**Variant Acid β-Glucosidase and Gaucher disease**

**Abstract**

**Authors:** Kathleen Cornely, Roderico Acevedo, and Kristen Procko

**Abstract**:

This case focuses on a woman in her 20s who was recently diagnosed as having Gaucher disease, a diagnosis that comes with much relief for her, as she finally has an explanation for the symptoms of the disease that have plagued her entire life. Gaucher disease is a genetic disease involving a mutation in the acid β-glucosidase enzyme, a hydrolase required for the degradation of glucosyl ceramides in the lysosomes. The inability to degrade glucosyl ceramides leads to their build up in the spleen, liver, lungs, bones, and brain, which causes the symptoms observed in these patients—enlarged liver and spleen, liver malfunction, skeletal disorders, and neurological complications. A study of the acid β-glucosidase enzyme, involving the construction of mutants, and of small molecule inhibitors, leads to a greater understanding of how the enzyme works, and can also lead to the development of therapeutic agents to treat the disease. Inhibiting an enzyme with decreased function may seem counterintuitive as a treatment strategy, but research has shown that these compounds can bind to a mutated enzyme and act as molecular chaperones, shepherding the enzyme to the lysosome (where the inhibitor dissociates at the low pH), resulting in an increased amount of enzyme delivered to the lysosome.

**Molecules explored**:

The primary molecule examined in this case study is acid β-glucosidase. Visualization of this enzyme with small molecule inhibitors bound leads to a greater understanding of the important intermolecular interactions involved between the inhibitor and the enzyme.