Systemic lupus erythematosus (SLE) disease and B-cell protein-protein interaction network

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Systemic lupus erythematosus (SLE) disease is a complex, multifactorial disease and polygenic autoimmune disease. The specific cause of SLE is unknown, but it is thought to be an autoimmune disease with interrelated environmental, hormonal, viral and genetic factors. Systemic lupus erythematosus clinical symptoms are butterfly rash, joints tenderness and swelling, arthritis-like pain, edema, general headache, fever, nausea, vomiting and weight loss. Mainly females are affected from this disease. This disease can be seen worldwide but most of the affected individuals are American and European. Immune system is a network of cells, tissues and organs that recognizes foreign pathogens (bacteria, microbes, virus and parasites). Several immune cells work together and activate B-cells to produce antibodies and invade foreign pathogen. The immune system mistakenly attacks the body's healthy cells or organ tissues by depositing self antibodies. This phenomenon is called autoimmunity and the antibodies are known as autoantibodies. Previous studies have indicated that excessive activity of B-cells lead to production of autoantibodies.

A previous genetic study has identified a gene that codes for a protein called B-cell scaffold protein with ankyrin repeats (*BANK1*) which is associated with SLE disease. Another gene, coding for B lymphoid tyrosine kinase (*BLK*) also has been associated with SLE disease. My project was to study the interaction between these two proteins by creating mutations altering the BANK1 and BLK proteins at different places. I created some mutations in BANK1 and the BLK and also in other kinase proteins. I cloned the mutated genes into a plasmid (a small DNA molecule) to express the proteins. These plasmids were introduced into human HEK 293 cells for protein expression. Later the protein expression and protein interaction was studied with western-blot experiment (a technique for detecting specific proteins separated by electrophoresis by use of labeled antibodies). The phosphorylation (addition of a phosphate to a protein) was also studied using the same method. One BLK mutant had phosphorylated all BANK1 mutants. This mutation was created at the position BLK Y501F.

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