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Changes in consensus arylamine N-acetyltransferase (NAT) gene nomenclature

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Abstract

Changes in consensus arylamine N-acetyltransferase (NAT) gene nomenclature determined at the 2007 international NAT workshop include: 1) Alleles in all species except mouse and rat are all uppercase. For mouse and rat, the first letter is upper case followed by lower case. 2) The nomenclature system is now species-specific. Thus, *NAT2*1* (chicken), *NAT2*2* & *NAT2*3* (rabbit), *Nat2*8* *Nat2*9*, *Nat2*22* & *Nat2*23* (mouse), *NAT2*15*, *NAT2*16A* & *NAT2*16B* (Syrian hamster), and *NAT2*20*, *NAT2*21A* & *NAT2*21B* (rat) are retired and renumbered within a species. A species modifier incorporated into the allele designation is written in upper case Roman font, e.g., (MOUSE) *Nat1*1* is now the reference *Nat1* allele in mouse; and 3) The NAT website also can now be accessed at a webalias address: <http://N-acetyltransferasenomenclature.louisville.edu>. New NAT alleles should continue to be submitted to the NAT nomenclature committee for inclusion on the website to ensure proper categorization and to continue consistency in nomenclature.

Keywords

arylamine; N-acetyltransferases; gene/allele nomenclature

Consensus gene nomenclature is necessary to report and interpret the results of human epidemiological studies, as well as to perform meta analyses and/or compare the results of different studies. Towards that end, consensus nomenclature for arylamine N-acetyltransferase 1 (*NAT1*) and 2 (*NAT2*) alleles was published in 1995 [1]. Subsequently, many additional *NAT1* and *NAT2* alleles have been identified in humans and in other species. In the rat and mouse, a third arylamine N-acetyltransferase gene (*NAT3*) has been discovered and various *NAT3* alleles also have been identified.

Sessions on arylamine N-acetyltransferase gene nomenclature have been held at each of the four International Arylamine N-acetyltransferase Workshops held in Kuranda, Australia (1998), Oxford, UK (2001), Vancouver, Canada (2004) and Alexandroupolis, Greece (2007). An arylamine N-acetyltransferase gene nomenclature committee, established at the first workshop in 1998 and reviewed at subsequent workshops, assesses what changes need to be made in the nomenclature and serves as a clearing house for naming new arylamine N-

acetyltransferase alleles. Scientific correspondence reporting establishment of the international nomenclature committee, updates to the arylamine N-acetyltransferase gene nomenclature, and the initiation of a consensus arylamine N-acetyltransferase gene nomenclature website (<http://www.louisville.edu/medschool/pharmacology/NAT.html>) was published in 2000 [2].

Since 2000, the arylamine N-acetyltransferase gene nomenclature committee (now expanded and consisting of the authors of this report) continues to maintain the website and update the nomenclature listings as new genes and alleles are identified. The committee considers the most “functionally significant” single nucleotide polymorphism when assigning human *NAT2* alleles. Thus, human *NAT2* alleles containing 341T>C (I114T) are assigned to the *NAT2**5 cluster, alleles containing 590G>A (R197Q) are assigned to the *NAT2**6 cluster, and so on. This is consistent with the original consensus *NAT2* nomenclature [1] and with general recommendations for human gene nomenclature.

At the most recent arylamine N-acetyltransferase workshop held September 2007 in Alexandroupolis, several decisions were made that have now been implemented by the nomenclature committee and reflected at the arylamine N-acetyltransferase gene nomenclature website. These changes are as follows:

- Functional information has been added for the human *NAT1* and *NAT2* alleles. There is consensus regarding the functional effects of most alleles. Those in which consensus is still not achieved (particularly *NAT1**10) are noted.
- Arylamine N-acetyltransferase alleles in all species except mouse and rat are all uppercase. Mouse and rat are the two exceptions with first letter upper case followed by lower case (case was previously optional). Genes and alleles are italicized. Protein products are not italicized.
- The nomenclature system is now species-specific (we no longer mix species into a common nomenclature). Thus, *NAT2**1 (chicken), *NAT2**2 (rabbit), *NAT2**3 (rabbit), *Nat2**8 (mouse), *Nat2**9 (mouse), *NAT2**15 (Syrian hamster), *NAT2**16A (Syrian hamster), *NAT2**16B (Syrian hamster), *NAT2**20 (rat), *NAT2**21A (rat), *NAT2**21B (rat), *Nat2**22 (mouse) and *Nat2**23 (mouse) all are officially retired and have been renumbered within a species. A species modifier incorporates the official identifier found in the HGNC gene nomenclature guidelines (<http://www.genenames.org/guidelines.html>), which can be found in the SWISS-PROT database (<http://www.expasy.ch/cgi-bin/speclist>). This species modifier is incorporated into the allele designation and is written in upper case Roman font, e.g., (MOUSE)*Nat1**1 is now the reference *Nat1* allele in mouse. (RAT)*Nat1**1 is now the reference *Nat1* allele in rat.
- The existing arylamine N-acetyltransferase website now provides only human and selected non-human mammalian species (i.e., mouse, rat, Syrian hamster, rabbit, Rhesus monkey). The website also can now be accessed at a webalias address: <http://N-acetyltransferasenomenclature.louisville.edu>. The prokaryotic arylamine N-acetyltransferase nomenclature system announced in the last update [2] and previously maintained at the website is now discontinued.
- A second website to be linked to the existing one is being constructed and will be accessible in 2008. This will include arylamine N-acetyltransferase nomenclature for all species other than humans.
- Random SNP (rs) identifier numbers have been added for human single nucleotide polymorphisms, where available.

- SNPs identified outside the open reading frame will not be assigned an allele name until a functional effect is observed. SNPs should be identified in manuscripts by designating “A” of the ATG translation initiation codon as number 1. SNPs upstream of this site are designated with negative numbers and SNPs downstream of this site are designated with positive numbers.
- As new *NAT* alleles are identified, they should continue to be submitted to the *NAT* nomenclature committee for inclusion on the website to ensure proper categorization and naming and to continue the consistency in nomenclature. Additional input on arylamine *N*-acetyltransferase nomenclature is always welcome. Committee contact information is provided at the website.

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