MFN2 Gene

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mitofusin 2

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1. Introduction

The *MFN2* gene provides instructions for making a protein called mitofusin 2. This protein helps determine the shape and structure (morphology) of mitochondria, the energy-producing centers within cells. Mitofusin 2 is made in many types of cells and tissues, including muscles, the spinal cord, and the nerves that connect the brain and spinal cord to muscles and to sensory cells that detect sensations such as touch, pain, heat, and sound (peripheral nerves).

Within cells, mitofusin 2 is found in the outer membrane that surrounds mitochondria. Mitochondria are dynamic structures that undergo changes in morphology through processes called fission (splitting into smaller pieces) and fusion (combining pieces). These changes in morphology are necessary for mitochondria to function properly. Mitofusin 2 helps to regulate the morphology of mitochondria by controlling the fusion process.

2. Health Conditions Related to Genetic Changes

2.1. Charcot-Marie-Tooth disease

Researchers have identified more than 100 *MFN2* gene mutations that cause a form of Charcot-Marie-Tooth disease known as type 2A. Charcot-Marie-Tooth disease damages the peripheral nerves, which can result in loss of sensation and wasting (atrophy) of muscles in the feet, legs, and hands.

Almost all of the *MFN2* gene mutations that cause Charcot-Marie-Tooth disease change single protein building blocks (amino acids) in mitofusin 2. These changes alter a critical region in mitofusin 2, and the protein cannot function properly. A few mutations create a premature stop signal in the instructions for making mitofusin 2. As a result, no protein is produced, or an abnormally small protein is made.

Several *MFN2* gene mutations cause a variant of type 2A Charcot-Marie-Tooth disease that is characterized by particularly severe symptoms that begin before age 10 and include impaired vision. (This variant is also called hereditary motor and sensory neuropathy VI.) Vision loss is caused by the breakdown of the nerves that carry information from the eyes to the brain (optic atrophy).

It is unclear how *MFN2* gene mutations lead to the nerve problems characteristic of type 2A Charcot-Marie-Tooth disease. Researchers suggest that mitochondria cannot fuse properly or move normally within the cell without functional mitofusin 2, which may disrupt the cell's energy supply. Nerve cells may be particularly sensitive to an interrupted supply of energy.

3. Other Names for This Gene

- CMT2A2
- CPRP1
- KIAA0214
- MARF
- MFN2_HUMAN
- mitochondrial assembly regulatory factor

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