Supplemental Information

Degraded protein adducts of *cis*-2-butene-1,4-dial are urinary and hepatocyte metabolites of furan

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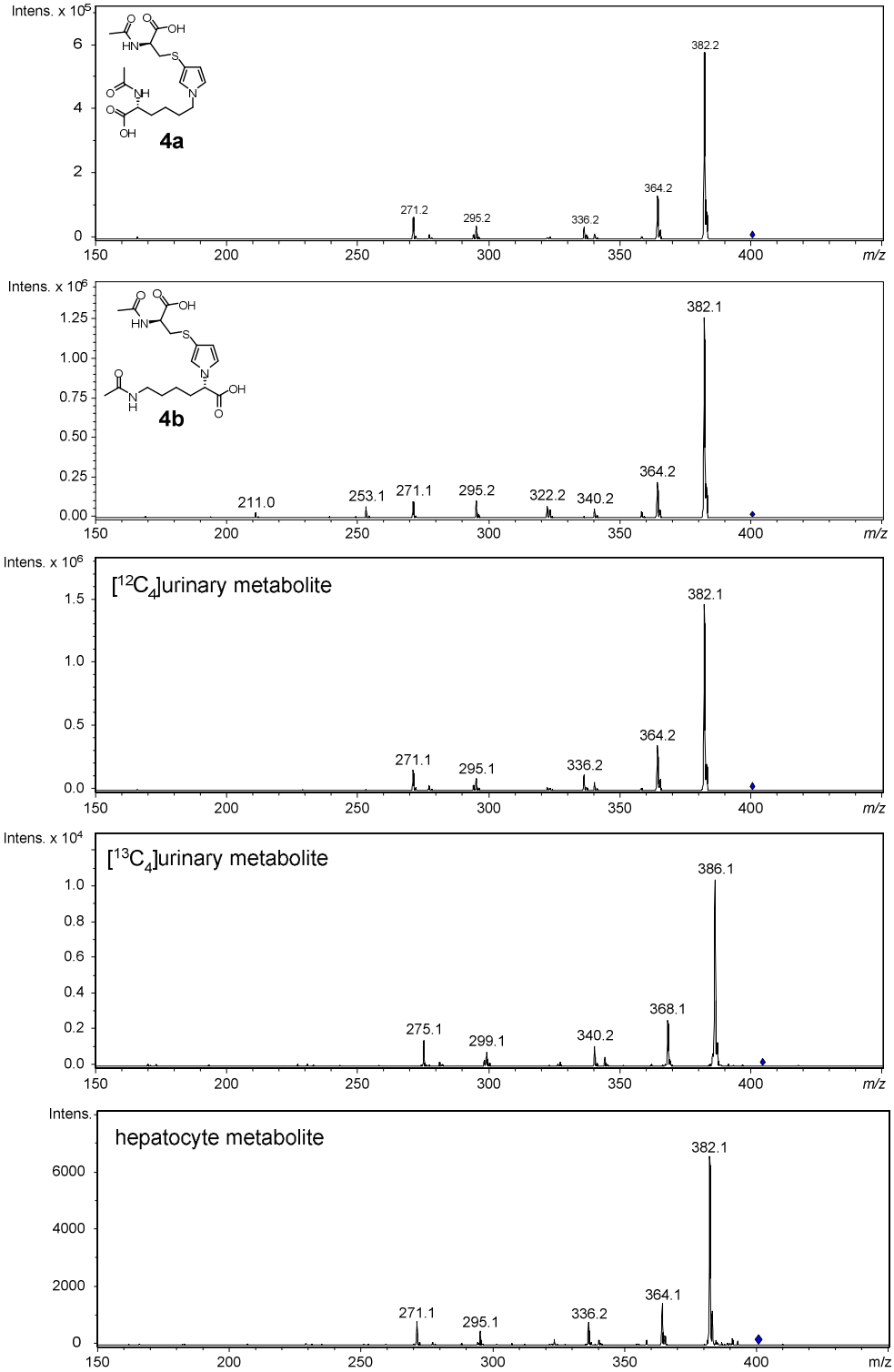
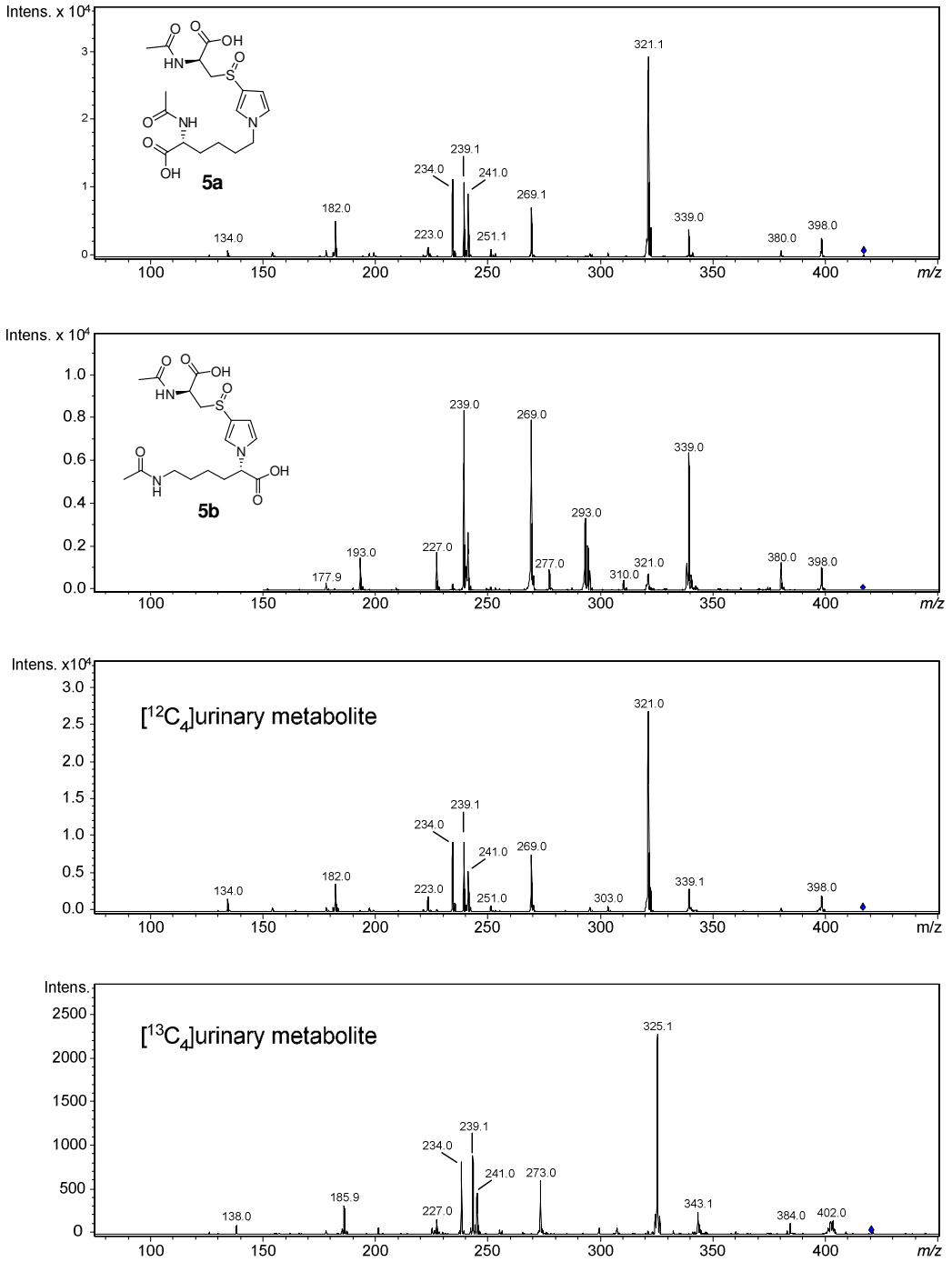
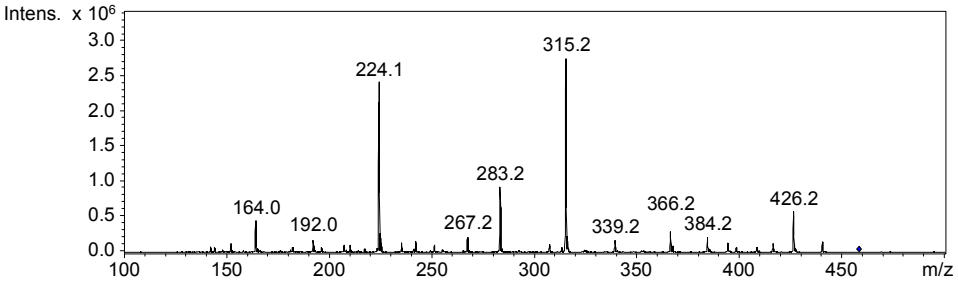


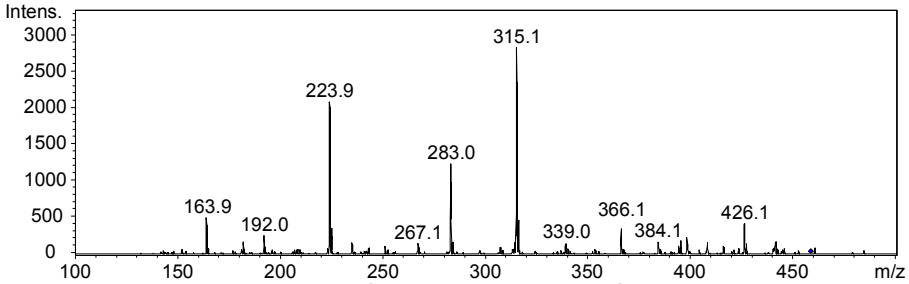
Supplemental Figure 1. Daughter ion mass spectra for the *N*-acetylcysteine-BDA-lysine reaction products, *N*-acetyl-*S*-[1-(5-acetylamino-5-carboxypentyl)-1*H*-pyrrol-3-yl]-L-cysteine (**4a**) and *N*-acetyl-*S*-[1-(5-acetylamino-1-carboxypentyl)-1*H*-pyrrol-3-yl]-L-cysteine (**4b**) as well as those for the urinary and hepatocyte furan metabolites with the same retention time and mass.



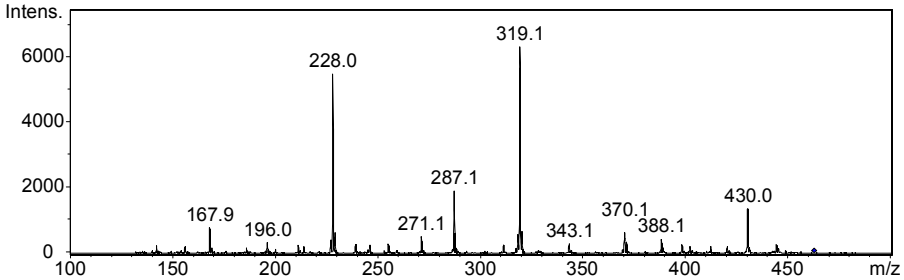
Supplemental Figure 2. Daughter ion mass spectra for the sulfoxides of *N*-acetyl-cysteine-BDA-lysine reaction products, *N*-acetyl-*S*-[1-(5-acetylamino-5-carboxypentyl)-1*H*-pyrrol-3-yl]-L-cysteine sulfoxide (**5a**) and *N*-acetyl-*S*-[1-(5-acetylamino-1-carboxypentyl)-1*H*-pyrrol-3-yl]-L-cysteine sulfoxide (**5b**) as well as those for the urinary furan metabolite with the same mass and retention time.



Daughter ion spectrum of the major product formed upon reaction of **5a** with acidic methanol

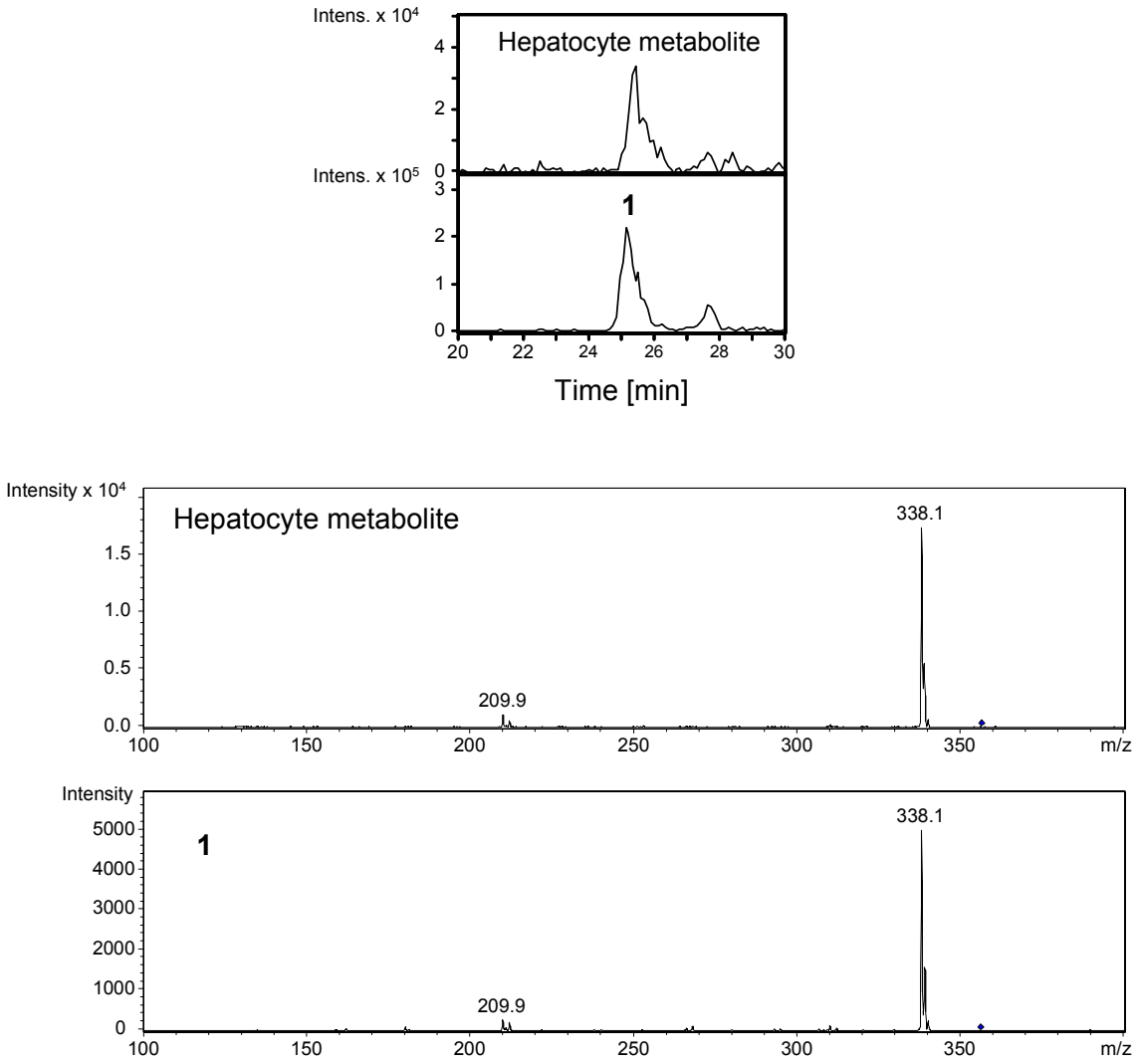


Daughter ion spectrum of the major product formed upon reaction of [$^{12}C_4$]furan-derived metabolite **5a** with acidic methanol

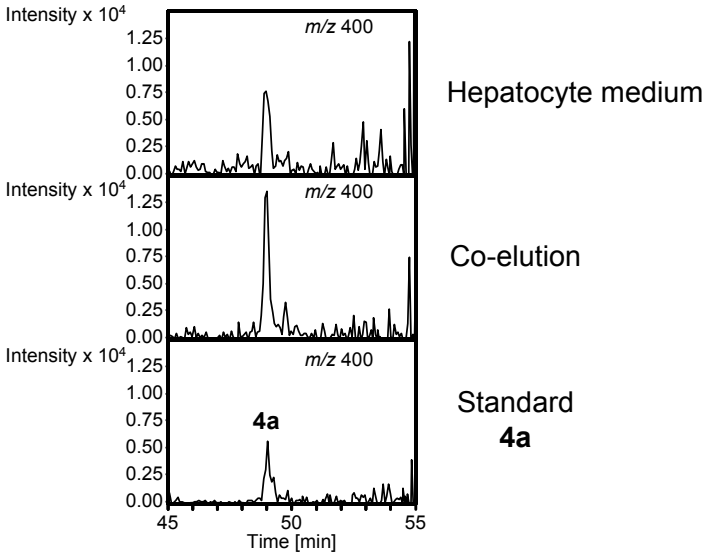


Daughter ion spectrum of the major product formed upon reaction of [$^{13}C_4$]furan-derived metabolite **5a** with acidic methanol

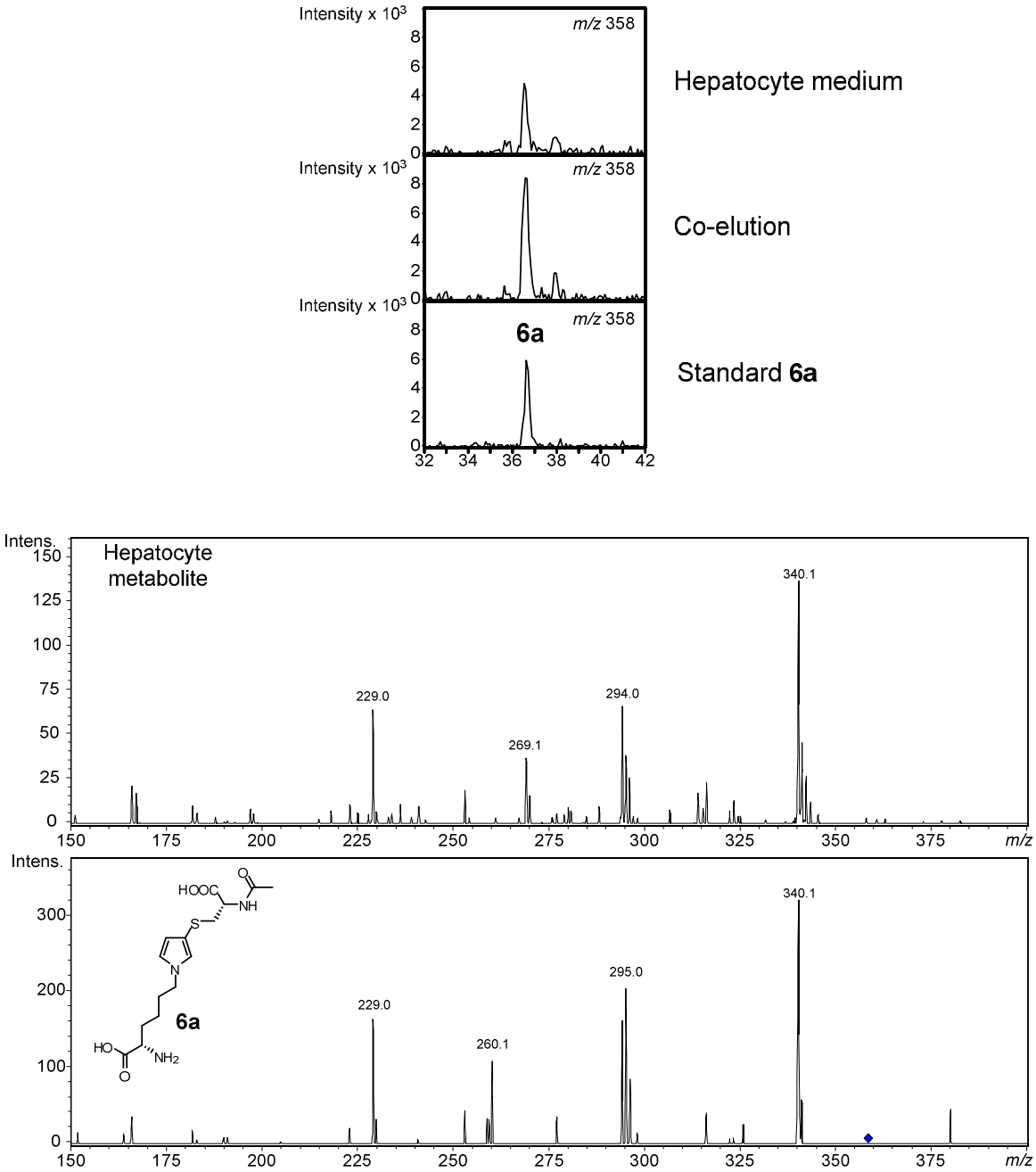
Supplemental Figure 3. Mass chromatograms and mass spectra of the products formed upon incubating *N*-acetyl-*S*-[1-(5-acetylamino-5-carboxypentyl)-1*H*-pyrrol-3-yl]-L-cysteine sulfoxide (**5a**) in methanolic HCl.



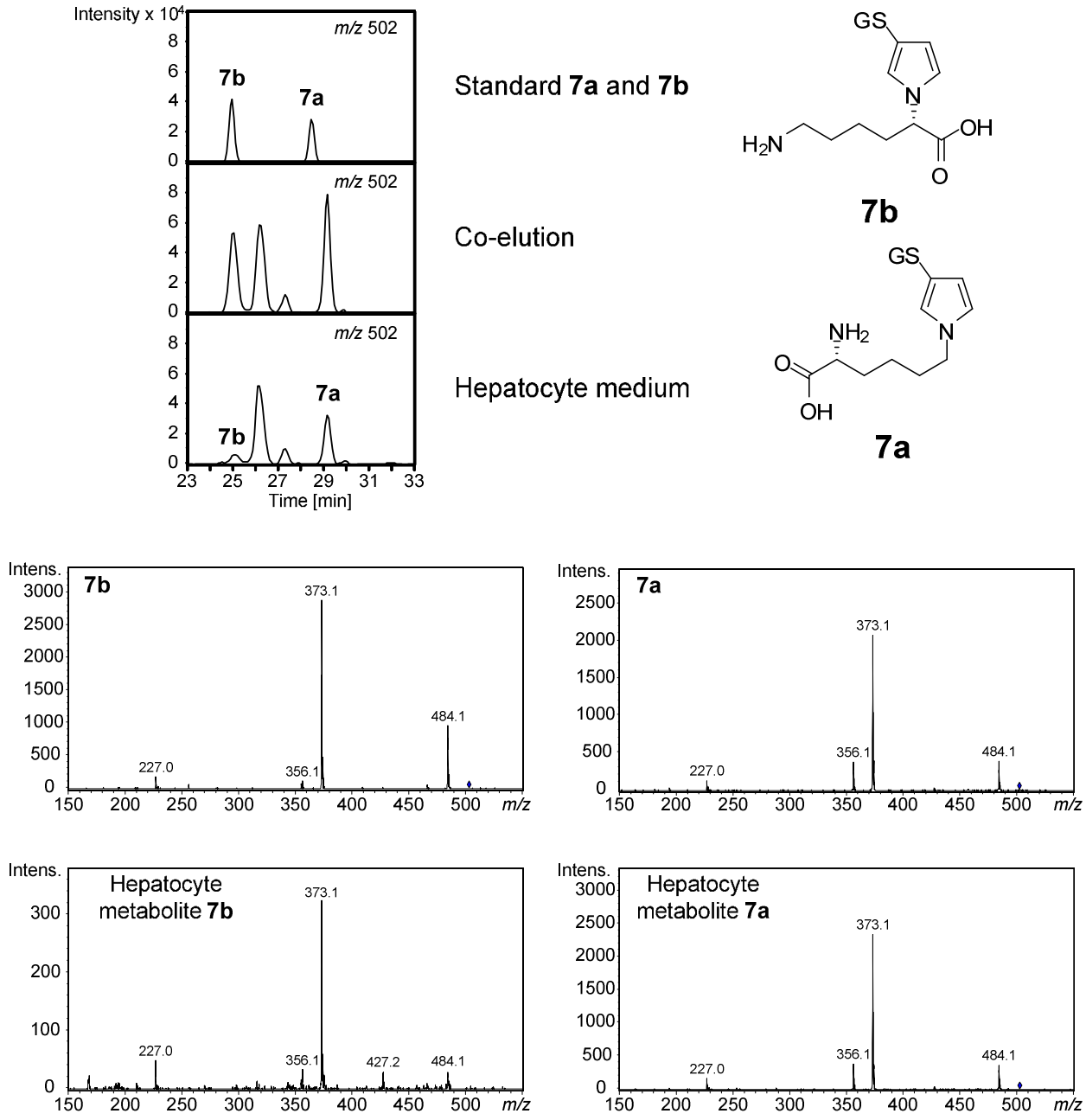
Supplemental Figure 4. Extracted ion current at 356 amu for the medium from furan exposed hepatocytes (top) and a standard solution of the mono-GSH-BDA reaction product **1** (bottom) and the mass spectra corresponding to these LC peaks.



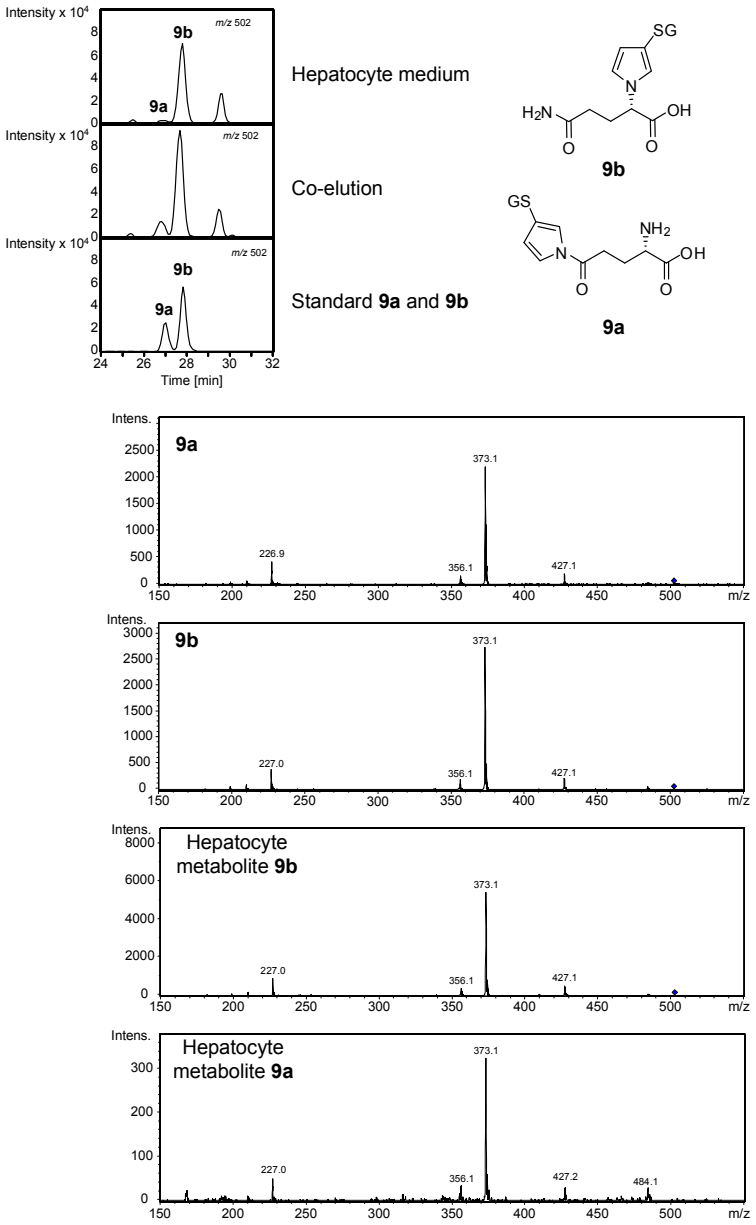
Supplemental Figure 5. Extracted ion current at 400 amu demonstrating co-elution of hepatocyte metabolite with *N*-acetyl-*S*-[1-(5-acetylamino-5-carboxypentyl)-1*H*-pyrrol-3-yl]-L-cysteine (**4a**).



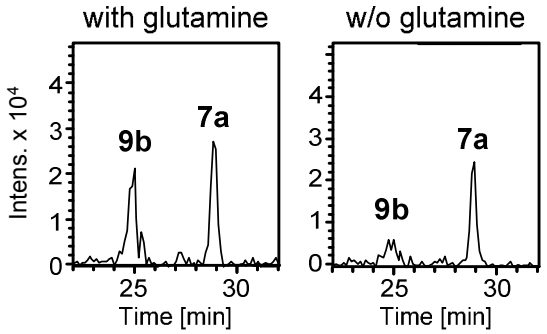
Supplemental Figure 6. Extracted ion current at 358 amu demonstrating co-elution of hepatocyte metabolite with *N*-acetyl-*S*-[1-(5-amino-5-carboxypentyl)-1*H*-pyrrol-3-yl]-L-cysteine (**6a**) as well as the corresponding mass spectra.



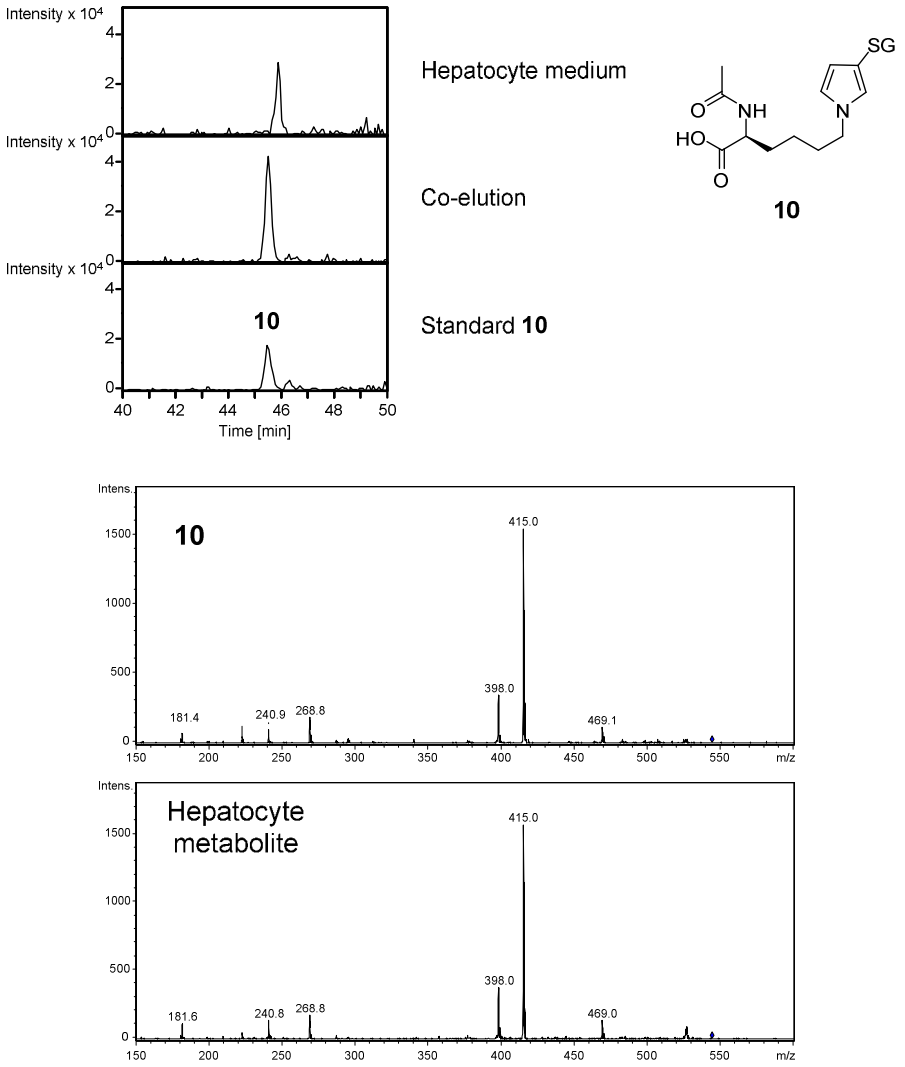
Supplemental Figure 7. Extracted ion current at 502 amu demonstrating co-elution of hepatocyte metabolites with *S*-[1-(5-amino-5-carboxypentyl)-1*H*-pyrrol-3-yl]-glutathione (**7b**) and *S*-[1-(5-amino-1-carboxypentyl)-1*H*-pyrrol-3-yl]-glutathione (**7a**) as well as their corresponding mass spectra.



Supplemental Figure 8. Extracted ion current at 502 amu demonstrating co-elution of *S*-[1-(4-amino-1-carboxy-4-oxobuty)-1*H*-pyrrol-3-yl]-glutathione (**9b)** with hepatocyte metabolite **9b** and *S*-[1-(4-amino-4-carboxy-1-oxobutyl)-1H-pyrrol-3-yl]-glutathione (**9a**) with hepatocyte metabolite **9a** as well as their corresponding mass spectra.



Supplemental Figure 9. Extracted ion current at 502 amu indicating that the levels of glutamine in the hepatocyte medium influence the levels of *S*-[1-(4-amino-1-carboxy-4-oxobuty)-1*H*-pyrrol-3-yl]-glutathione (**9b**) but not *S*-[1-(5-amino-5-carboxypentyl)-1*H*-pyrrol-3-yl]-glutathione (**7a**) in furan exposed hepatocytes.



Supplemental Figure 10. Extracted ion current at 544 amu demonstrating co-elution of standard **10** with the hepatocyte metabolite as well as their corresponding mass spectra.