Case Study: A Lysosomal Enzyme Disorder

John and Margaret made and appointment with their daughter's pediatrician to discuss changes in her behavior. Alisha is John and Margaret's first and only child. As new parents they are very much attuned to her behavior and somewhat unsure of what actually constitutes normal infant behavior. They made the appointment to reassure themselves that Alisha was healthy. Alisha is 8 months old. Her delivery was normal and to date she had reached all her infant milestones within appropriate time intervals. Her parents were concerned because even though Alisha was easily turning over at 5 months, she hadn't actually turned over by herself in the last two weeks. The doctor performed a number of tests which tested Alisha's motor skills and muscle strength. He tested her ability to follow his finger and penlight with her eyes. He also tested her startle response by slamming his hand down on a nearby table. Finally, he examined her eyes. What he found was that Alisha's muscle tone had noticeably diminished from his observations at her 6 month check-up. Although she initially focused on the doctor's finger she did not maintain the focus. She did not focus on the penlight at all. Her startle response was disproportionately exaggerated to the stimulus. The eye exam revealed a cherry-red spot on the back of her eye. The doctor recommended further genetic testing but he suspected Alisha had Tay-Sachs disease.

Tay-Sachs is a relatively rare fatal inherited disease occurring in only 1 in 112,000 births. It is an autosomal recessive trait, which means affected individuals inherit a copy of the defective gene from both parents. Tay-Sachs disease is equally prevalent in males and females. Tay-Sachs is found primarily in people of eastern and central European Jewish ancestry, however other populations do carry the mutation with increased frequency including Old Order Amish communities in Pennsylvania, Cajun populations of Louisiana and some French-Canadian populations. Individuals with infantile Tay-Sachs are usually diagnosed around 6 months of age and die before age 5.

Tay-Sachs disease is caused by a mutation in a gene for a lysosomal enzyme. The normal version of the enzyme breaks down a fatty molecule formed in cells. The protein resulting from the Tay-Sachs mutation does not breakdown these fats. The fats build up in cells and eventually kill the cells. The symptoms of Tay-Sachs disease are caused by the accumulation of fats and death of cells within the nervous system, particularly neurons in the brain and spinal cord.

Unfortunately, genetic testing revealed Alisha had mutations in the HEXA gene and she was diagnosed with Tay-Sachs disease. Her nervous system responses continued to degenerate. By age 2 she could no longer hear or see. She was having difficulty swallowing and breathing and was subject to periodic seizures. Shortly before her 4th birthday she entered hospice and died within a week.