

An innovative approach to sample preparation based on chromatographic principles.

Thermo Scientific TurboFlow Technology

Automated online sample preparation

- **Minimize sample preparation – simplifies complex sample preparation protocols**
- **Reduce ion suppression – achieves better data quality**
- **Simplify method development – uses the same method for different matrices**
- **Save time – injects samples directly into LC/MS system**

Thermo Scientific TurboFlow technology is an automated online sample preparation technique for complex matrices for the mass spectrometer. It enables users to inject complex matrices such as food, plasma, urine and other biological matrices directly into the mass spectrometer – without prior sample pretreatment.

Labs around the world are simplifying their methods by performing sample preparation and liquid chromatography together in one step. Save money effortlessly and boost productivity, without compromising data quality or sensitivity.

TurboFlow™ technology combines the principles of turbulence, diffusion and chemistry to quickly eliminate matrix interferences while capturing analytes of interest. The ability to analyze complex samples with high sensitivity using minimal resources is the direct result of TurboFlow technology.

Thermo Scientific Transcend TLX system is powered by TurboFlow technology



**Less Steps,
Faster Results**

Liquid-Liquid Extraction (LLE)

1. Aliquot of sample
2. Spike with IS
3. Add buffer
4. Add MTBE
5. Shake 10 min
6. Centrifuge
7. Remove organic
8. Evaporate to dryness
9. Reconstitute
10. Transfer to plate
11. Inject onto column

Solid Phase Extraction (SPE)

1. Aliquot of sample
2. Spike with IS
3. Add 0.1N HCL
4. Condition sorbent
5. Add sample to sorbent
6. Wash
7. Evaporate
8. Reconstitute
9. Transfer
10. Inject onto column

Protein Precipitation (PPT)

1. Aliquot of sample
2. Spike with IS
3. Add acetonitrile
4. Centrifuge
5. Remove supernatant
6. Reconstitute
7. Transfer to plate
8. Inject onto column

TurboFlow Method

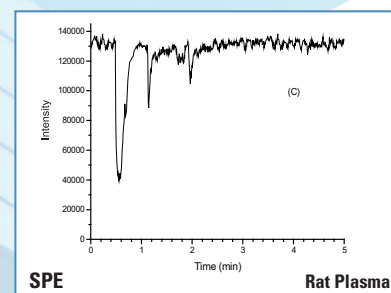
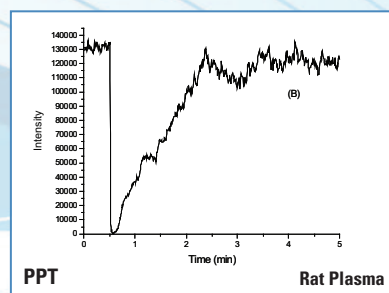
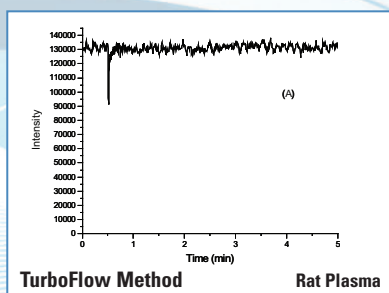
1. Aliquot of sample
2. Spike with IS
3. Centrifuge
4. Inject onto column

TurboFlow methods enable users to remove most of the time-consuming steps required by traditional sample preparation methods – maximizing sample throughput while minimizing errors and variability.

Minimize Sample Preparation

TurboFlow technology eliminates up to 2/3 of the sample preparation steps required by traditional methods, such as liquid-liquid extraction. Automated online sample

preparation techniques enable TurboFlow methods to prepare and analyze samples up to 95% faster than traditional methods.

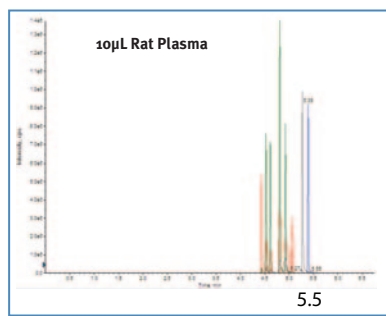
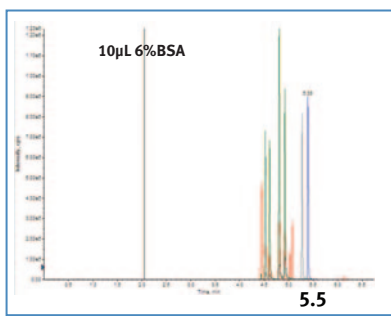
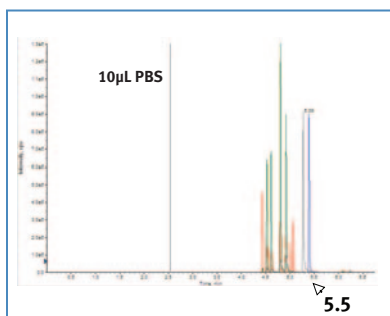


Three chromatograms show an analyte directly injected into a mass spectrometer followed by the addition of rat plasma. The TurboFlow method shows no significant ion suppression, while a drop in the signal is evident in the both PPT and SPE methods.

Reduce Ion Suppression

TurboFlow technology effectively removes sample components and matrix interferences that typically cause ion suppression. In a recent study, raw plasma samples analyzed with TurboFlow technology produced no ion suppression.

A direct comparison of various sample preparation methods demonstrates less ion suppression with TurboFlow methods.



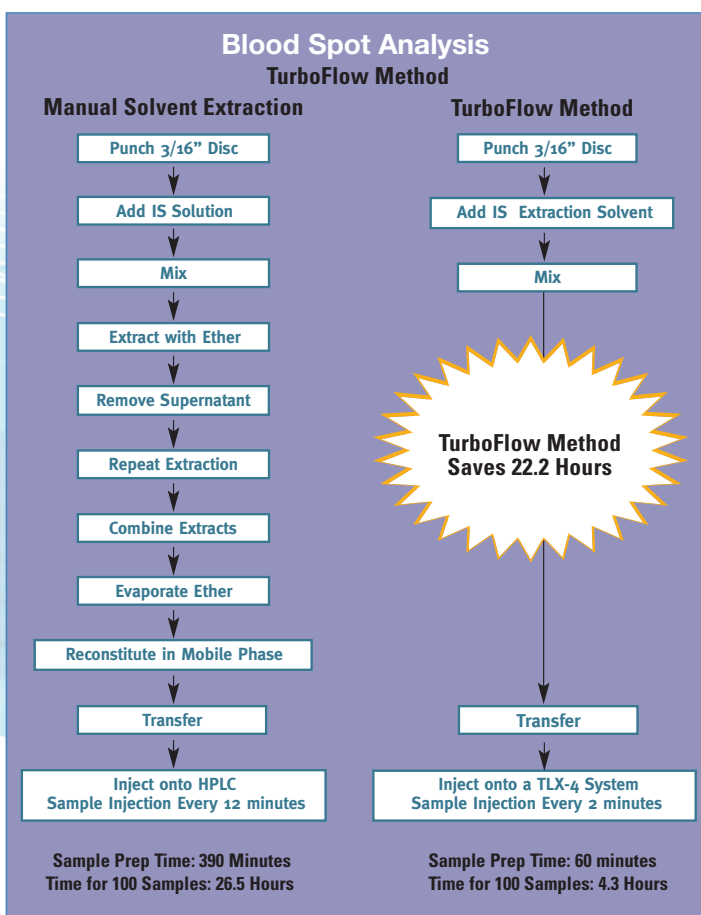
The same TurboFlow method was used for multiple matrices (PBS, BSA, and rat plasma) thus eliminating the need to spend weeks developing individual methods for each.

Simplify Method Development

Most often times your TurboFlow method can be transferred to different matrices, eliminating time-consuming method development, which can take weeks.

Save Time

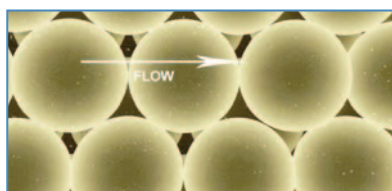
TurboFlow technology allows for direct injection of complex matrices, like food and biological fluids, making screening with LC/MS practical. Multi-step sample preparation protocols have been simplified as seen below with the blood spot protocol.



Turbulence: Enables Fast Separation

TurboFlow technology optimizes turbulence to separate analytes from food and biological samples prior to analysis with a mass spectrometer.

The mobile phase flows through the TurboFlow column creating high linear velocities, which are greater than what is typically seen in HPLC columns. The large interstitial spaces between the column particles and the high linear mobile phase velocity creates turbulence within the TurboFlow column.

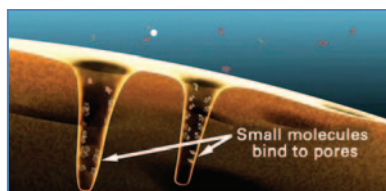


Diffusion: Separates Large and Small Molecules

TurboFlow technology leverages the difference in diffusion rates of small and large molecules.

The mobile phase quickly flushes the large sample molecules through the column to waste. The small sample molecules, which have a higher diffusion rate than the large sample molecules, interact with the stationary phase and diffuse into the particle pores.

Compared to alternate online sample preparation techniques, TurboFlow technology is the most efficient at removing large molecules based on size exclusion – resulting in the cleanest samples entering the mass spectrometer.

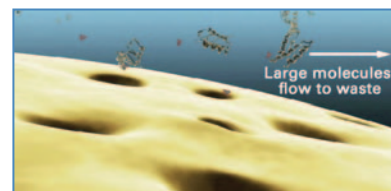


Chemistry: Retains Small Molecules

TurboFlow technology employs chemistry to further separate analytes from other sample molecules. The patented TurboFlow columns, used with the Transcend™ TLX system, are the only columns available to perform turbulent flow chromatography.

Of the sample molecules that enter the pores, those that have an affinity to the chemistry inside the pores bind to the column particles' internal surface. The small sample molecules with a lower binding affinity quickly diffuse out of the pores and are flushed to waste.

A mobile phase change then elutes the small molecules that were bound by the TurboFlow column to the mass spectrometer or to a second analytical LC column for further separation.

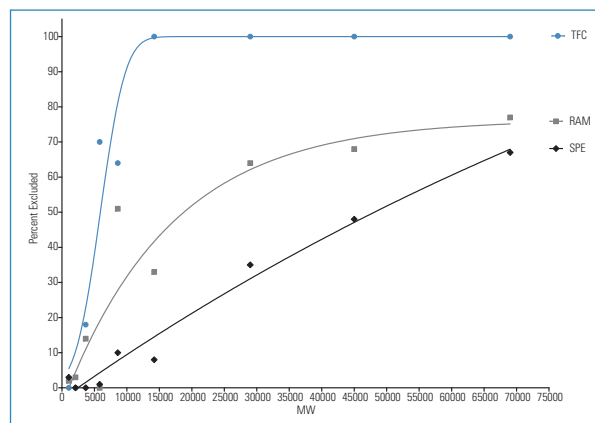


TurboFlow Columns:

TurboFlow columns perform two types of separation, size exclusion and chromatography, and are available in a variety of column chemistries to accommodate different analyte types.

TurboFlow columns effectively remove large molecules, which are the primary interference in a biological matrix. When compared to alternate online sample preparation methodologies, such as restricted access media (RAM) and SPE, TurboFlow columns are the most efficient at removing proteins based on their size, resulting in better quality data.

TurboFlow columns can be used exclusively with Transcend TLX systems.



Comparison of online sample clean-up methods. TurboFlow technology is superior in removing protein matrices compared to SPE and RAM columns, resulting in better quality data.

(Email TurboFlow@thermo.com to request the complete application note.)

For Research Use Only. Not for use in diagnostic procedures.

www.thermoscientific.com/turboflow

©2010 Thermo Fisher Scientific Inc. All rights reserved. All trademarks are the property of Thermo Fisher Scientific Inc. and its subsidiaries. Specifications, terms and pricing are subject to change. Not all products are available in all countries. Please consult your local sales representative for details.

Africa-Other +27 11 570 1840
Australia +61 3 9757 4300
Austria +43 1 333 50 34 0
Belgium +32 53 73 42 41
Canada +1 800 530 8447
China +86 10 8419 3588
Denmark +45 70 23 62 60

Europe-Other +43 1 333 50 34 0
Finland/Norway/Sweden +46 8 556 468 00
France +33 1 60 92 48 00
Germany +49 6103 408 1014
India +91 22 6742 9434
Italy +39 02 950 591

Japan +81 45 453 9100
Latin America +1 561 688 8700
Middle East +43 1 333 50 34 0
Netherlands +31 76 579 55 55
New Zealand +64 9 980 6700
Russia/CIS +43 1 333 50 34 0
South Africa +27 11 570 1840

Spain +34 914 845 965
Switzerland +41 61 716 77 00
UK +44 1442 233555
USA +1 800 532 4752



Thermo Fisher Scientific,
San Jose, CA USA is ISO Certified.

PS62287_E 12/10S

Thermo
SCIENTIFIC