Hepatocellular carcinoma (HCC) is currently a major challenge in medicine for its poor prognosis and lack of effective therapeutic options. The AAA+ ATPase RuvBL1 associates with Hsp90 in several multiprotein complexes regulating key cellular pathways such as cell proliferation, gene expression, chromatin remodeling and telomere maintenance. In several human cancer, including HCC, RuvBL1 overexpression correlates with a poor prognosis. Despite the several functions potentially regulated by RuvBL1, its role in the onset and progression of HCC is still unknown. We had previously generated a RuvBL1 hepatocyte-specific knock-out mouse model on genes differentially expressed in high- vs low-RUVBL1 HCC samples. In conclusion, our data uncover a novel role of RuvBL1, possibly through its interaction with Hsp90β, in mitochondria integrity and function.

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Introduction: Hepatocellular carcinoma (HCC) is one of the most common cancers worldwide with more than 800,000 newly diagnosed cases every year. The late diagnosis, that limits the treatments options, makes this tumor the fifth cause of cancer-related death. The existing diagnostic procedures are expensive and lack of adequate sensitivity and the specificity. The growing interest in the use of circulating miRNAs as reliable biomarkers for cancer diagnosis opens new perspectives in clinical oncology.

Aim: The main objective of the SERMI4Cancer project is to develop a portable, user friendly, and cost-effective Point Of Care (POC) system integrated with the innovative Surface Enhanced Raman Spectroscopy (SERS) technology for circulating miRNA detection in HCC patients.

Materials and methods results: The system allows a label-free direct detection of the analyte making this technology suitable for a POC system for multiple applications. The SERMI4Cancer project includes the development of three components: The miRNA separation and binding support (polymers functional matrix); the detection system consisting of a Portable Raman Spectrometer and nanostructured SERS Sensor; the data integration system. Molecular beacons targeting miRNAs are immobilized onto silver coated silicon nanopillars spotted on a nitrocellulose membrane and incubated with patients' plasma. Quantifications are performed with the Raman Renishaw spectrometer, a simple, rapid and powerful tool yielding a unique “chemical fingerprint” of the chemical composition of the sample. SERS technology allow a cost-effective detection of very low concentrations of miRNAs (attomolar) increasing the accuracy of the diagnostic biomarker candidate at early stages of the disease.

Conclusion: These results will open new perspectives on HCC diagnosis that could be useful for the development of a point of care system with the innovative SERS technology for miRNAs detection blood samples.

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