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Q1 **Methylated and thiolated arsenic species for** 2 **environmental and health research — A review** 3 **on synthesis and characterization**☆

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A B S T R A C T

Hundreds of millions of people around the world are exposed to elevated concentrations 20
of inorganic and organic arsenic compounds, increasing the risk of a wide range 21
of health effects. Studies of the environmental fate and human health effects of 22
arsenic require authentic arsenic compounds. We summarize here the synthesis and 23
characterization of more than a dozen methylated and thiolated arsenic compounds that 24
are not commercially available. We discuss the methods of synthesis for the following 25
14 trivalent (III) and pentavalent (V) arsenic compounds: monomethylarsonous acid 26
(MMA^{III}), dicysteinylmethylthioarsenite (MMA^{III}(Cys)), monomethylarsonic acid (MMA^V), 27
monomethylmonothioarsonic acid (MMMTA^V) or monothio-MMA^V, monomethylthioarsonic 28
acid (MMDTA^V) or dithio-MMA^V, monomethyltrithioarsonate (MMTTA^V) or trithio-MMA^V, 29
dimethylarsinous acid (DMA^{III}), dimethylarsino-glutathione (DMA^{III}(SG)), dimethylarsinic acid 30 Q3
(DMA^V), dimethylmonothioarsinic acid (DMMTA^V) or monothio-DMA^V, dimethyldithioarsinic 31
acid (DMDTA^V) or dithio-DMA^V, trimethylarsine oxide (TMAO^V), arsenobetaine (AsB), and an 32
arsenicin-A model compound. We have reviewed and compared the available methods, 33
synthesized the arsenic compounds in our laboratories, and provided characterization 34
information. On the basis of reaction yield, ease of synthesis and purification of product, safety 35
considerations, and our experience, we recommend a method for the synthesis of each of these 36
arsenic compounds. 37

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