

Supplementary Information for:

Investigation of Arsenic Speciation on Drinking Water Treatment Media utilizing Automated Sequential Continuous Flow Extraction with IC-ICP-MS Detection

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Figure SI-1: Stability of As in the 10mM NaH₂PO₄ Extraction Fluid for Media 1^a

Figure SI-1A: Stability of As(III)

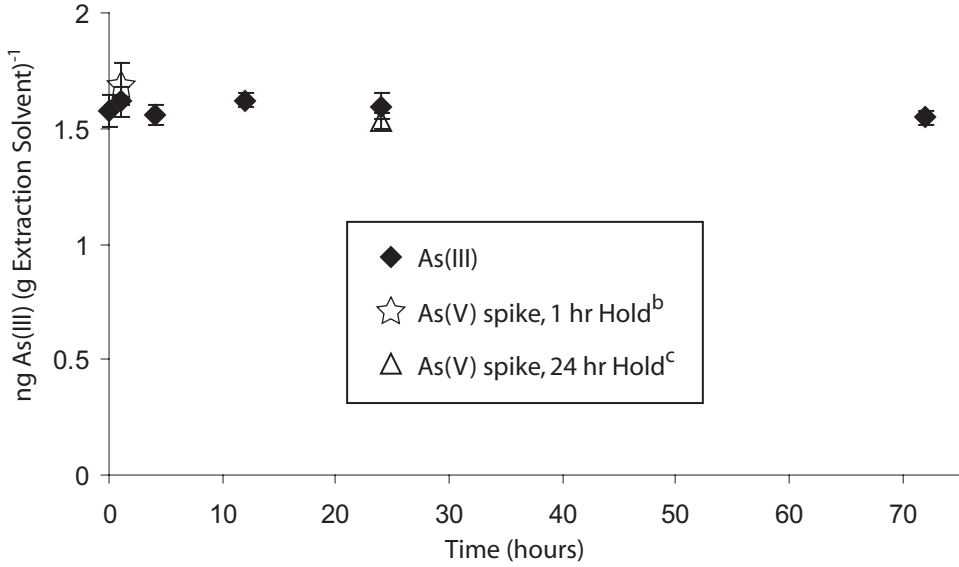
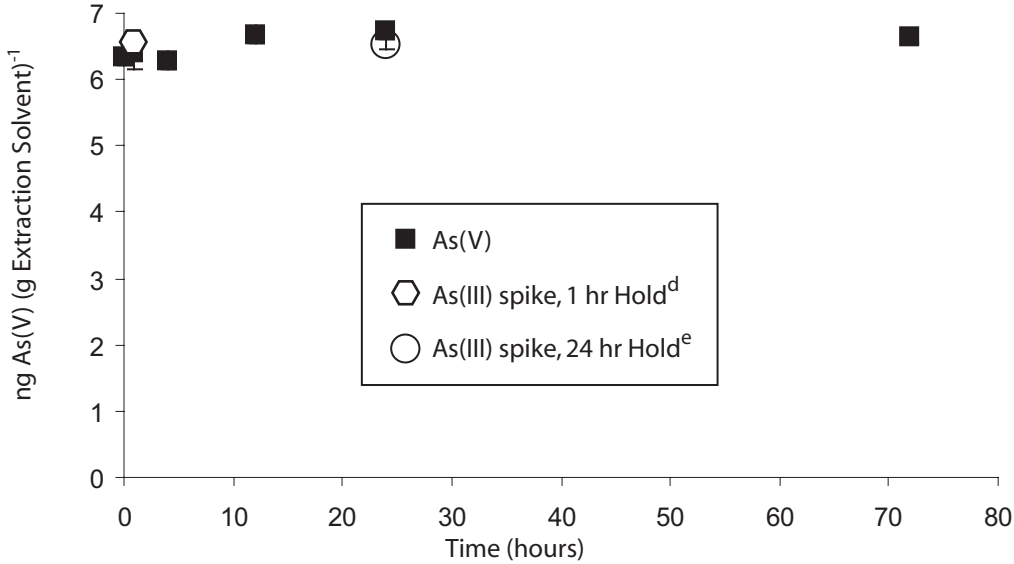


Figure SI-1B: Stability of As(V)



- a. The error bars are 2 σ based on n = 5. Error bars are not shown if the dimension of the symbol exceeds the error.
- b. As(III) concentration is determined after fortifying with pure As(V) and holding the sample for 1hr.
- c. As(III) concentration is determined after fortifying with pure As(V) and holding the sample for 24hr.
- d. As(V) concentration is determined after fortifying with pure As(III) and holding the sample for 1hr.
- e. As(V) concentration is determined after fortifying with pure As(III) and holding the sample for 24hr.

Estimating the Inter-Conversion of As(III) and As(V) in 10mM NaH₂PO₄ at pH 7 for Media 1

Figure SI-1A is a plot of the As(III) concentrations vs. time for the control and fortified samples. Figure SI-1B contains the corresponding As(V) data. The control (◆, Fig SI-1A; ■, Fig SI-1B) was analyzed 6 times at t = 0, 1, 4, 12, 24 and 72hrs. The analysis of the control indicates that the As(III) and As(V) concentrations were stable over the 72hr period.

In Figure SI-1A, the extraction fluid was fortified with As(V) and held for 1hr and 24hrs in order to estimate how much of the As(V) spike would convert to As(III) in time. The analysis of the 1hr and 24hr samples (☆ and △, Fig SI-1A) indicated that very little, if any, of the As(V) converted to As(III).

The As(III) fortified samples were used to evaluate the potential for oxidation in the extraction fluid. Figure SI-1B contains the results for the As(III) fortified samples. The 1hr and 24 hr samples (Fig SI-1B, ⬡ and ○) are consistent with Figure SI-1A. This indicates that very little, if any, of the fortified As(III) converted to As(V).

Figure SI-2: Stability of As in the 10mM MgCl₂ Extraction Fluid for Media 2^a

Figure SI-2A: Stability of As(III)

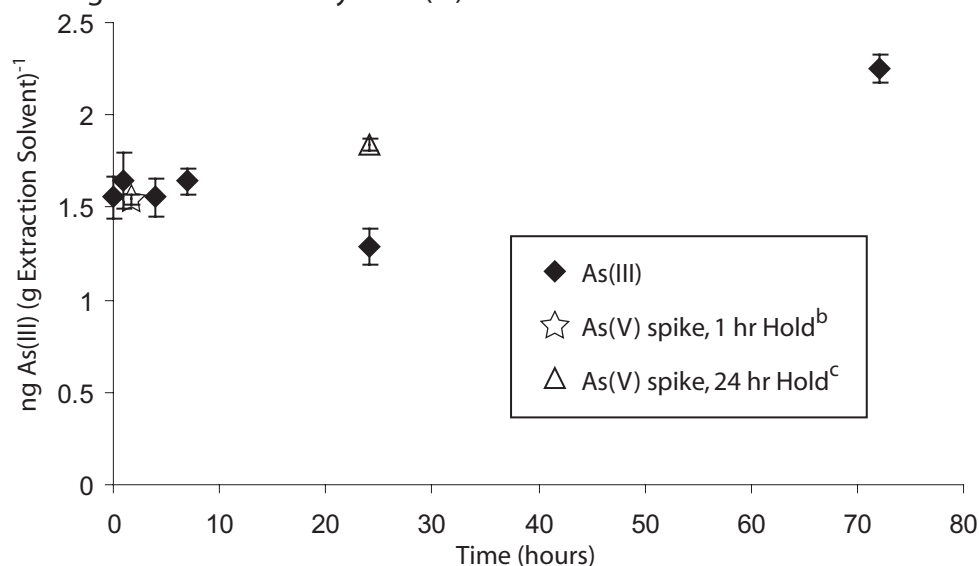
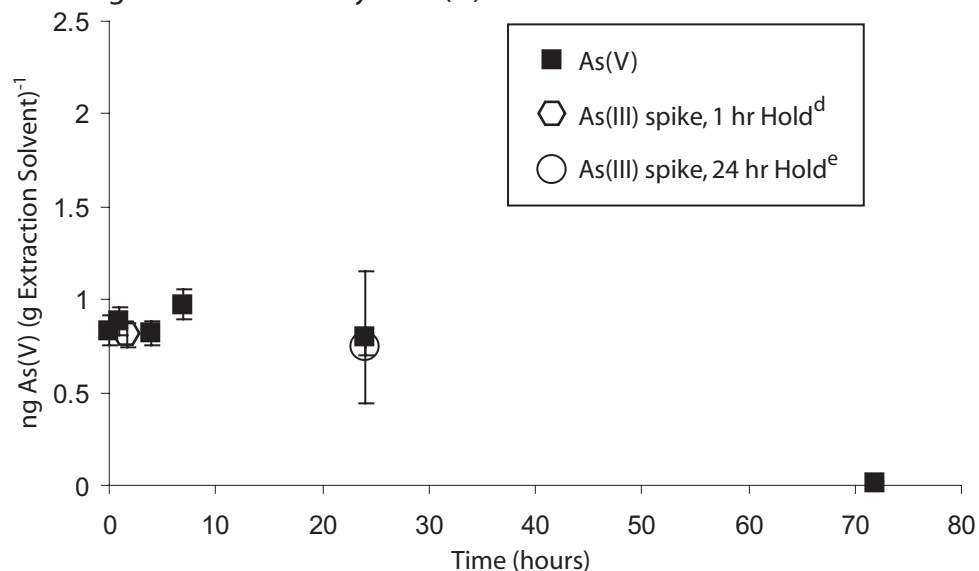


Figure SI-2B: Stability of As(V)



a. The error bars are 2 σ based on $n = 5$. Error bars are not shown if the dimension of the symbol exceeds the error.

b. As(III) concentration is determined after fortifying with pure As(V) and holding the sample for 1hr.

c. As(III) concentration is determined after fortifying with pure As(V) and holding the sample for 24hr.

d. As(V) concentration is determined after fortifying with pure As(III) and holding the sample for 1hr.

e. As(V) concentration is determined after fortifying with pure As(III) and holding the sample for 24hr.

Estimating the Inter-Conversion of As(III) and As(V) in 10mM MgCl₂ at pH 8 for Media 2

Figure SI-2A is a plot of the As(III) concentrations vs. time for the control and fortified samples. Figure SI-2B contains the corresponding As(V) data. The control (◆, Fig SI-2A; ■ Fig SI-2B) was analyzed 6 times at $t = 0, 1, 4, 7, 24$ and 72hrs. The analysis of the control indicates a 0.7ppb increase in the As(III) concentration over the 72hr period. This increase is small, but it coincides with a drop in the As(V) (■) concentration in Figure SI-2B. The control indicates that the As(V) extracted from the media is slowly ($t > 7$ hr) converting to As(III) in the 10mM MgCl₂ used to extract the media.

The extraction fluid was fortified with As(V) and held for 1hr and 24hrs in order to estimate how much of the As(V) spike would convert to As(III) in time. The analysis of the one hour sample (☆, Fig. SI-2A) indicated that very little, if any, of the As(V) converted to As(III); however, some of the As(V) converted to As(III) after 24 hours (△, Fig. SI-2A).

The As(III) fortified samples were used to evaluate the potential for oxidation in the extraction fluid. Figure SI-2B contains the results for the As(III) fortified samples. These samples were prepared to see if oxidation was observed in the extraction fluid. Given the results in Figure SI-2A, the fortified As(III) should not convert to As(V) and the native or extracted As(V) should slowly convert to As(III). The 1hr sample (Fig SI-2B, ⬡) and the 24hr sample (Fig SI-2B, ○) are consistent with Figure SI-2A. These both indicate that very little, if any, of the fortified As(III) converted to As(V).

Figure SI-3: Stability of As in the 10mM NaH₂PO₄ Extraction Fluid for Media 2^a

Figure SI-3A: Stability of As(III)

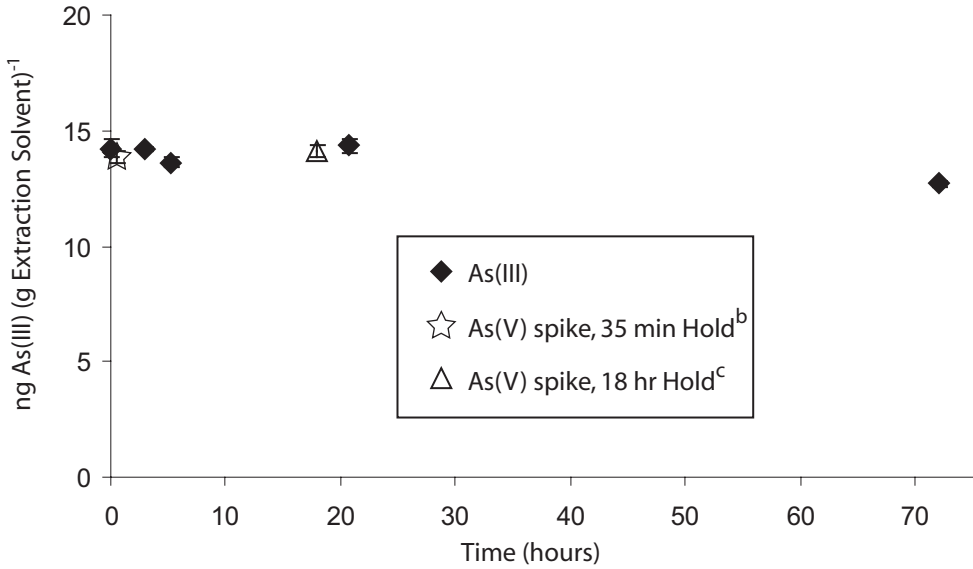
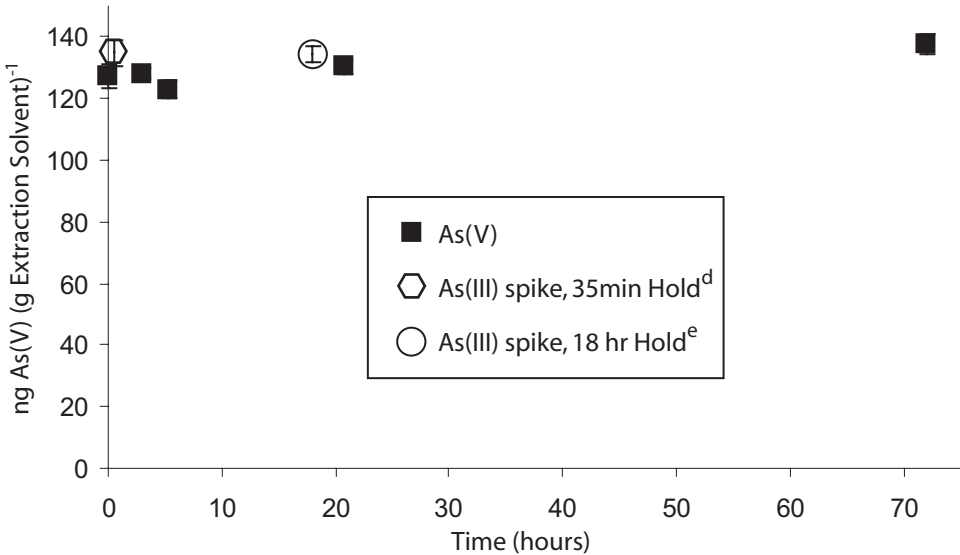


Figure SI-3B: Stability of As(V)



- a. The error bars are 2 σ based on n = 5. Error bars are not shown if the dimension of the symbol exceeds the error.
- b. As(III) concentration is determined after fortifying with pure As(V) and holding the sample for 35 min.
- c. As(III) concentration is determined after fortifying with pure As(V) and holding the sample for 18hr.
- d. As(V) concentration is determined after fortifying with pure As(III) and holding the sample for 35 min.
- e. As(V) concentration is determined after fortifying with pure As(III) and holding the sample for 18hr.

Estimating the Inter-Conversion of As(III) and As(V) in 10mM NaH₂PO₄ at pH 7 for Media 2

Figure SI-3A is a plot of the As(III) concentrations vs. time for the control and fortified samples. Figure SI-3B contains the corresponding As(V) data. The control (\blacklozenge , Fig SI-3A; \blacksquare , Fig SI-3B) was analyzed 5 times at t = 0, 2, 5, 20 and 72hrs. The analysis of the control indicates that the As(III) and As(V) concentrations were stable over the 72hr period.

The extraction fluid was fortified with As(V) and held for 35 min and 18hrs in order to estimate how much of the As(V) spike would convert to As(III) in time. The analysis of the 35 min and 18 hr samples (\star and \triangle , Fig. SI-3A) indicated that very little, if any, of the As(V) converted to As(III).

The As(III) fortified samples were used to evaluate the potential for oxidation in the extraction fluid. Figure SI-3B contains the results for the As(III) fortified samples. The 35 min and 18 hr samples (Fig SI-3B, \hexagon and \circ) are consistent with Figure SI-3A. This indicates that very little, if any, of the fortified As(III) converted to As(V).

Figure SI-4: Stability of As in the 10mM MgCl₂ Extraction Fluid for Media 3^a

Figure SI-4A: Stability of As(III)

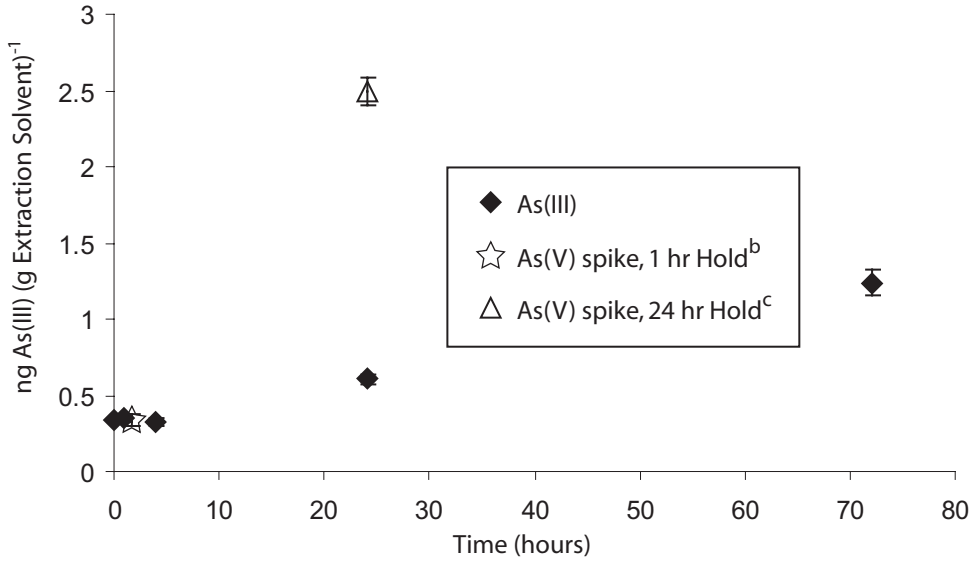
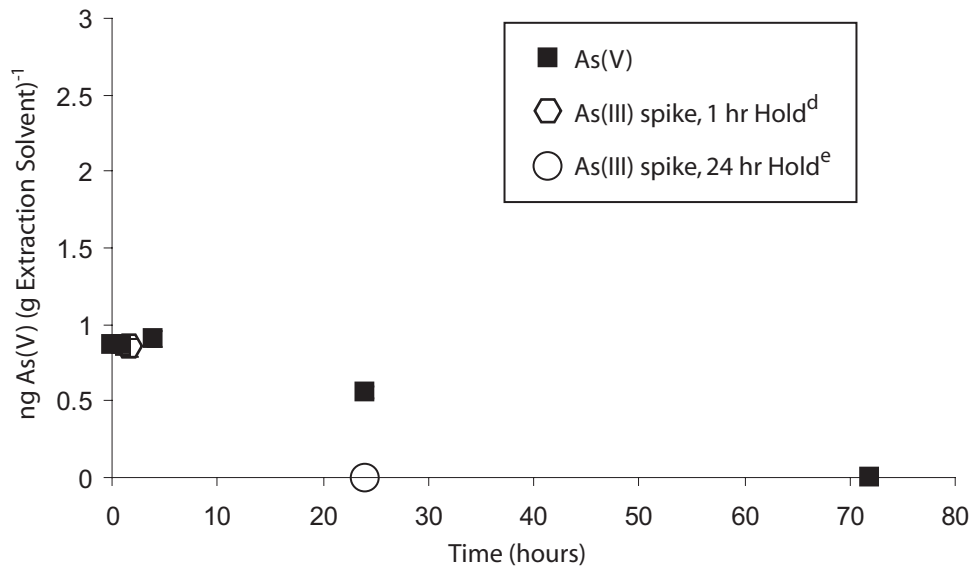


Figure SI-4B: Stability of As(V)



- a. The error bars are 2 σ based on n = 5. Error bars are not shown if the dimension of the symbol exceeds the error.
- b. As(III) concentration is determined after fortifying with pure As(V) and holding the sample for 1hr.
- c. As(III) concentration is determined after fortifying with pure As(V) and holding the sample for 24hr.
- d. As(V) concentration is determined after fortifying with pure As(III) and holding the sample for 1hr.
- e. As(V) concentration is determined after fortifying with pure As(III) and holding the sample for 24hr.

Estimating the Inter-Conversion of As(III) and As(V) in 10mM MgCl₂ at pH 8 for Media 3

Figure SI-4A is a plot of the As(III) concentrations vs. time for the control and fortified samples. Figure SI-4B contains the corresponding As(V) data. The control (◆, Fig SI-4A; ■, Fig SI-4B) was analyzed 5 times at t = 0, 1, 4, 24 and 72hrs. The analysis of the control indicates a 0.9ppb increase in the As(III) concentration over the 72hr period. This increase is small, but it coincides with a drop in the As(V) (■) concentration in Figure SI-4B. The control indicates that the As(V) extracted from the media is slowly (t > 4hr) converting to As(III) in the 10mM MgCl₂ used to extract the media.

The extraction fluid was fortified with As(V) and held for 1hr and 24hrs in order to estimate how much of the As(V) spike would convert to As(III) in time. The analysis of the one hour sample (☆, Fig.SI-4A) indicated that very little, if any, of the As(V) converted to As(III); however, the As(V) converted to As(III) after 24 hours (△, Fig.SI-4A).

The As(III) fortified samples were used to evaluate the potential for oxidation in the extraction fluid. Figure SI-4B contains the results for the As(III) fortified samples. Given the results in Figure SI-4A, the fortified As(III) should not convert to As(V) and the native or extracted As(V) should slowly convert to As(III). The 1hr sample (Fig SI-4B, ◻) is consistent with Figure SI-4A and indicates that very little, if any, of the fortified As(III) had been converted to As(V). The 24hr samples (○) shows that some of the native As(V) has been reduced to As(III) and for this reason, the 24hr sample contains less As(V).

Figure SI-5: Stability of As in the 10mM NaH₂PO₄ Extraction Fluid for Media 3^a

Figure SI-5A: Stability of As(III)

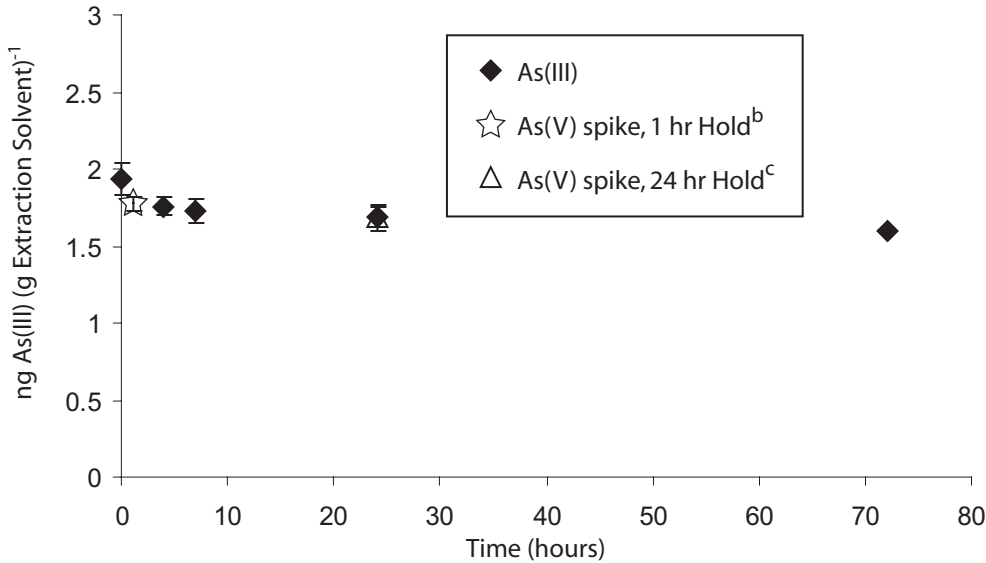
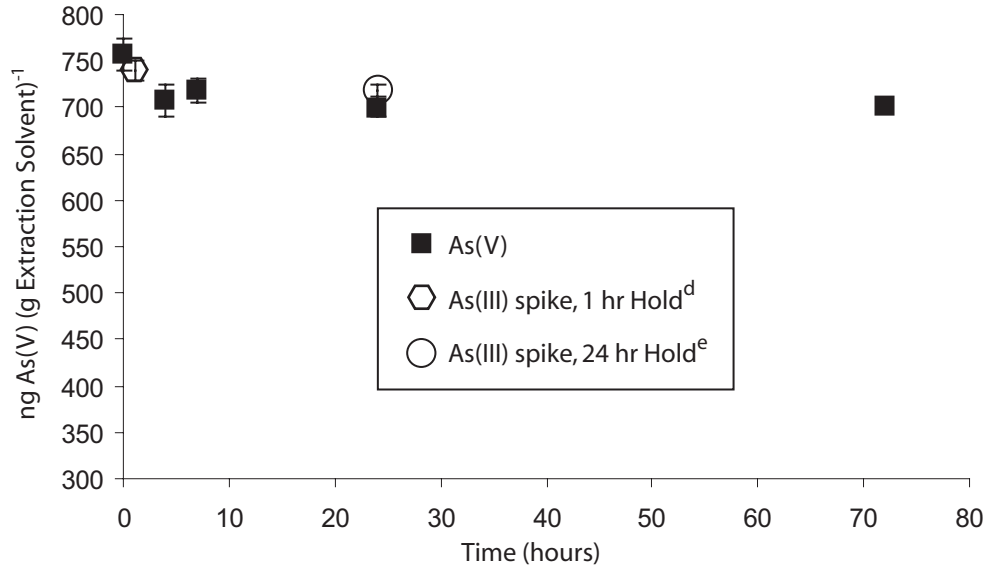


Figure SI-5B: Stability of As(V)



- a. The error bars are 2 σ based on n = 5. Error bars are not shown if the dimension of the symbol exceeds the error.
- b. As(III) concentration is determined after fortifying with pure As(V) and holding the sample for 1 hr.
- c. As(III) concentration is determined after fortifying with pure As(V) and holding the sample for 24 hr.
- d. As(V) concentration is determined after fortifying with pure As(III) and holding the sample for 1 hr.
- e. As(V) concentration is determined after fortifying with pure As(III) and holding the sample for 24 hr.

Estimating the Inter-Conversion of As(III) and As(V) in 10mM NaH₂PO₄ at pH 7 for Media 3

Figure SI-5A is a plot of the As(III) concentrations vs. time for the control and fortified samples. Figure SI-5B contains the corresponding As(V) data. The control (\blacklozenge , Fig SI-5A; \blacksquare , Fig SI-5B) was analyzed 5 times at t = 0, 4, 7, 24 and 72 hrs. The analysis of the control indicates that the As(III) and As(V) concentrations were stable over the 72 hr period. The initial data point at t = 0 was slightly higher; however, this falls within the error of this technique.

The extraction fluid was fortified with As(V) and held for 1 hr and 24 hrs in order to estimate how much of the As(V) spike would convert to As(III) in time. The analysis of the 1 hr and 24 hr samples (\star and \triangle , Fig. SI-5A) indicated that the As(V) was very stable in this extraction solvent and no conversion to As(III) was noted.

The As(III) fortified samples were used to evaluate the potential for oxidation in the extraction fluid. Figure SI-5B contains the results for the As(III) fortified samples. The 1 hr and 24 hr samples (Fig SI-5B, \hexagon and \circ) are consistent with Figure SI-5A. This indicates that very little, if any, of the fortified As(III) converted to As(V).