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Understanding the metabolic effect of PFBS on human SH-SY5Y cell line with NMR-Metabolomics

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Although perfluorobutanesulfonic acid (PFBS) was introduced as a safer alternative to the Stockholm Convention-regulated pollutant perfluorooctanesulfonic acid (PFOS), its neurotoxic potential remains insufficiently explored. This knowledge gap is mainly attributable to the shorter human half-life of PFBS relative to PFOS, as well as the limited availability of direct tissue concentration data. [1,2]. To evaluate its effects on the central nervous system, we employed NMR-based metabolomics to investigate the impact of subtoxic PFBS exposure on human neuroblastoma cells (SH-SY5Y) after 48, 72, and 96 hours of treatment.

Principal Component Analysis (PCA) clearly distinguished high- and low-dose exposure groups at all investigated time points. Moreover, separation between control and low-dose samples emerged after 96 hours of exposure, revealing increased levels of GPC, choline, hypotaurine, uridine, and uracil, alongside decreased levels of PC, creatine, glycine, and taurine in treated cells compared with controls (Figure 1). Pathway analysis identified taurine and hypotaurine metabolism, together with glutathione metabolism, as the most significantly affected metabolic pathways.

Since differentiation between controls and low-dose samples was observed only at the longest exposure time, these preliminary results support the notion that PFBS exhibits lower short-term toxicity than its long-chain predecessors. Nevertheless, its potential long-term neurotoxicity warrants careful attention, given the high chemical stability and environmental persistence of PFBS.

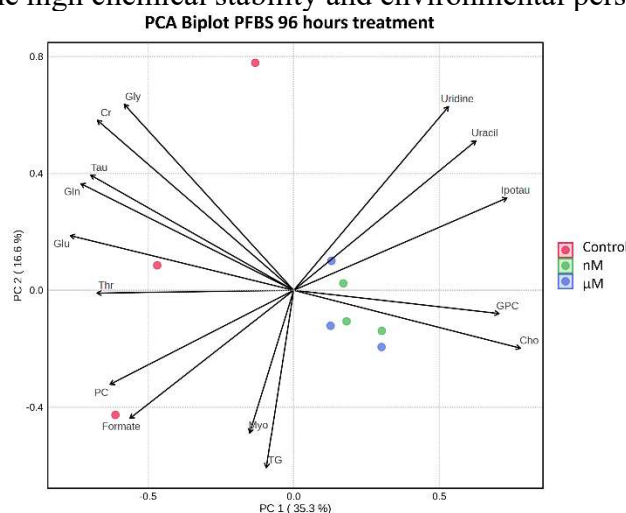


Fig. 1. Principal Component Analysis Biplot of low-dose samples treated for 96 hours with PFBS

References

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- [2] S. E. Fenton, A. Ducatman, A. Boobis, J. C DeWitt, C. Lau, J. S. Smith and S. M. Roberts, *Environmental Toxicology and Chemistry*, **40**, 606-630 (2021)