Erwinia amylovora is a Gram-negative, facultative anaerobe and the causative agent of Fire blight, a disease of the Rosaceae plant family. Pathogenic bacteria such as E. amylovora produce virulence factors to aid in their invasion of host tissue. One example of virulence factors are exotoxins—secreted proteins that attack important cellular functions. One such family of exotoxins are the mono-ADP-ribosyltransferases (mARTs), a class of virulence factors responsible for diseases such as cholera and diphtheria. These toxins are enzymes that transfer the ADP-ribose moiety of NAD+ to a target macromolecule. Cellular targets of mART toxins are diverse, ranging from cytoskeletal proteins such as actin, to those involved in cell communication like G\textsubscript{as}; recently, some mART toxins have been shown to target DNA.

Vorin is a novel mART toxin produced by E. amylovora ATCC BAA-2158, a bacterial pathogen to the Rosoideae subfamily of plants, including raspberries, blackberries, and dewberries. Vorin is highly toxic to both eukaryotic and bacterial cells. However, a putative immunity protein, VorinI, has been discovered which neutralizes Vorin cellular toxicity. It is proposed that Vorin and VorinI are the constituent parts of a Toxin-Antitoxin (TA) system, where Vorin is the toxin and VorinI is the antitoxin. TA systems are ubiquitous among bacterial species and can be present on mobile genetic elements such as plasmids or, in the case of Vorin/VorinI, in the chromosome. Of the five types of TA systems, group II – where both the toxin and antitoxin are proteins – is the most common.

The goals of this research are to characterize the enzymatic activity of Vorin and to uncover the mechanism by which VorinI provides immunity to the toxic effects of Vorin.