METHODS

INTRODUCTION

The analysis of chemicals of concern has become an area of significant interest in the field of environmental research. In order to achieve trace level analysis, large sample volumes are usually extracted using various off-line extraction methods to remove background interferences and concentrate the analytes into a smaller volume. By combining the extraction column, analytical separation column, MS/MS and software, an online SPE/LC/MS/MS system can be created.

A major advantage of this integrated platform is that the most time consuming steps in the off-line method are reduced or eliminated altogether. By reducing sample loading requirement from liters to milliliters, the sample loading time is markedly reduced. In addition, direct elution into the mass spectrometer means there is no requirement for evaporation and reconstitution steps.

The time required for the analysis can be reduced by up to 80%.

Here we show the use of online SPE/LC/MS/MS for the analysis of pesticides and pharmaceuticals in drinking and river water.

Drinking water analysis

Selected pharmaceuticals and pesticides (Table 1) were spiked into drinking water samples and introduced to the online SPE LC/MS/MS system. The time required for the analysis can be reduced by up to 80%.

Automated sample preparation combined with LC/MS/MS plays a key role to:

- Reduce labor intensive steps
- Reduce sample turnaround time
- Increase lab investment on automation

The utility of the online SPE/LC/MS/MS for the analysis of chemicals of concern in drinking and river water, is shown here.

RESULTS

Drinking water results

CONCLUSIONS

Table 1. List of pharmaceuticals and pesticides loaded in drinking water.

Figure 5. Number of sites at which compound was detected above the LOQ.

The seven sites selected for sampling included locations upstream and downstream from water treatment works as well as tributaries to the main river. Figure 4 shows the sampling sites selected. Some compounds were detected at multiple sampling sites, whereas others were not detected at all. Figure 3 shows the number of sites at which each compound was detected above the LOQ. With the 1 000 L enrichment factor, the limit of quantitation (LOQ) was 10 ppt. Atrazine and metoprolol were below detection limits at all 7 sites. The antibiotic oxytetracycline was detected at all 7 sites. The samples were loaded, washed and eluted as described above for the pharmaceutical compounds.

Figure 4. Sampling sites for river water.

Figure 5. Analytical results from river water sites. Red boxes indicate analytes detected above the LOQ at the site.

Table 2. List of pharmaceuticals and pesticides analyzed in drinking water.

Pharmaceuticals

Carbonic acid

Atarax

Benadryl

Atenolol

Clotrimazole

ERBITUX

Cimetidine

Ranitidine

Tramadol

Trimethoprim

Propylamine

Pharmaceuticals

Carbamazepine

Atarax

Diphenhydramine

Atenolol

Metoprolol

Cocaine

Propylamine

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