NANO-OMICS FOR BLOOD BIOMARKER DISCOVERY IN GLIOBLASTOMA

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NANO-OMICS FOR BLOOD BIOMARKER DISCOVERY IN Glioblastoma
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AIMS: Glioblastoma (GBM) remains one of the most aggressive cancers with an average survival of only 12-15 months. Current diagnostic methods are burdensome and ineffective, underscoring an urgent need to improve early detection and monitoring. The application of ‘liquid-biopsy’ markers holds great promises however, despite technological advances, to date there are no clinically used blood-based biomarkers for GBM. We have recently introduced the ‘Nano-Omics’ paradigm, which utilises nanoparticles (NPs) as scavenging platforms to capture and enrich disease-associated analytes from biological fluids for omics analyses. In this study, we utilised the Nano-Omics pipeline coupled with brain tissue mass spectrometry-based proteomics, to unveil GBM specific protein biomarker candidates. METHOD: We exploited the spontaneous interaction of nanoparticles with blood proteins to comprehensively analyse the blood proteome of GL261 glioma-bearing C57BL/6J mice. Tumoural and peritumoural brain tissue originated from the same animals were also collected, micro-dissected and analysed by label-free mass spectrometry in order to correlate the nanoparticle-enriched blood-circulating proteome with the tumour tissue proteome. RESULTS: Our data revealed a number of GBM-specific biomarker candidates in blood even at low tumour burden, followed by validation in a human GBM clinical cohort. Furthermore, the peritumoural region of glioblastoma GBM displayed unique proteomic profiling, shedding light on the mechanism behind GBM infiltration and recurrence. CONCLUSIONS: Our work highlights the importance of integrating blood and brain tissue proteomics and opens up new possibilities for further validation of the proteomic signatures discovered with the potential for further development of a much-needed blood test for GBM early detection and monitoring.