

# Genetic polymorphisms in AS3MT and arsenic metabolism in residents of the Red River Delta, Vietnam

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**Abstract:** To elucidate the role of genetic factors in arsenic (As) metabolism, we studied associations of single nucleotide polymorphisms (SNPs) in As (+ 3 oxidation state) methyltransferase (AS3MT) with the As concentrations in hair and urine, and urinary As profile in residents in the Red River Delta, Vietnam. Concentrations of total As in groundwater were 0.7-502 µg/l. Total As levels in groundwater drastically decreased by using sand filter, indicating that the filter could be effective to remove As from raw groundwater. Concentrations of inorganic As (IAs) in urine and total As in hair of males were higher than those of females. A significant positive correlation between monomethylarsonic acid (MMA)/IAs and age in females indicates that older females have higher methylation capacity from IAs to MMA. Body mass index negatively correlated with urinary As concentrations in males. Homozygote for SNPs 4602AA, 35991GG, and 37853GG, which showed strong linkage disequilibrium (LD), had higher percentage (%) of dimethylarsinic acid (DMA) in urine. SNPs 4740 and 12590 had strong LD and associated with urinary %DMA. Although SNPs 6144, 12390, 14215, and 35587 comprised LD cluster, homozygotes in SNPs 12390GG and 35587CC had lower DMA/MMA in urine, suggesting low methylation capacity from MMA to DMA in homo types for these SNPs. SNPs 5913 and 8973 correlated with %MMA and %DMA, respectively. Heterozygote for SNP 14458TC had higher MMA/IAs in urine than TT homozygote, indicating that the heterozygote may have stronger methylation ability of IAs. To our knowledge, this is the first study on the association of genetic factors with As metabolism in Vietnamese. © 2009 Elsevier Inc. All rights reserved.

**Author Keywords:** Arsenic; AS3MT; Groundwater; Human hair; Human urine; Polymorphism; Sand-filtered water; SNP; Vietnam

**Index Keywords:** arsenic; cacodylic acid; drinking water; ground water; methanearsonic acid; methyltransferase; adolescent; adult; aged; arsenic metabolism; article; child; controlled study; female; filtration; gene linkage disequilibrium; hair analysis; homozygosity; human; male; metal metabolism; methylation; nucleotide sequence; school child; single nucleotide polymorphism; urinalysis; Viet Nam; water analysis

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Chemicals/CAS: arsenic, 7440-38-2; cacodylic acid, 124-65-2, 75-60-5; methanearsonic acid, 124-58-3; methyltransferase, 9033-25-4

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