Actin, Alpha, Skeletal Muscle 1

Alternative Names
ACTA1
ASMA

Record Category
Gene locus

WHO-ICD
N.B.: Classification not applicable to gene loci.

Incidence per 100,000 Live Births
N/A to gene loci

OMIM Number
102610

Mode of Inheritance
N/A

Gene Map Locus
1q42.13

Description
The ACTA1 gene encodes a protein called skeletal alpha (α)-actin, which is the main component of thin filaments in skeletal muscle. It belongs to the actin family of proteins, which are highly conserved proteins that play an important role in cell motility, structure and integrity and are expressed in all eukaryotic cells. Alpha actin is one of the three isoforms of actin, and is a major constituent of the contractile apparatus, and is therefore, essential for movement as well as breathing. It plays a role in skeletal muscles, and is an essential component of the sarcomeres.

Defects in this protein have been associated with five congenital myopathies including actin-accumulation myopathy, cap myopathy, congenital fiber-type disproportion, intranuclear rod myopathy, and nemaline myopathy.

Molecular Genetics

The ACTA1 gene, located on 1q42.13, has six coding exons spanning approximately 3 kb. The encoded protein consists of 377 amino acids with a molecular weight of 42 kDa. Two of the N-terminal amino acids are cleaved from the protein to yield the mature protein.

ACTA1 mutations are known to result in defects in actin folding, actin polymerization, and muscle contraction. To date, different mutations in this gene have been reported in the literature causing five myopathies including: nine mutations in patients with actin-accumulation myopathy, one (Met47Val) mutation in patients with cap myopathy, seven mutations in patients with congenital fiber-type disproportion, thirteen mutations in patients with intranuclear rod myopathy, and 170 mutations in patients with nemaline myopathy. The vast majority of ACTA1 mutations lead to dominant disease, most of which are de novo mutations. Only about 10% of the mutations in this gene are recessive.

Epidemiology in the Arab World

Saudi Arabia
Seidahmed et al., (2016) reported two brothers born to second cousin Saudi parents who presented with severe congenital hypotonia. Two other brothers had died before the age of one year with severe hypotonia and respiratory failure. A heterozygous missense mutation (c.868G>A, p.Asp290Asn) in the ACTA1 gene was identified in both brothers. This mutation was not found in both parents, confirming gonadal mosaicism. The brothers died at the age of six and seven months, respectively, of cardiopulmonary arrest.

References
Seidahmed MZ, Salih MA, Abdelbasit OB, Alassiri AH, Hussein KA, Miqdad A, Samadi A, Rasheed AA, Alorainy IA, Shaheen R, Alkuraya FS. Gonadal mosaicism for ACTA1 gene masquerading as autosomal recessive nemaline myopathy. Am J Med Genet A. 2016; 170(8):2219-21. PMID: 27242277.

Related CTGA Records

Nemaline Myopathy 3

External Links

https://ghr.nlm.nih.gov/gene/ACTA1
http://www.genecards.org/cgi-bin/carddisp.pl?gene=ACTA1

Contributors

Pratibha Nair: 3.1.2017
Nada Assaf: 17.11.2016