Title: Mucolipidosis II *GeneReview* Table 2
Authors: Leroy JG, Cathey SS, Friez MJ
Updated: May 2012
Note: The following information is provided by the author(s) listed above and has not been reviewed by *GeneReviews* staff.

Table 2. *GNPTAB* Mutation Summary Table

Exon	Mutation	Alternate Name	Protein	Reference
1	c.10A>C	174A>C	p.K4Q	Kudo [2006]
1	c.44C>A		p.S15Y	Cathey [2010]
2	c.118-2A>G		Splicing	Bargal [2006]
2	c.121delG		F.S.	Encarnacão [2009]
2	c.136C>T		p.R46X	Cathey [2010]
2	c.163_164insT		F.S.	Zarghooni [2009]
2	c.168T>A		p.Y56X	Cathey [2010]
2	c.171delA		F.S.	Cathey [2010]
2	Duplication exon 2		F.S.	Otomo [2009]
3	c.232delGTT		p.V78del	Cathey [2010]
3	c.242G>T		p.W81L	Encarnacão [2009]
3	c.310C>T		p.Q104X	Paik [2005]
4	c.342delCA		F.S.	Cathey [2010]
5	c.440delC		F.S.	Encarnacão [2009]
5	c.445delG		F.S.	Zarghooni [2009]
5	c.517insA		F.S.	Cathey [2010]
5	c.545T>A + c.614A>C		p.V182D + p.Q205P	Zarghooni [2009]
5	c.569A>T	733A>T	p.D190V	Kudo [2006]
5	c.571+3A>C		F.S.	Cathey [2010]
5	Alu insert		F.S.	Tappino [2008]
6	c.616del CAGA	773_776del CAGA	F.S.	Kudo [2006]
6	c.625delAGGGG		F.S.	Cathey [2010]
7	c.637-1G>A		Splicing	Cathey [2010]
7	c.648delAGAA		F.S.	Cathey [2010]
7	c.749dupA		F.S.	Tappino [2009]
7	c.750+3A>C		Splicing	Zarghooni [2009]

Exon	Mutation	Alternate Name	Protein	Reference
7	c.755_759delCCTCT		F.S.	Tappino [2009]
7	c.771G>A		F.S. (Skipping of exon 7)	Steet [2005]
8	c.832C>T	996C>T	p.Q278X	Kudo [2006]
8	c.848delA	1012delA	F.S.	Kudo [2006]
8	c.857dupA		F.S.	Tappino [2009]
8	c.914_915insA		F.S.	Otomo [2009]
9	c.940C>T		p.Q314X	Tappino [2009]
9	c.1000C>T		p.R334X	Cathey [2010]
9	c.1001G>A		p.R334Q	Cathey [2010]
9	c.1001G>T		p.R334L	Otomo [2009]
9	c.1042A>C		p.I348L	Cathey [2010]
9	c.1090C>T		p.R364X	Cathey [2010]
10	c.1120T>C		p.F374L	Otomo [2009]
10	c.1123C>T		p.R375X	Cathey [2010]
10	c.1191_1194dupGCTG		F.S.	Tappino [2009]
10	c.1196C>T		p.S399F	Bargal [2006]
10	c.1206dupT		F.S.	Tappino [2009]
10	c.1208T>C		p.I403T	Tappino [2009]
10	c.1220A>C		p.D407A	Tiede [2005a]
11	c.1285-2A>G		Splicing	Cathey [2010]
11	c.1325G>A		p.C442Y	Tappino [2009]
11	c.1331dupG		F.S.	Tappino [2009]
11	c.1381T>G		p.C461G	Tappino [2009]
11	c.1385_1386insA		F.S.	Zarghooni [2009]
11	c.1399delG		F.S.	Cathey [2010]
11	c.1402T>A		p.C468S	Cathey [2010]
12	c.1514G>A		p.C505Y	Cathey [2010]
12	c.1519C>T		p.Q507X	Tappino [2009]
12	c.1580delC	1744delC	F.S.	Kudo [2006]
13	c.1625insC		F.S.	Tiede [2005b]
13	c.1738_1741 tripTATA	1902_1905 tripTATA	F.S.	Kudo [2006]
13	c.1759C>T		p.R587X	Cathey [2010]
13	c.1895C>G		p.A663G	Tiede [2005a]
13	c.1959_1962delTAGT		F.S.	Tappino [2009]

Exon	Mutation	Alternate Name	Protein	Reference
13	c.1965delC		F.S.	Tappino [2009]
13	c.1999G>T		p.E66X	Encarnacão [2009]
13	c.1999insT		F.S.	Cathey [2010]
13	c.2051_2055delACTCA	2215_2219delACTCA	F.S.	Kudo [2006]
13	c.2089_2090insC		F.S.	Otomo [2009]
13	c.2188T>AAA	2352T>AAA	F.S.	Kudo [2006]
13	c.2189delT		F.S.	Cathey [2010]
13	c.2196G>T		p.K732N	Zarghooni [2009]
13	c.2220_2221dupGA		F.S.	Tappino [2009]
13	c.2249_2250insA		F.S.	Encarnacão [2009]
13	c.2275delAA		F.S.	Cathey [2010]
13	c.2422delC		F.S.	Ma [2011]
13	c.2427delC		F.S.	Cathey [2010]
13	c.2533C>T		p.Q845X	Tiede [2005b]
13	c.2544delA		F.S.	Otomo [2009]
13	c.2550_2554delGAAAA		F.S.	Tappino [2009]
13	c.2574_2575delGA		F.S.	Paik [2005]
13	c.2591insG		F.S.	Cathey [2010]
13	c.2659dupA		F.S.	Tappino [2008]
13	c.2664C>G		p.Y888X	Cathey [2010]
13	c.2681G>A		p.W894X	Paik [2005]
13	c.2693insA		F.S.	Cathey [2010]
13	c.2693delA		F.S.	Otomo [2009]
13	c.2715+1G>A		Splicing	Paik [2005]
13	c.2715+2T>G		Splicing	Cathey [2010]
14	c.2777A>C		p.Q926P	Tappino [2009]
14	c.2783A>G + c.2864C>T		p.K928 + p.A955V	Zarghooni [2009]
14	c.2866C>T		p.H956Y	Otomo [2009]
14	c.2867A>G		p.H956R	Cathey [2010]
15	c.2916insT		F.S.	Bargal [2006]
15	c.3002T>C		p.L1001P	Tappino [2009]
15	c.3053A>G		p.D1018G	Cathey [2010]
15	c.3061C>T		p.Q1021X	Cathey [2010]

Exon	Mutation	Alternate Name	Protein	Reference
15	c.3091C>T		p.R1031X	Cathey [2010]
16	c.3145insC		F.S.	Tiede [2005b]
16	c.3160T>G		p.L1054V	Zarghooni [2009]
16	c.3173C>G		p.S1058X	Paik [2005]
16	c.3231_3234dupCTAC	3395_3398dupCTAC	F.S.	Kudo [2006]
16	c.3232delT		F.S.	Cathey [2010]
16	c.3249+1G>A		Splicing	Bargal [2006]
16	c.3249+1G>C		Splicing	Cathey [2010]
17	c.3252delA		F.S.	Tiede [2005b]
17	c.3310delG		F.S.	Otomo [2009]
17	c.3327insA		F.S.	Cathey [2010]
17	c.3335+1G>A		Splicing	Tiede [2005b]
17	c.3335+6T>G	Kudo IVS17+6T>G	Splicing	Kudo [2006]
18	c.3336-1G>C		Splicing	Cathey [2010]
18	c.3388_3389insC+c.3392C>T		Splicing	Otomo [2009]
18	c.3410T>A		p.L1137X	Cathey [2010]
18	c.3428_3429insA		F.S.	Otomo [2009]
18	c.3434+1G>A		Splicing	Bargal [2006]
19	c.3435-1G>A	IVS19-1G>A	Splicing	Kudo [2006]
19	c.3443_3446delTTTG		F.S.	Tappino [2009]
19	c.3458A>G		p.N1153S	Otomo [2009]
19	c.3474_3437delTA		F.S.	Paik [2005]
19	c.3487_3490delACAG		F.S.	Tappino [2009]
19	c.3503_3504delTC	3665_3666delTC	F.S.	Kudo [2006]
19	c.3523_3529delATGTTCC		F.S.	Tappino [2009]
19	c.3565C>T		p.R1189X	Paik [2005]
19	c.3566insA		F.S.	Tiede [2005b]
20	c.3613C>T		p.1205X	Tiede [2005b]
21	c.3741_3744delAGAA		F.S.	Otomo [2009]

1. The alternate name column has been added to clarify the nomenclature of Kudo et al [2006]. The reference nucleotide sequence used by Kudo et al [2006] is GenBank AY687932 where the first nucleotide of the cDNA sequence is numbered 1. There are 164 nucleotides of untranslated sequence included in this numbering system. The mutation designations in the first column are numbered with the first nucleotide at the A of the ATG start codon.

References

Bargal R, Zeigler M, Abu-Libdeh B, Zuri V, Mandel H, Ben Neriah Z, Stewart F, Elcioglu N, Hindi T, Le Merrer M, Bach G, Raas-Rothschild A. When Mucolipidosis III meets Mucolipidosis II: GNPTA gene mutations in 24 patients. Mol Genet Metab. 2006;88:359-63.

Cathey SS, Leroy JG, Wood T, Eaves K, Simensen RJ, Kudo M, Stevenson RE, Friez MJ. Phenotype and genotype in mucolipidoses II and III alpha/beta: a study of 61 probands. *J Med Genet*. 2010;47:38-48.

Encarnação M, Lacerda L, Costa R, Prata MJ, Coutinho MF, Ribeiro H, Lopes L, Pineda M, Ignatius J, Galvez H, Mustonen A, Vieira P, Lima MR, Alves S. Molecular analysis of the GNPTAB and GNPTG genes in 13 patients with mucolipidosis type II or type III - identification of eight novel mutations. *Clin Genet.* 2009;76:76-84.

Kudo M, Brem MS, Canfield WM. Mucolipidosis II (I-cell disease) and mucolipidosis IIIA (classical pseudo-hurler polydystrophy) are caused by mutations in the GlcNAc-phosphotransferase alpha / beta - subunits precursor gene. *Am J Hum Genet*. 2006;78:451-63.

Ma GC, Ke YY, Chang SP, Lee DJ, Chen M. A compound heterozygous GNPTAB mutation causes mucolipidosis II with marked hair color change in a Han Chinese baby. *Am J Med Genet A*. 2011;155A:931-4.

Otomo T, Muramatsu T, Yorifuji T, Okuyama T, Nakabayashi H, Fukao T, Ohura T, Yoshino M, Tanaka A, Okamoto N, Inui K, Ozono K, Sakai N. Mucolipidosis II and III alpha/beta: mutation analysis of 40 Japanese patients showed genotype-phenotype correlation. *J Hum Genet*. 2009;54:145-51.

Paik KH, Song SM, Ki CS, Yu HW, Kim JS, Min KH, Chang SH, Yoo EJ, Lee IJ, Kwan EK, Han SJ, Jin DK. Identification of mutations in the GNPTA (MGC4170) gene coding for GlcNAc-phosphotransferase alpha/beta subunits in Korean patients with mucolipidosis type II or type IIIA. *Hum Mutat*. 2005;26:308-14.

Plante M, Claveau S, Lepage P, Lavoie EM, Brunet S, Roquis D, Morin C, Vézina H, Laprise C. Mucolipidosis II: a single causal mutation in the N-acetylglucosamine-1-phosphotransferase gene (GNPTAB) in a French Canadian founder population. *Clin Genet.* 2008;73:236-44.

Steet RA, Hullin R, Kudo M, Martinelli M, Bosshard NU, Schaffner T, Kornfeld S, Steinmann B. A splicing mutation in the alpha/beta GlcNAc-1-phosphotransferase gene results in an adult onset form of mucolipidosis III associated with sensory neuropathy and cardiomyopathy. *Am J Med Genet A*. 2005;132:369-75.

Tappino B, Chuzhanova NA, Regis S, Dardis A, Corsolini F, Stroppiano M, Tonoli E, Beccari T, Rosano C, Mucha J, Blanco M, Szlago M, Di Rocco M, Cooper DN, Filocamo M. Molecular characterization of 22 novel UDP-N-acetylglucosamine-1-phosphate transferase alpha- and beta-subunit (GNPTAB) gene mutations causing mucolipidosis types II alpha/beta and III alpha/beta in 46 patients. *Hum Mutat*. 2009;30:E956-73.

Tappino B, Regis S, Corsolini F, Filocamo M. An Alu insertion in compound heterozygosity with a microduplication in GNPTAB gene underlies Mucolipidosis II. *Mol Genet Metab*. 2008;93:129-33.

Tiede S, Muschol N, Reutter G, Cantz M, Ullrich K, Braulke T. Missense mutations in N-acetylglucosamine-1-phosphotransferase alpha/beta subunit gene in a patient with mucolipidosis III and a mild clinical phenotype. *Am J Med Genet A*. 2005a;137A:235-40.

Tiede S, Storch S, Lübke T, Henrissat B, Bargal R, Raas-Rothschild A, Braulke T. Mucolipidosis II is caused by mutations in GNPTA encoding the alpha/beta GlcNAc-1-phosphotransferase. *Nat Med*. 2005b;11:1109-12.

Zarghooni M, Dittakavi SS. Molecular analysis of cell lines from patients with mucolipidosis II and mucolipidosis III. *Am J Med Genet* A. 2009;149A:2753-61.