UBA1 Gene

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Ubiquitin like modifier activating enzyme 1.

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1. Normal Function

The *UBA1* gene provides instructions for making the ubiquitin-activating enzyme E1. This enzyme is necessary for the ubiquitin-proteasome system, which targets damaged or unneeded proteins to be broken down (degraded) within cells. Protein degradation helps to maintain the proper balance of protein production and breakdown (protein homeostasis). Old proteins need to be removed to make way for new proteins to allow cells to function and survive. The ubiquitin-proteasome system acts as the cell's quality control system by disposing of damaged, misshapen, and excess proteins.

Ubiquitin-activating enzyme E1 is responsible for the first step in the ubiquitin-proteasome system; it turns on (activates) a small protein called ubiquitin. With the assistance of other proteins, the active ubiquitin attaches to a protein that is to be broken down. When a chain of ubiquitin proteins is attached to a protein, the protein is recognized and destroyed by a complex of enzymes called a proteasome.

2. Health Conditions Related to Genetic Changes

2.1. X-Linked Infantile Spinal Muscular Atrophy

At least four mutations in the *UBA1* gene have been found to cause X-linked infantile spinal muscular atrophy. This condition is characterized by severe muscle weakness that begins at birth or in early infancy and affects only boys. Weakness in the chest muscles that control breathing often causes death from respiratory failure in early childhood.

Each of the *UBA1* gene mutations that causes X-linked infantile spinal muscular atrophy changes one DNA building block (nucleotide) in an area of the gene known as exon 15. These mutations reduce the activity, function, or production of the enzyme. This shortage of functional enzyme allows damaged or unneeded proteins to build up inside cells instead of being degraded, which may damage cells and contribute to cell death. This buildup also disrupts protein homeostasis. If damaged or unneeded proteins are not degraded, they can impair normal cell functions by stopping the production of new proteins. An imbalance in protein production and breakdown can ultimately lead to cell death. Specialized nerve cells that control muscle movement (motor neurons) are particularly susceptible to disruptions in cell function, likely due to their large size. Loss of these cells causes many of the signs and symptoms of X-linked infantile spinal muscular atrophy.

3. Other Names for This Gene

- A1S9
- A1S9T
- A1ST
- AMCX1
- CFAP124
- GXP1
- MGC4781
- SMAX2

- UBA1, ubiquitin-activating enzyme E1 homolog A
- UBA1_HUMAN
- UBA1A
- UBE1
- UBE1X
- ubiquitin-activating enzyme E1
- ubiquitin-like modifier activating enzyme 1

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