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## Fabric phase sorptive extraction (FPSE): a paradigm shift sample preparation approach for whole blood analysis targeted to metabolomic disease biomarker discovery

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Metabolomics plays an important role in discovering potential disease biomarkers from biological samples, preferably whole blood. Due to the distinct complexity of whole blood, either plasma or serum is used in metabolomics biomarker discovery research. When whole blood is converted into plasma or serum prior to the extraction of metabolites using conventional sample preparation techniques such as solid phase extraction (SPE) or liquid-liquid extraction (LLE), a significant portion of the analytical information disappears. Fabric phase sorptive extraction (FPSE) has offered a paradigm shift approach in metabolomics sample preparation. FPSE utilizes a flexible and permeable fabric substrate, coated with high-performance sol-gel sorbents as the extraction media. This uniquely designed extraction medium is capable of extracting target analyte(s) directly from whole blood without converting it into plasma or serum. Due to the special geometry of FPSE membrane (flexible, flat, and permeable) and sponge-like porous architecture of sol-gel sorbents, rapid analyte mass transfer occurs between the bulk sample and the extraction medium. FPSE is suitable for extracting broad range of biomarkers directly from whole blood without requiring protein precipitation or other sample pre-treatment such as filtration and/or centrifugation. After the extraction, FPSE membrane is exposed to a small volume of organic solvent for eluting the extracted analyte(s) from the FPSE membrane. Low viscosity of organic solvent, capillary force of the fabric support and sponge-like porous architecture of sol-gel network allows fast diffusion of organic solvent into the FPSE membrane for quick and complete recovery of the extracted analyte(s). FPSE also eliminates solvent evaporation and sample reconstitution steps. FPSE offers a large number of biocompatible sol-gel sorbents specifically suitable for polar metabolites/biomarkers. As a result, searching for a new disease biomarker from whole blood in presence of numerous endogenous and exogenous interferents is no longer a wishful thinking but an achievable reality.

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