PEP'S: A MICROFLUIDIC DEVICE TO PROCESS WHOLE BLOOD AT BEDSIDE BEFORE PLASMA PROTEOMICS ANALYSES

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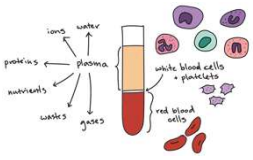
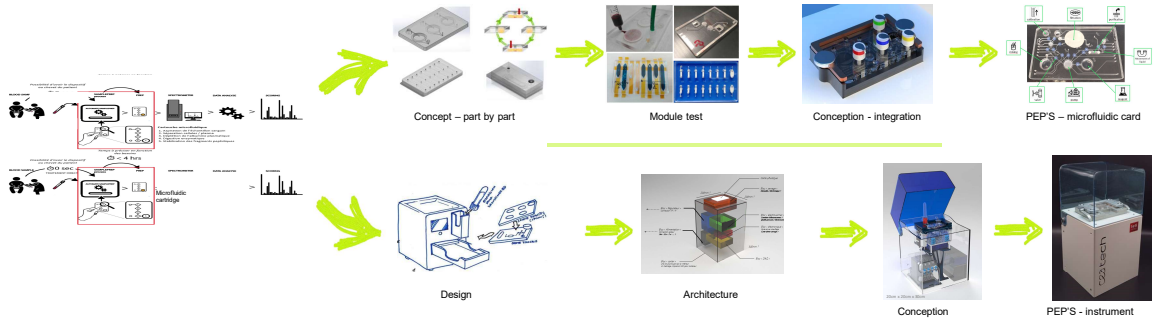
INTRODUCTION

Immunoassays are used for decades in clinical laboratories to quantify proteins in serum/plasma samples. However, MS-based proteomics analysis has recently appeared as a promising option to assess panels of protein biomarkers and provide protein profiles useful for health state monitoring. Nevertheless, **the translation of MS-based proteomics into the clinics is hampered by the complexity, the substantial time and human workforce necessary for sample preparation.** The processing of plasma matrix is especially tricky as it contains more than 3000 proteins spanning in an extreme dynamic range (10^{10}) of concentrations. To address this pre-analytical challenge we have designed and conceived a microfluidic device (Pep's) to automate and fasten blood sample preparation for proteomics analysis.



CONCEPTION OF PEP'S MICROFLUIDIC DEVICE & INSTRUMENTATION

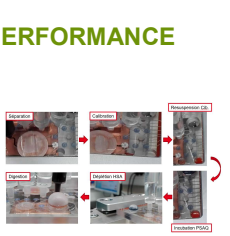


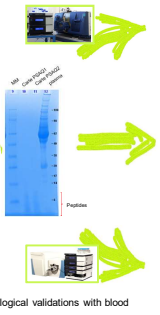
Six steps of the sample preparation protocol were integrated into the device and can be performed in **only 2 hours:** (1) plasma separation and calibration, (2) spiking with quantification standards, (3) albumin depletion, enzymatic digestion and storage of the peptides.

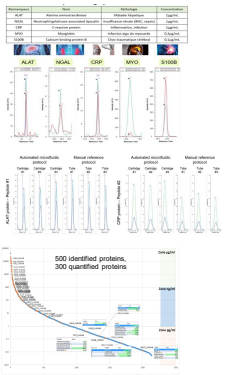
ASSESSMENT OF PEP'S DEVICE PERFORMANCE

The performance of the microfluidic system was evaluated by comparison with conventional manual preparations. **Five protein biomarkers** routinely analyzed in clinical chemistry were quantified in plasma samples by **targeted proteomic analysis** (LC-MRM). Blood samples were collected from healthy patients or were spiked to mimick pathological concentrations of protein biomarkers.
All biomarkers were detected at pathological concentrations using the microfluidic device.

Exploratory analyses were also performed using label-free proteomics (LC-MS/MS) to evaluate the **depth of plasma proteome coverage** provided by PEP'S device.







CONCLUSION

Portable, compact and easy to handle, PEP'S is designed for the automated and rapid preparation of blood samples collected at patient's bedside. This innovative microfluidic device and associated instrumentation [patent WO/2017/162956] are expected to streamline and simplify clinical proteomics studies