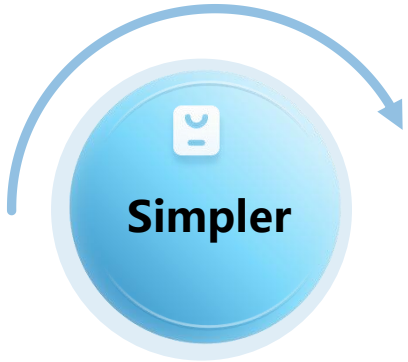
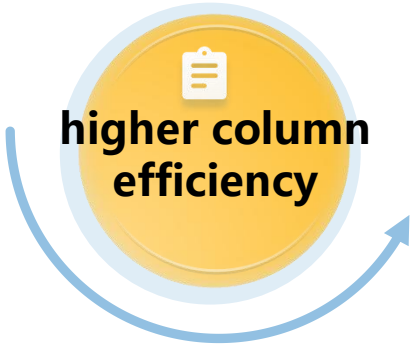
HMR-Lipid Ultra-efficient Split 96-well Plate

01

Innovative Product HMR-Lipid Ultra-efficient Split 96-well Plate

Innovative Product——HMR-Lipid Ultra-efficient Split 96-well Plate



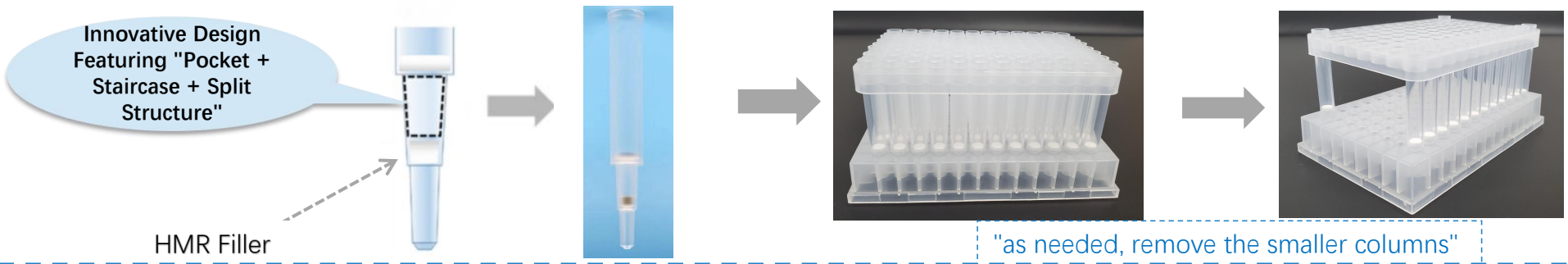


✓ **Pouch Design**—— Protein precipitation and sample purification are achieved in **a single step** on the microcolumns, offering **a simpler and more efficient process**.

✓ **Stepwise design**—— higher column efficiency and **superior purification results**; **smaller sample loading**, conserving valuable samples.

✓ **Modular Design**——Efficient Utilization of a Reduced Number of Columns, **Reducing Costs**. Additionally, Facilitating the **Observation of Liquid Level Changes**.

✓ **HMR-Lipid**——Innovative inorganic solid-phase extraction sorbents enable complete lipid removal from blood samples, leading to **more accurate experimental data results**.



HMR-Lipid Filler Introduction—Mechanism of Lipid Removal

01 High Specific Surface Area

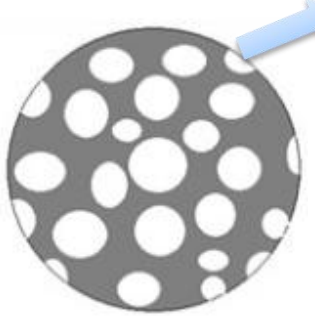
The unique synthetic inorganic porous structure provides a large specific surface area, which allows the retention of fats and impurities with molecular weights below 10,000 Da within the pores.

02 Specific Adsorption

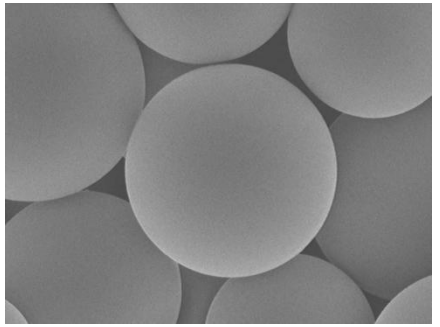
Functional groups with selective adsorption for phospholipids are densely modified on an inorganic framework, enabling efficient selective adsorption and removal of phospholipids from complex matrices.

03 Complete Phospholipid Removal

It exhibits exclusive affinity adsorption for phospholipids, theoretically allowing for 100% phospholipid removal, with no adsorption of small molecules such as acidic, neutral, or basic ions.



Functional groups with selective adsorption modified on high specific surface area inorganic frameworks—exclusive adsorption of phospholipids



HMR-Lipid filler electron microscopy images

02

Comparison of Methodological Advantages

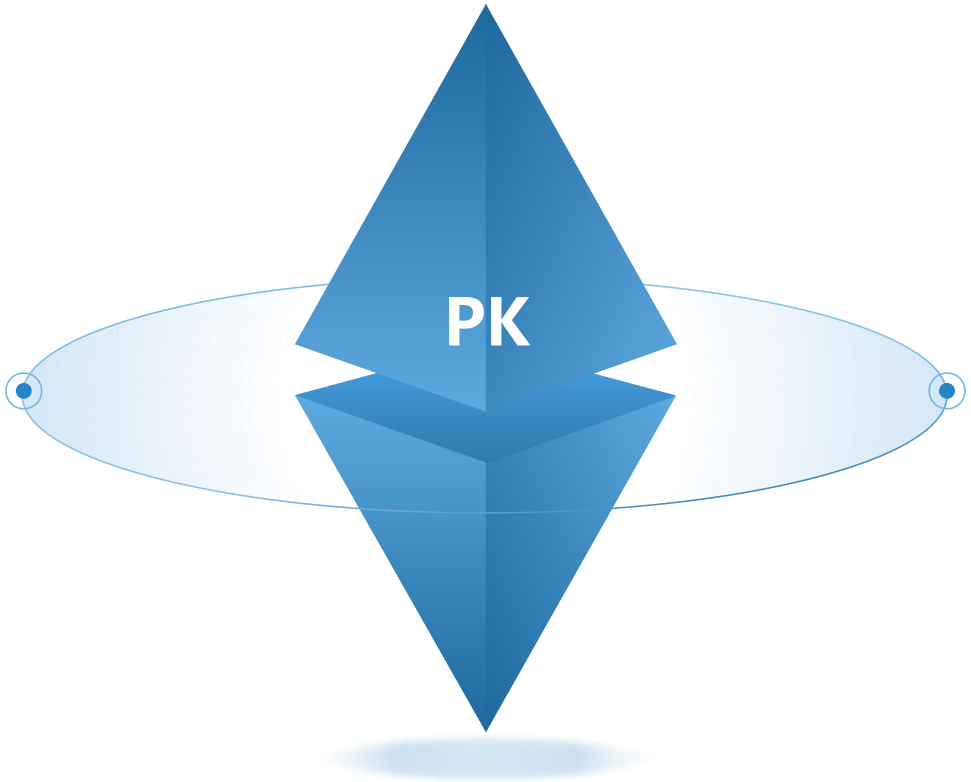
Comparison of Pre-treatment Steps

SCICHRO	Conventional methodologies	International Methodology
✓ Through purification, significantly simplifying the pre-treatment steps. ✓ Protein precipitation & purification in a single step	Tedious extraction, dispersion solid-phase extraction purification steps	➢ Traditional liquid-liquid extraction methods are characterized by their laborious procedures.

Sample Load Comparison

SCICHRO

Draw a serum sample of **50 μL** and add the internal standard solution to the HMR purification tube separately...



Conventional &International Approaches

Withdraw **200μL** of serum sample and internal standard solution into a 1.5mL centrifuge tube...

A smaller sample volume is required. Traditional 96-well plates require a 200μL sample, whereas the HMR S-micro 96-well plate only requires 50μL, significantly saving precious samples.

Pre-treatment Duration Comparison

Note: For the purpose of this study, 30 samples were used.

SCICHRO（47min)

① Add 50 µL of serum sample and internal standard solution into the HMR purification tube, then slowly add 200 µL of acetonitrile along the tube wall. Let it stand for 5 minutes to allow protein precipitation (approximately 7 minutes).

② Apply positive pressure and wait for the liquid to drip slowly. Gradually increase the pressure to ensure no liquid remains in the purification tube (approximately 5 minutes).

③ Repeat the extraction once with 200 µL of acetonitrile under positive pressure (approximately 5 minutes).

④ Place the collection plate containing the filtered solution in a nitrogen evaporator and evaporate to near dryness. Reconstitute with 50 µL of methanol-water solution (50:50) and proceed with measurement (approximately 30 minutes).

Traditional Methods (1h 40min)

①Take 200 µL of serum sample and internal standard solution into a 1.5 mL centrifuge tube; add 1 mL of methanol solution, vortex to mix, and sonicate for 15 minutes (approximately 18 minutes total).

②Transfer the supernatant to a new centrifuge tube and centrifuge for 10 minutes (approximately 18 minutes total).

③Repeat the extraction with 1 mL of methanol solution (approximately 30 minutes).

④Combine the supernatants and add 50 mg of PSA, mix well, and shake for 10 minutes.

⑤Evaporate the supernatant to dryness under nitrogen; reconstitute with 200 µL of methanol-water (50:50) solution and analyze using the instrument (approximately 30 minutes).

International Methods (3h 10min)

Transfer 200 µL of serum sample and internal standard solution into a 1.5 mL centrifuge tube.;

① Add 2 mL buffer solution (Na_2CO_3 5.30 g, $NaHCO_3$ 4.20 g dissolved in 200 mL water, concentration 0.25 mol/L, pH = 10),

② 1 mL TBAHS solution (17.00 g tetrabutylammonium hydrogen sulfate dissolved in 100 mL water, 0.5 mol/L),

③ 4 mL methyl tert-butyl ether (complex solution preparation, approximately 60 minutes).

Shake for 20 minutes, centrifuge, and collect the supernatant (approximately 30 minutes).

Repeat the extraction twice with the above extraction solution (approximately 60 minutes).

Combine the supernatants, evaporate to dryness under nitrogen (approximately 40 minutes).

Redissolve in 200 µL methanol-water (50:50) solution, and proceed with instrument analysis.

Pre-treatment Duration Comparison

SCICHRO

Sample preparation requires minimal material and involves a simple pre-treatment process that can be completed in approximately one hour.

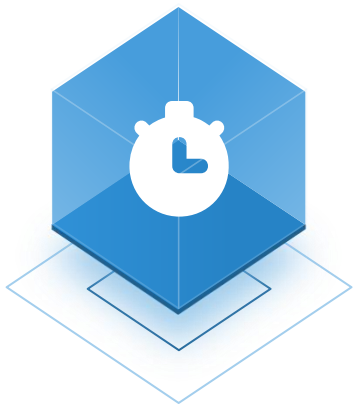
Traditional&International Methods

The traditional methods, such as repeated ultrasonic extraction, vortexing, and centrifugation, are time-consuming and require 2-4 hours due to the complex steps involved.

This method significantly reduces preparation time. While conventional techniques require repeated liquid-liquid extractions, ultrasonic centrifugation, and tube changes, our method only involves using the HMR S-micro 96-well plate, making the process simpler, more efficient, and time-saving.

Additionally, the 96-well plate format enables the simultaneous high-throughput processing of 96 samples, further improving efficiency.

Required Reagent Comparison



SCICHRO

A single extraction requires only 200μL of acetonitrile, and two extractions require just 400μL of acetonitrile.

Traditional Methods

Two repeated extractions require 2mL of methanol and the addition of 50mg of PSA, which is cumbersome and time-consuming for weighing.

International Methods

The preparation of buffer solutions is cumbersome, requiring 4 mL of methyl tert-butyl ether for a single extraction, and repetitive extraction operations are tedious with significant reagent consumption.

Reduced reagent consumption. Compared to traditional and international methods, the amount of reagent used is smaller, making it more environmentally friendly.

Comparison of Purification Efficiency

SCICHRO

The unique pre-filtering design of the micro-column effectively removes certain impurities from the sample; the innovative inorganic enhanced lipid-removal material eliminates lipid and protein interferences in a single step.

Traditional&International Methods

Traditional liquid-liquid extraction and PSA purification methods result in incomplete removal of phospholipids and protein impurities, which affects the efficiency of purification.

Enhanced purification efficiency, furthermore, HMR-Lipid specifically adsorbs phospholipid groups, effectively eliminating matrix effects caused by phospholipids.

Conclusion

Lower sample volume

Only 50 μL of sample is required, significantly conserving valuable material.

Reduced experimental steps

The entire process can be carried out in a single small column, reducing the number of experimental steps and conserving laboratory consumables.;

Method advantage

High recovery rate

The column efficiency far exceeds that of traditional SPE, providing a higher number of theoretical plates, with a stable recovery rate around 90%.

Effective impurity removal

Protein precipitation and phospholipid removal are completed in one step, effectively eliminating the interference of proteins and phospholipids from serum in the experimental results.

Expandable to all blood sample pretreatment for lipid and debris removal