QUALITY AND SUSTAINABILITY: ENHANCING WORKFLOWS USING CONCENTRATED LC-MS KITS.

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INTRODUCTION.

The growing demand for sustainability and cost-efficiency in laboratories has led to innovative solutions that maintain analytical quality. We tested concentrated LC-MS kits* as alternatives to conventional Ready-to-Use kits. These concentrated kits reduce shipping weight, packaging, and storage needs, supporting environmental and economic goals. They also offer flexibility, as components are available individually or in starter and solvent kits, enabling tailored use and efficient inventory management. This study systematically evaluates the analytical equivalence of the new concentrated kits compared to standard versions, focusing on a broad panel of relevant analytes.

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METHODS.

Seven analytes were chosen to represent diverse compound classes: water-soluble vitamins (B1, B6), fat-soluble vitamins (A, E), steroid hormones (Cortisol, Cortisone), and an organic acid (Methylmalonic acid). Method comparison followed international standards, using at least 40 samples to assess agreement between the two analytical methods. Identical samples were analyzed in parallel with both standard and concentrated kits. For each analyte, linear regression (slope, intercept), mean bias, and percent bias were evaluated to determine agreement and practical interchangeability (see Table 1). The concentrated format was also assessed for its impact on workflow, including sample preparation, storage, and potential reductions in shipping and packaging costs.

ADVANTAGES OF CONCENTRATED KITS.

Analytical Quality & Reliability. Concentrated LC-MS kits deliver analytical performance equivalent to standard kits, ensuring precise, reproducible, and high-quality results. Stable reagent storage and minimized risk of contamination further enhance data reliability.

Efficiency & Flexibility. Streamlined sample preparation enables rapid workflows. The modular ordering system allows tailored procurement—laboratories can select Starter kits, Solvent kits, or individual components—optimizing resource management and reducing unnecessary inventory.

Sustainability & Cost-Effectiveness. Reduced shipping weight, packaging, and storage volume lower environmental impact and laboratory waste. Lower shipping and storage costs, minimized use of hazardous materials, and less packaging contribute to overall cost savings.

On our homepage you will find further information on the concentrated LC-MS Kits.

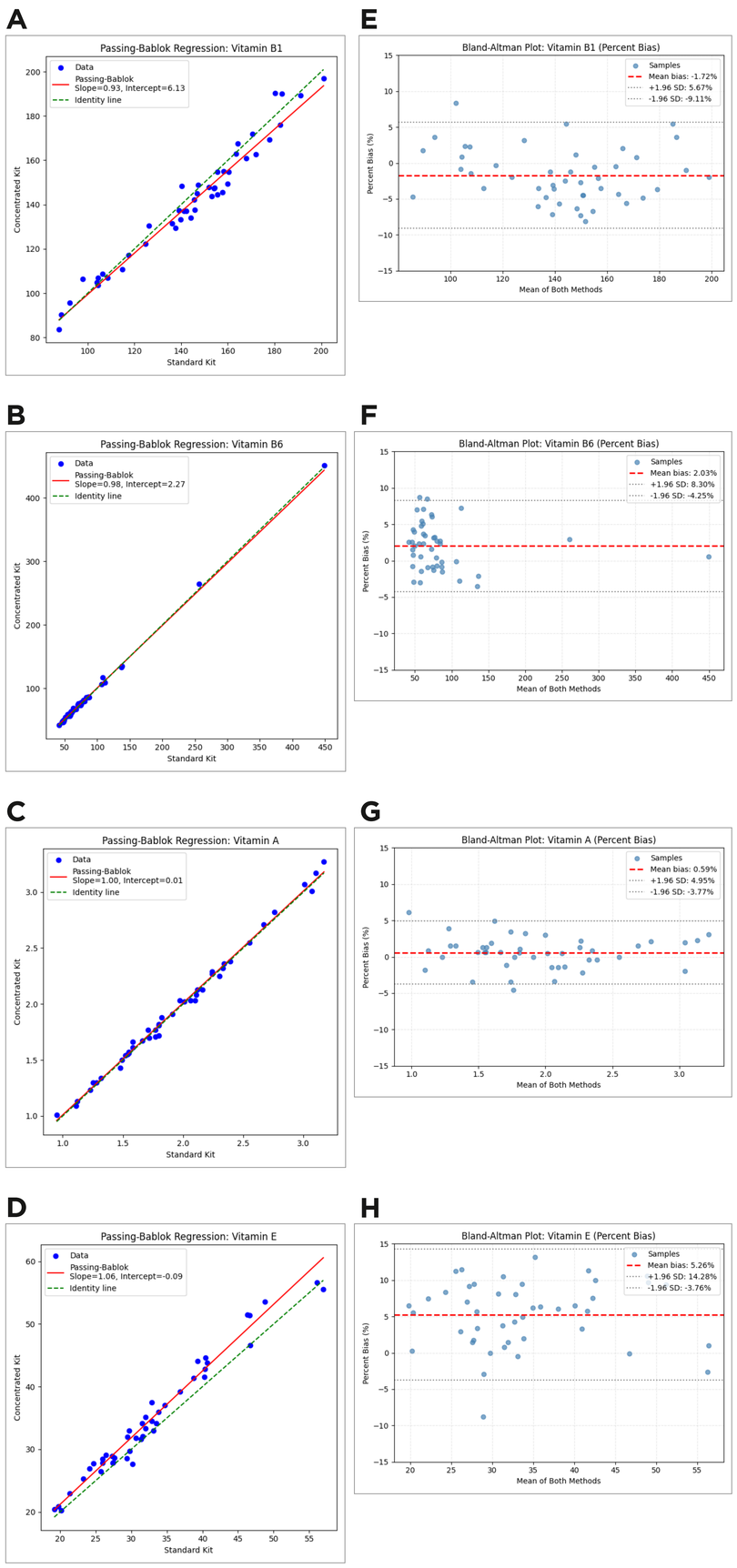

Figure 1: A-D, Passing-Bablok regression of different analytes; E-H Bland-Altman plots of different analytes

RESULTS.

Results demonstrated consistently high agreement between concentrated and standard kits across all analytes.

Passing-Bablok regression analysis showed slopes close to unity, ranging from 0.93 for Vitamin B1 to 1.08 for Methylmalonic Acid, with generally small intercepts (e.g., 6.14 for Vitamin B1, 2.27 for Vitamin B6, -14.33 for Methylmalonic Acid), indicating minimal proportional and constant bias. For example, Vitamin B1 had a slope of 0.93 and an intercept of 6.14, while Vitamin B6 showed 0.98 and 2.27. Cortisol (slope 0.99, intercept -0.17), Cortisone (1.04, 4.94), Vitamin A (1.00, 0.01), and Vitamin E (1.07, -0.09) further supported analytical equivalence. See Figure 1 A-D.

Bland-Altman analysis confirmed that mean differences between methods were consistently small relative to measurement ranges, with narrow 95% limits of agreement, reflecting excellent precision and reproducibility. For instance, the mean bias for Cortisol was -0.71 (95% limits: -3.74 to 2.32), and for Vitamin E, 1.79 (95% limits: -1.52 to 5.10). Even for analytes with slightly higher mean differences, such as Methylmalonic Acid (mean bias 18.94), the limits of agreement remained within acceptable boundaries for clinical research use.
Slightly higher values were observed for Cortisone, Vitamin E, and Methylmalonic Acid with the concentrated kits (slopes >1.04), but these differences were minor and did not impact overall analytical equivalence. Across all analytes, no significant systematic or proportional errors were observed, supporting a comparable analytical performance use of both kit types. The percent bias remained within a low single-digit range, indicating a high level of agreement between the methods. Even for analytes with slightly higher percent bias values, such as Cortisone (9.31%) and Vitamin E (5.26%), the deviations were still within acceptable limits. See Figure 1 E-H.

Table 1. Results of comparison

Analyte	Passing-Bablok Slope	Passing-Bablok Intercept	Mean Bias	Percent Bias (%)
Vitamin B1	0.933	6.135	-2.63	-1.72
Vitamin B6	0.984	2.273	1.38	2.03
Cortisol	0.990	-0.168	-0.71	-2.45
Cortisone	1.040	4.941	13.03	9.31
Vitamin A	1.000	0.01	0.01	0.59
Vitamin E	1.065	-0.086	1.79	5.26
Methylmalonic Acid	1.083	-14.327	18.94	3.21

CONCLUSION.

Concentrated LC-MS kits are a robust and sustainable alternative to conventional ready-to-use kits, offering equivalent analytical performance across diverse analytes. They provide significant workflow and environmental benefits, including reduced shipping weight, minimized packaging, and optimized storage. The modular system allows tailored procurement and better resource management, while improved sample preparation and less waste support sustainable lab operations. Overall, concentrated kits enable high-quality, reproducible results and advance both cost-efficiency and environmental responsibility in modern laboratories.