, signaling homeostatic imbalance. It was hypothesized that SeIO can potentially utilize ApnAs in autoAMPylation. A nucleotide screening was conducted investigating Ap<sub>3</sub>A, Ap<sub>4</sub>A, Ap<sub>5</sub>A, ADP, AMP, and ATP in AMPylation assays with SeIO, followed by visualization with Western Blotting. Viability assays were conducted by measuring optical density (OD<sub>600</sub>) at 30-minute increments to construct a growth curve. It was found that ATP was utilized most extensively as a cosubstrate by SeIO, followed by Ap<sub>3</sub>A and ADP. Wild-type strains of *E. coli* with SeIO presented increased viability in iron-deficient environments and under oxidative stress as compared to Knockout. These results highlight that SeIO's function as an AMPylator also rescues the cell from oxidative stress and presents a potential avenue for further research into its overarching role in the cell.

## Awards Won:

Second Award of \$2,000