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## Miniaturization of a metabolomics and fluxomics sample preparation workflow

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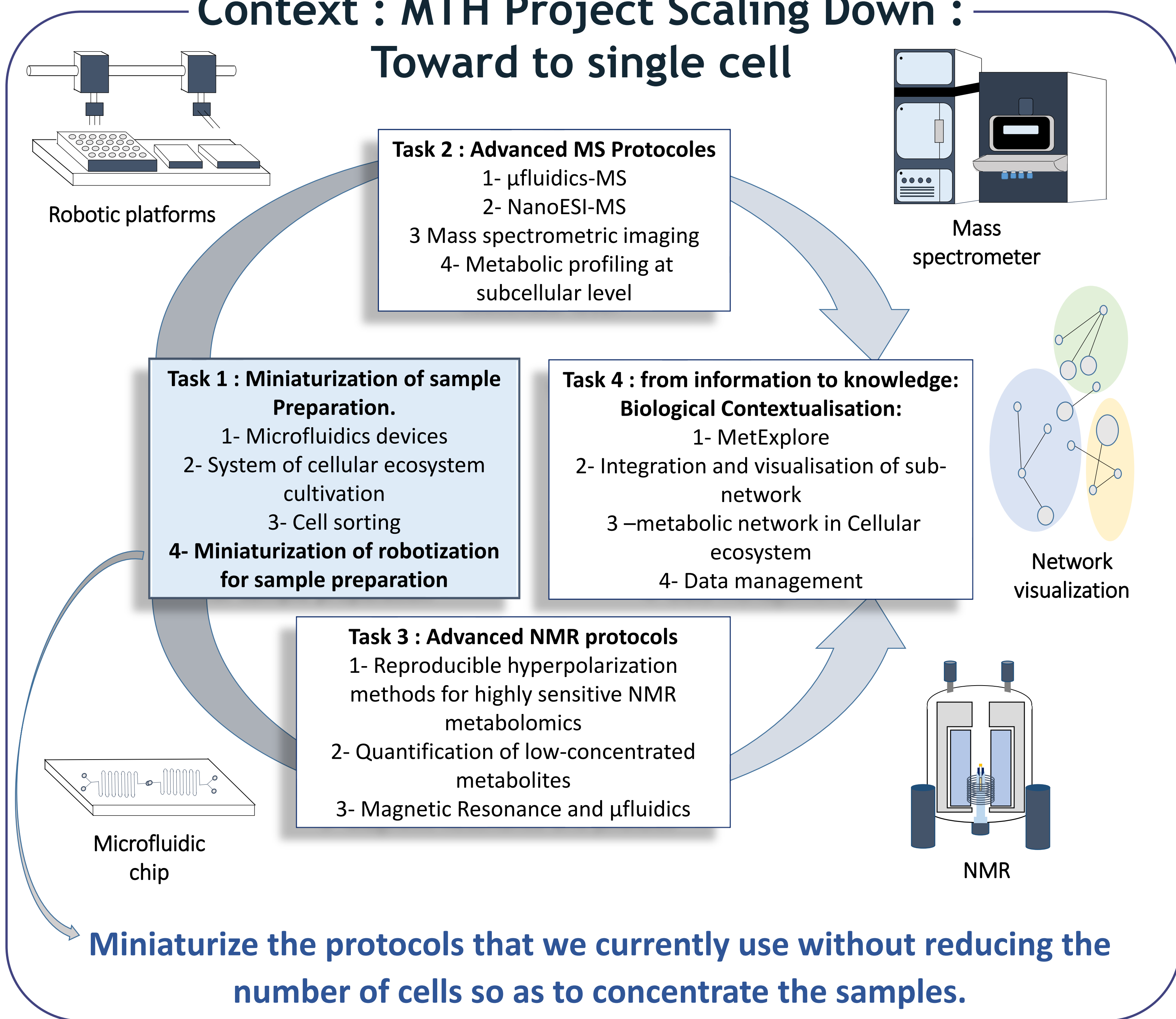
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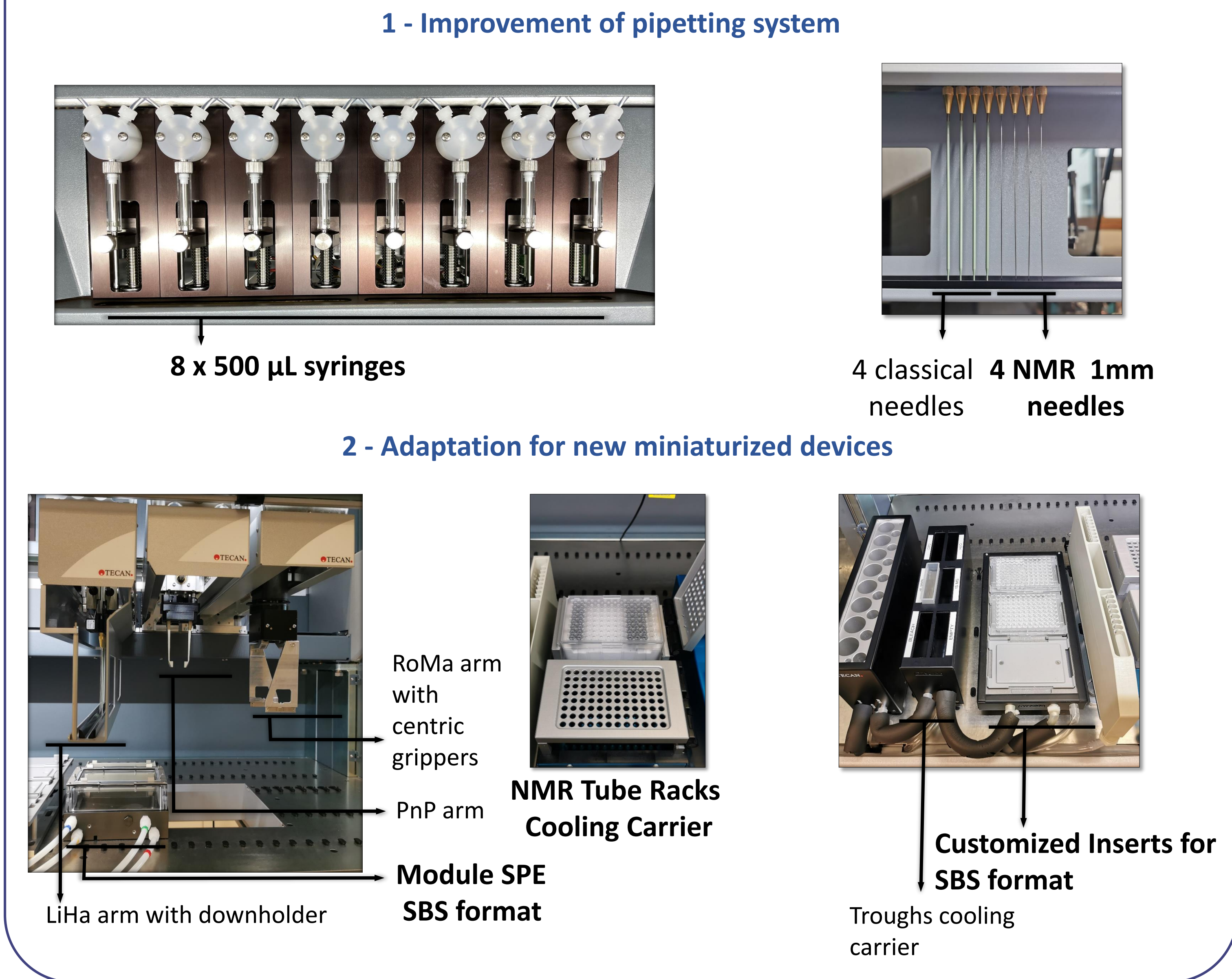
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<sup>2</sup> : MetaToul-MetaboHUB, National Infrastructure of Metabolomics & Fluxomics (ANR-11-INBS-0010)

## Context : MTH Project Scaling Down : Toward to single cell



## Robotic platform for miniaturized sample preparation



## Results and discussion

### 1 - Improvement of pipetting of miniaturized volumes :

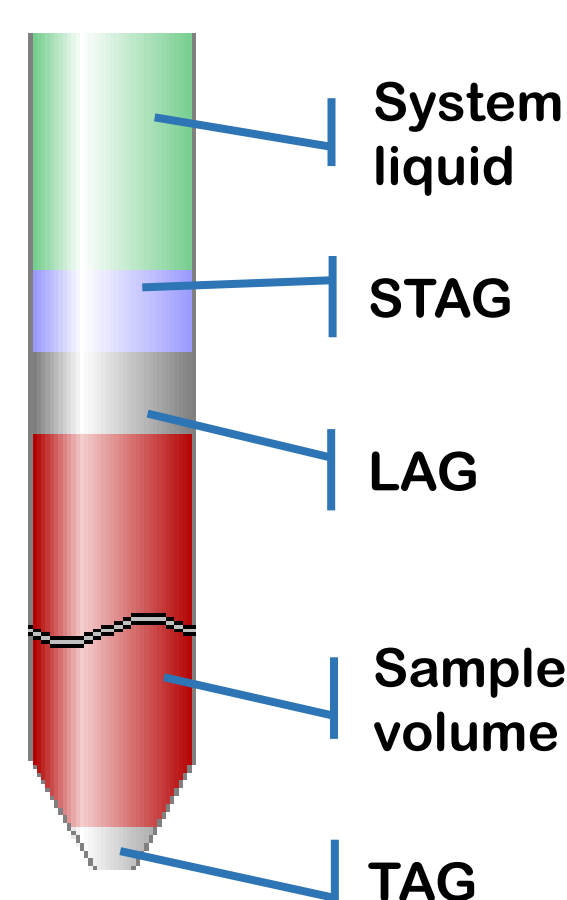
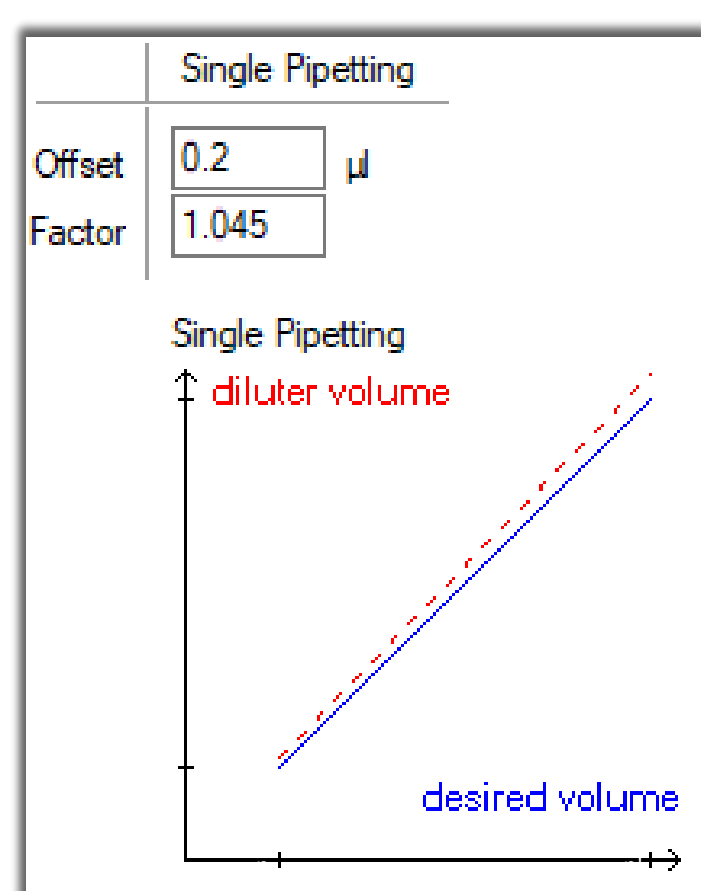
Development of a liquid handling robotic system suitable for pipetting 1 μL with a CV < 10%

Replace 1000 μL syringes by 500 μL syringes and optimization of various parameters:

**Calibration parameters :**  
 • The factor  
 • The offset

$$y = a \cdot x + b$$

Factor  
 Offset



**Airgap volume during pipetting :**

- STAG : system trailing airgap : to prevent contamination by liquid system
- LAG : Leading Airgap : optimize accurate pipetting
- TAG : Trailing Airgap : to prevent liquid dripping

**Pipetting speed :**

- The aspiration speed : lower aspiration improve pipetting accuracy
- The distribution speed : high dispense speed is needed to achieve a proper free dispense
- The needle position : in contact or not with the tube

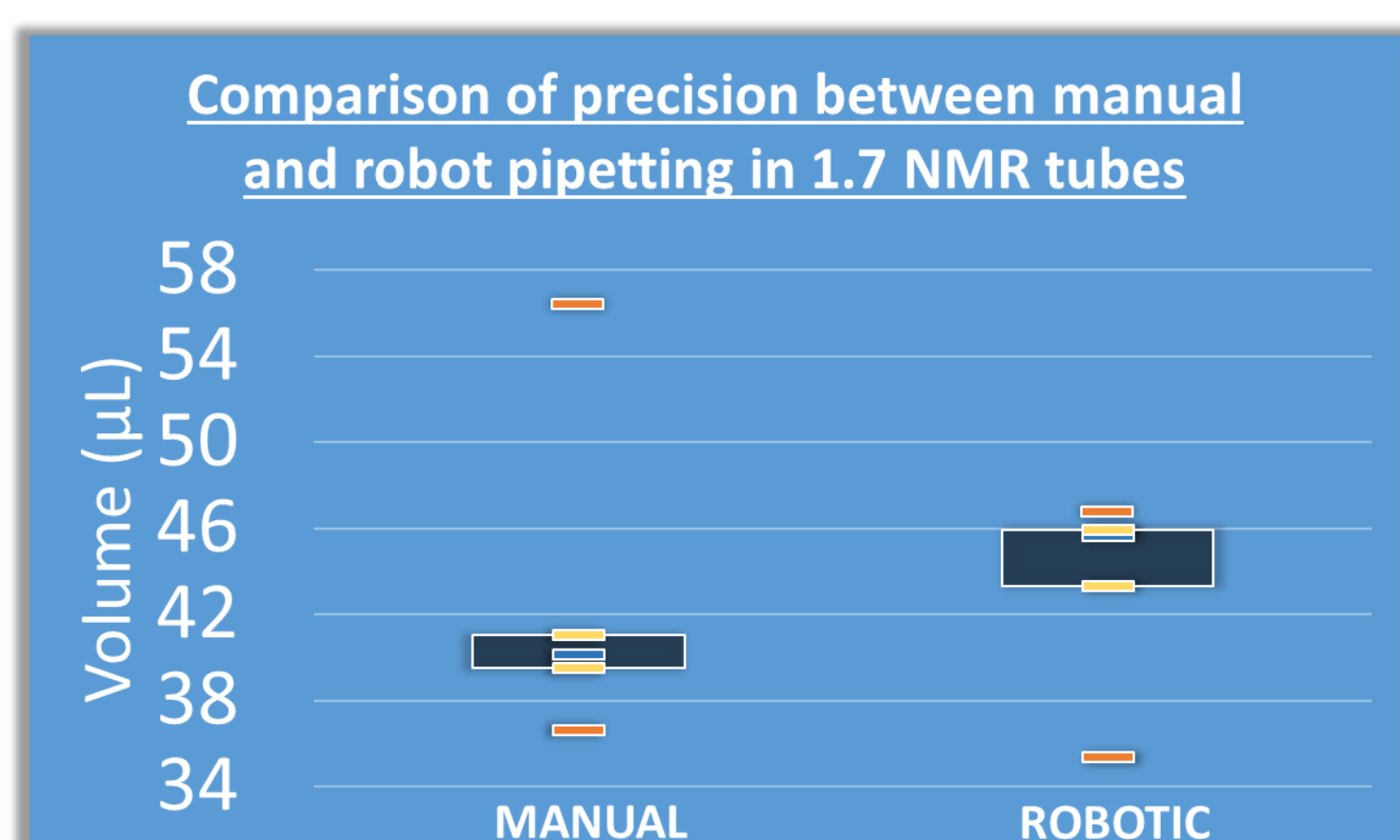
	With 1000 μL syringes				With 500 μL syringes			
Target volume (μL)	100	10	5	1	100	10	3	1
Mean	103.49	10.50	4.78	2.25	100.4	10.27	2.99	1.97
sd	1.04	0.97	0.44	0.6	0.82	0.37	0.08	0.4
Cv (%)	1	9	9	27	0.8	4	3	20

Better precision and accuracy with 500 μL syringes

### 2 - Adaptation for new miniaturized devices :

Development of robotic platform protocol to be able to pipette in 1.7 mm and 1 mm NMR tubes

Implementation and validation of a script with use of capillary needles for final dispense of 20 and 45 μL NMR tubes



NMR tubes filling : measure of final volume in the tube :

	Manual	Robot
MEAN	41 μL	44 μL
SD	4.3 μL	2.6 μL
MIN	36 μL	35 μL
MAX	56 μL	47 μL

Better precision and reproducibility with robot  
 Faster with robot



NMR Tubes : 5 3 1.7 1 mm

## Conclusions

- Pipetting capabilities : range 3 – 480 μL with a CV max of 4 %.
- Our robotic platform is now capable to fill 5, 3, 1.7 mm and 1 mm NMR tubes

APPLICATIONS : • High throughput screening • Provide access to metabolism of cells subpopulation • Replaces humans for repetitive tasks

## Acknowledgments

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