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Identification of Biomarkers for Tumor Development in the Liver using Bovine Serum Albumin as a Molecular Sensor

Analyzing biological fluids using untargeted metabolomics has proved challenging because it is time-consuming and, at times, inconclusive. As an alternative method, the Bothner Lab has established the use of the protein bovine serum albumin (BSA) as a molecular sensor to differentiate complex biological solutions. Serum albumin is the most abundant protein in mammalian blood, where it transports lipids, hormones and drugs. The natural role of BSA as a carrier protein inspired the Bothner Lab to test this proteins' ability to bind a wide variety of small molecules with a goal of targeted metabolite extractions from complex biological samples. This method has been coined the protein sensor assay (PSA). A new set of methods has been developed to perform metabolite extractions using the PSA on serum collected from mice with induced liver cancer from the Schmidt Lab at Montana State University. The Schmidt Lab has done much work to identify the key steps in biochemical pathways like oxidative stress in mice with induced cancer. In this project I have used the PSA together with liquid chromatography mass spectrometry and statistical analyses to identify biomarkers for tumor development in mouse serum. In the future, the PSA may be used to speed up analysis and improve confidence in disease diagnostics.

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