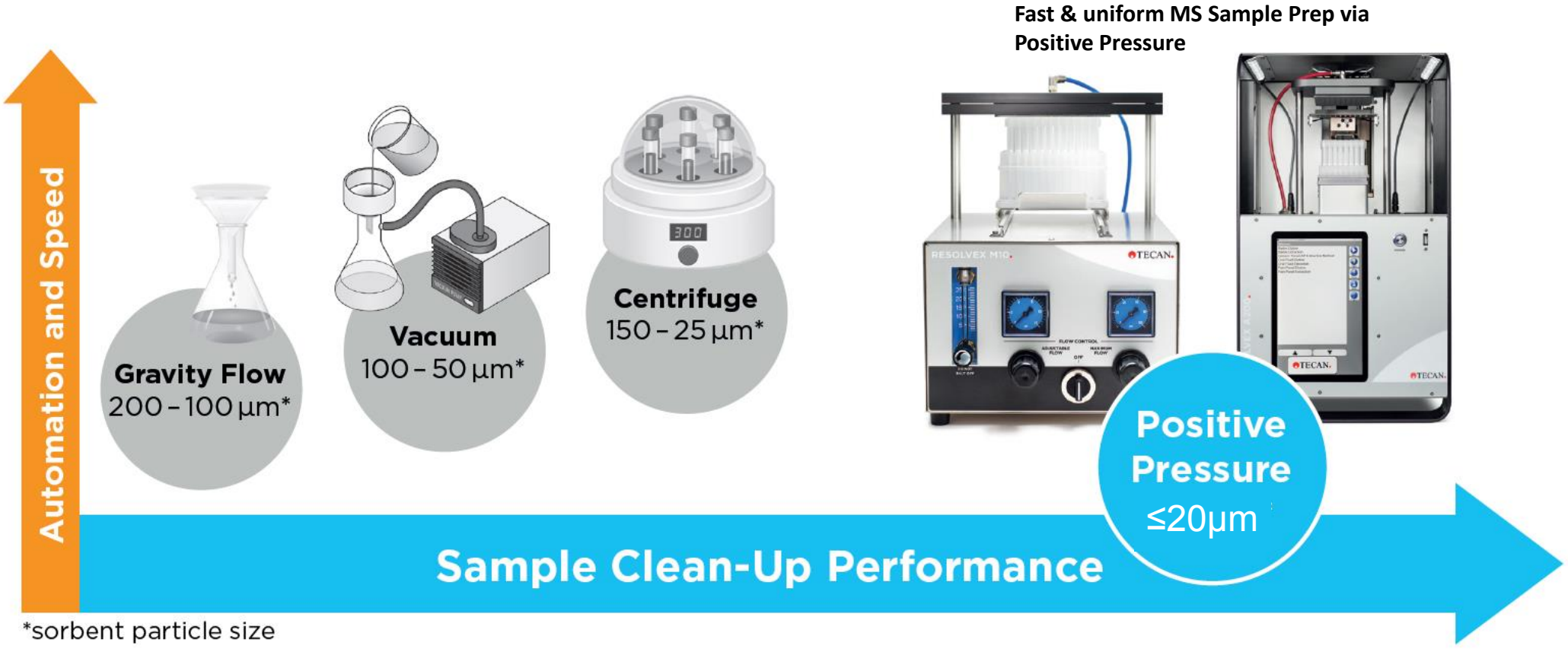
# Resolvex™
## Positive Pressure SPE

**CO-DEVELOPED INSTRUMENTS & SORBENTS**
**FOR THE MOST CHALLENGING MATRICES**
**IN SAMPLE PREPARATION**

TECAN.

# What is new with Tecan ?

## Positive Pressure as a universal tool for Solid Phase Extraction (SPE)




Combination of Positive Pressure Technology and Micro-particulate SPE columns results in faster sample and more consistent liquid flow compared to other commonly used technologies, *e.g.* as vacuum, centrifugation, gravity.

# Resolvex™ – key products for ppSPE

## Positive Pressure Workstations

## Smart Consumables

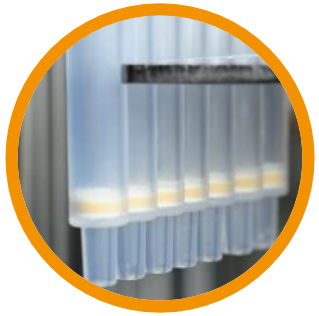
### RESOLVEX™ M10

Manual processor, very robust, uniform pressure flow!

### RESOLVEX™ A200

Automated processor, universal tool for sample prep!

### CEREX®



Micro Particle based SPE for positive pressure processing!

### NBE™


Advanced SPE featuring workflow consolidation!



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# Inspired by Developments in Liquid Chromatography

**from large to smaller particles** (micro-particulate sorbents)

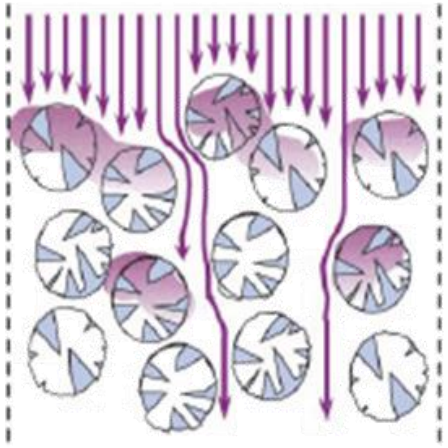

Figure 1 - 40 Micron Path

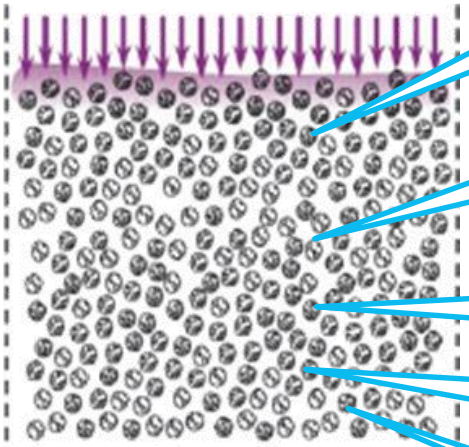

Figure 2 - 10 Micron Path

- Micro-particles
- Monodisperse
- Low Bed Mass
- High Capacity
- Polymeric

**40-80 µm particle size** classical sorbent bed size for gravity or vacuum applications. Large particle sorbents may exhibit significant analyte breakthrough during sample application. This is caused by the relatively large flow paths between sorbent particles, allowing analytes to bypass contact with the sorbent.

**10 - 20 µm particle size made for positive pressure applications** enables better contact with analyte molecules as they pass through the sorbent bed. This results in more efficient and consistent analyte trapping, leading to higher analyte recoveries and more reproducible results.

## ...and using the Power of Positive Pressure

# Resolvex™ – new positive pressure SPE line

## Smart Consumables

In combination with **micro particulate** sorbents technology in CEREX/NBE columns, positive pressure works as universal tool to prep **metabolites**, **peptides** or **fatty acids**:

- Fast liquid flow
- High pressure applications
- Micro particle sorbent
- Clean up challenging matrices
- Small sample volumes

- NBE columns integrate several workflow steps
- NBE allow micro elution

**CEREX**

**NBE™**


**The SPE columns are optimized for use in positive pressure devices by its specific design and the use of micro particulate sorbents.**

**Classical SPE column/plate format for positive pressure.**

**The two chamber design to prevent liquid flow and as reaction vessel.**



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# NBE – the all-in-one ppSPE column

## Narrow Bore Extraction (NBE) Column

**Reaction Reservoir** enables in Column Incubation, Hydrolysis, Precipitation

**Filter** for initial sample clean up

**Air Lock** no liquid flow w/o Pressure

**Microparticulate Sorbent**
Small Sorbent Bed Size, high Flow Rate

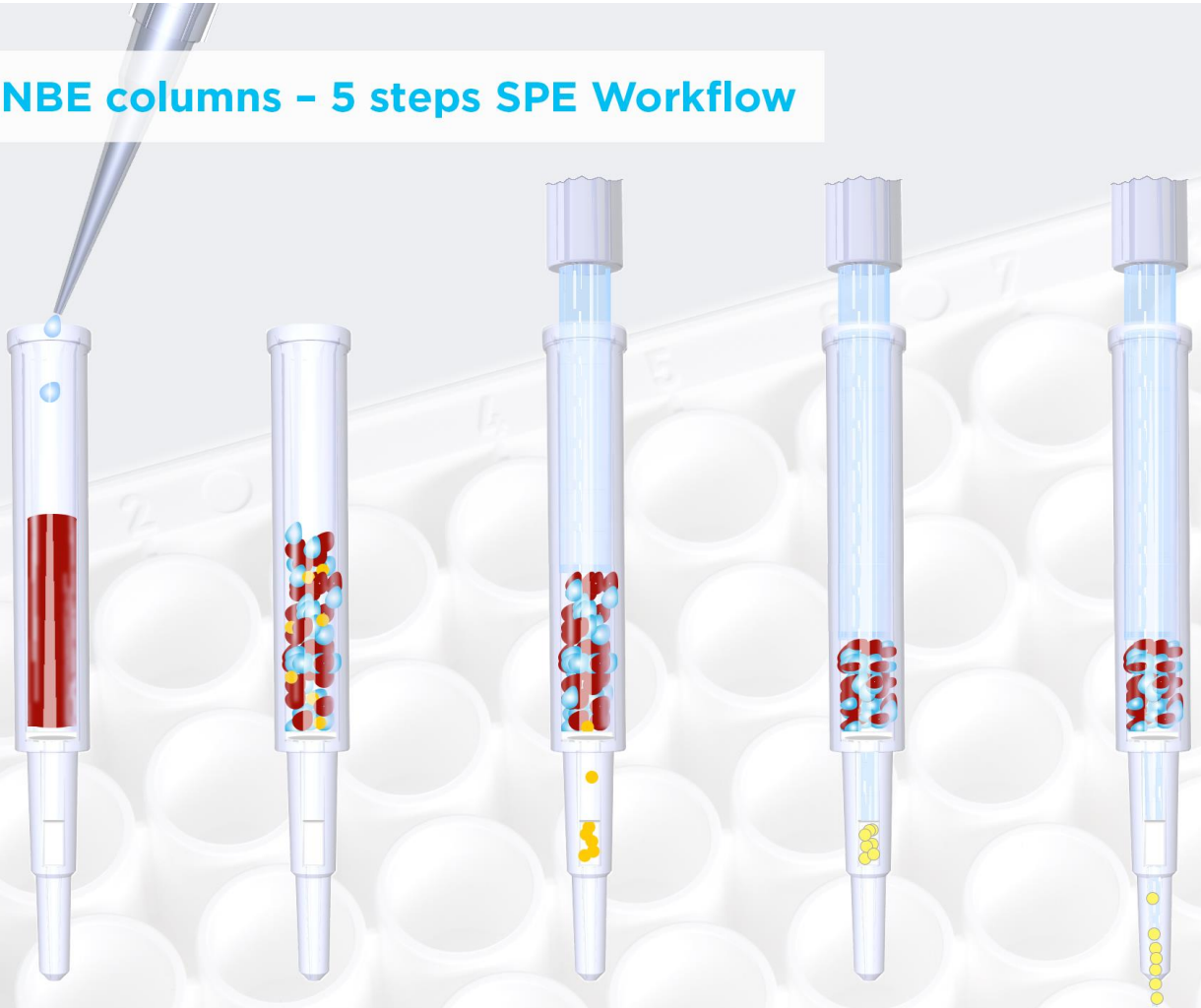
**Narrow bore outlet** directs small elution volume

Compared to classical SPE and SLE, NBE micro particulate columns provide faster flow rates, less solvent consumption and low elution volumes.

- New two chamber design for high SPE performance
- Micro particulate sorbent for high efficiency
- Integration of pre-SPE steps in reaction vessel
- Filter for matrix clean up
- Air lock prevents dripping
- Selection of sorbents for SPE or filtration

# NBE – the all-in-one ppSPE column

## NBE columns – 5 steps SPE Workflow



1. Pipette sample + solvent
2. Protein Crash, Incubation, Hydrolysis
3. Apply PP to overcome airlock and bind analyte
4. Sorbent Bed Drying by Positive Pressure
5. Wash & Elute by Positive Pressure

Compared to classical SPE and SLE, micro particulate columns provide several improvements:

- faster flow rates,
- less solvent consumption
- low elution volumes.



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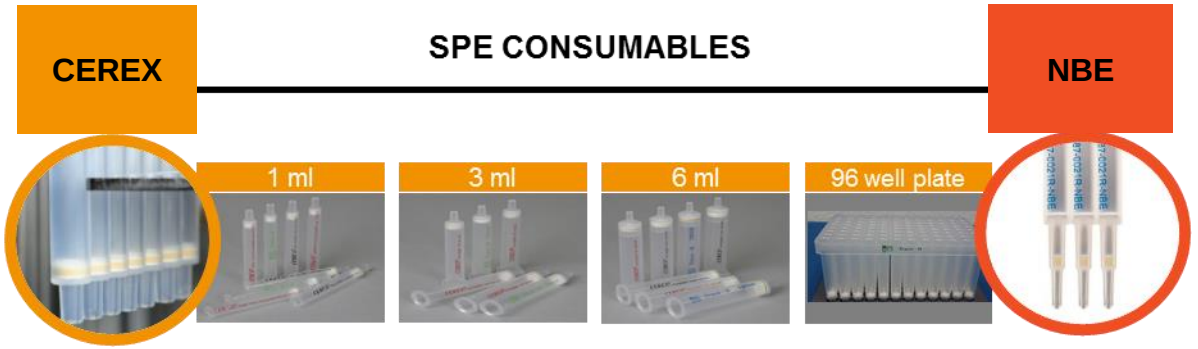
# **Positive Pressure** vs. other techniques

| | Positive Pressure SPE | Traditional SPE |
|---|---|---|
| Particles | **Micro-Particulate Polymeric Sorbent (≤ 20 µm)*** | **Large Particle Size (30 to 70 µm)** |
| | **Mono-Disperse Particles (Typically ± 2 µm)*** | **Big Particle Size Variation** |
| | Large Contact Zone for Analyte Interaction | Solvent Channeling Through Sorbent |
| | Fast and Uniform | Reproducibility Effects |
| Pressure | **Up to 5 bar Positive Pressure** | **Gravity, Vacuum, Centrifugation** |
| | Fast Flow Rates | Slow Flow Rates |
| | Single Well Pressure Control | Vacuum Reduction |
| | Handles Difficult or Viscous Matrices | Clogging of Single Wells |

* From Certificate of Analysis for the majority of polymeric sorbents used to manufacture T-SP SPE consumables

# Available Phases




| Phase Description | Phase Name |
|---|---|
| **Reversed Phase** | **WWP, WWP2,** Trace-N, Trace-N20 |
| **Mixed-Mode Anion Exchange** | **PSAX** |
| **Mixed-Mode Cation Exchange** | **PSCX** |
| **Strong Anion Exchange** | **HPSAX** |
| **Strong Cation Exchange** | **HPSCX** |
| **Weak Anion Exchange** | **PWAX** |
| **Weak Cation Exchange** | **PWCX** |
| **Special Applications** | Oral Fluids: **OFQC, OFXQ**;<br>Cannabinoid: **THC**; … |

Cerex and NBE consumables are optimized for use with positive pressure. The micro-particulate sorbents in plate or columns format (1, 3 & 6 ml) depending upon the phase have particle sizes typically ≤ 20 µm. The sorbent materials are hydrophobic polymer-based often requiring no conditioning and equilibration steps, can be dried and are stable in organic solvents. Bed mass ranges from 2.5-50 mg depending upon column size.
Trace-N sorbent materials are silica-based C18-bonded phase (endcapped).

# Application Examples

| Application Area | Analyte | Matrix | Suggested Column |
|---|---|---|---|
| **Vitamins** | **25-OH-Vitamin D** | Plasma | Trace-N |
| **Vitamins** | **Vitamin D Metabolites** | Plasma | Maestro |
| **Vitamins** | **Vitamin B** | Serum Plasma | Trace-N, Maestro |
| **Steroids** | **Testosterone, Cortisole and more** | Serum, Plasma | WWP2 |
| **Hormones** | **Thyroid Hormones (rT3,T3,T4)** | Serum, Plasma | THY II |
| **Drug Monitoring** | **Immunosuppressant Drugs** | Whole Blood | OFX |
| **Drug Monitoring** | **Buprenorphine, Norbuprenorphine, and Naloxone** | Urine, Oral Fluid | Trace-B, HPSCX |
| **Drugs of Abuse, Drug Monitoring** | **Broad Spectrum Drugs ("Pain Panel")** | Urine, Oral Fluid | OFX, HPSCX |
| **Drugs of Abuse** | **Nicotine and Nicotine Metabolites** | Serum, Plasma, Urine | PSCX, Trace B |
| **Drugs of Abuse** | **THC, THCA, Synthetic cannabinoids** | Oral Fluid, Urine | Trace-N, HPSAX, THC, PSCX |
| **Drugs of Abuse** | **Amphetamines/ Metamphetamines** | Urine, Whole Blood | HPSCX, Trace-B |
| **Drugs of Abuse** | **Benzodiazepines** | Urine, Whole Blood | HPSCX, Trace-B, Trace-J |
| **Drugs of Abuse** | **EtG/EtS** | Urine, Oral Fluid | EtGS, PSAX |
| **Life Science** | **Peptides, metabolites or fatty acids** | Serum, Plasma, Urine | NBE/CFP |

# Resolvex™ – new positive pressure SPE line


**M10 Positive Pressure Workstation**

- Positive pressure regulation from 0-5 bar
- Restricted-flow pressure manifold allows uniform pressure application
- Supports 1, 3, 6 ml (M10-48), or 1 ml cartridges, 96-well plates (M10-96)
- Operates NBE, Cerex or suitable third party columns
- Automatically adjusts to various plate heights or different columns sizes
- Column drying and slight evaporation function
- Difficult and dirty matrices
- Plug and Play, easy to operate

**Fast and uniform Sample Prep with Positive Pressure**

The manual M10 48/96 workstations featuring the core benefits of positive pressure technology coupled with ease of use, outstanding robustness and minimal maintenance for daily SPE sample preparation.

# Resolvex™ – new positive pressure SPE line

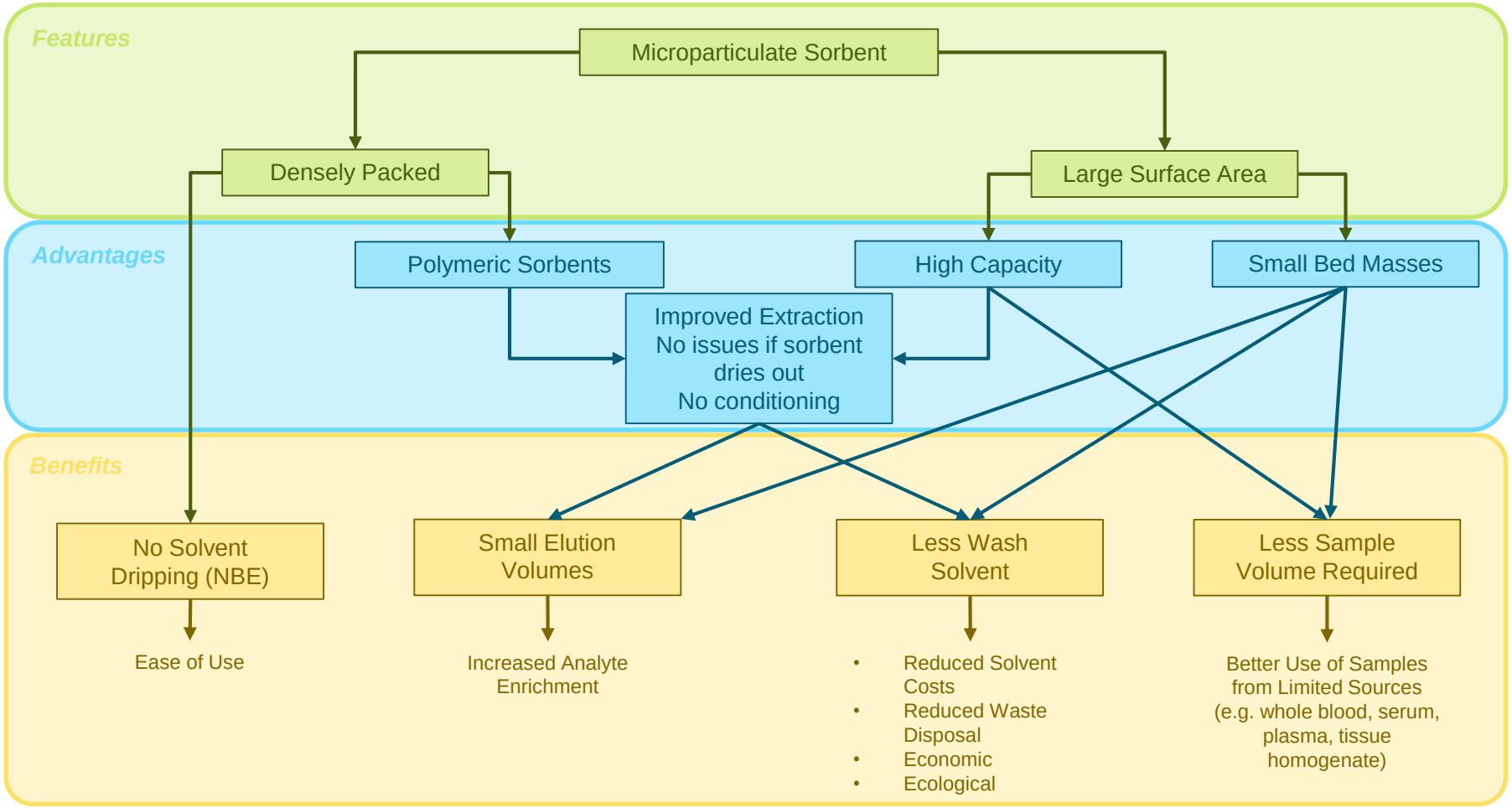

**A200 Positive Pressure Workstation**

- Programmable pressure profiles from 0-5 bar
- Automated 8-channel dispenser for 11 solvents
- Restricted-flow pressure manifold allows uniform pressure application
- Supports 96 well plates or variable number of framed 1ml colums
- Operates NBE, Cerex or suitable third party columns
- Automated column drying and slight evaporation function
- For difficult and dirty matrices
- Easy to learn and freely programmable via touch screen

**Fast and uniform Sample Prep with Positive Pressure**

The A200 automates SPE and provides reproducible sample preparation with minimized manual intervention. The system features variable pressure profiles for gentle or strong pressure application coupled with automated dispensing of wash and elution buffers.

# Key Differentiation of Tecan's Resolvex™ Technology are the microparticulate sorbents




Tecan's Resolvex™ portfolio comprises *Positive Pressure Instruments* and *Positive Pressure SPE Columns and Sorbents* that were co-developed with customers for the best possible SPE performance providing a number of clear advantages over conventional SPE.

# FAQ`s for Resolvex A200

1. **Since when is this device manufactured and when did it appear on the market?**
– Official Launch was March 8th 2018. Manufacturing began in August 2017
2. **How robust is the system? How often do breakages occur?**
– The A200 is the next generation instrument following on from the previous ALD3 instrument which was on the market in the US for over 5 years. The ALD3 has proven to be a robust system and we have made design improvements to the A200 that will make it even more robust. We have also performed simulated 5 year lifetime tests on the A200.
3. **Which parts of the device are most susceptible to breakdowns?**
– The silicone sealing gasket on the pressure manifold may need to be replaced every 12 months depending upon usage and solvents employed. We use a Cavro syringe pump for dispensing which may need replacing every few years, depending upon usage. Besides that, we do not anticipate any other high wear components that need frequent replacing. We do recommend purchasing a service contract as you would for any automated laboratory equipment.
4. **Is the interface of this device friendly to the user? Do you need some special qualification to work with it?**
– The user interface is extremely simple and intuitive and uses a touch screen and or mouse. No qualification needed.
5. **Which laboratories in Europe or USA already use this device? Can we get acquainted with their feedback?**
– We have sold hundreds of the ALD3 but since we just launched the A200 we only have a handful of labs right now using it.
6. **Are there any publications where this device is mentioned?**
– We are working on clinical proteomics and steroid posters for MSACL 2018.
7. **How is the process of pressure controlled, if we work with several cartridges? Can we control the pressure by installing only one SPE cartridge, with the expectation that the right pressure will then be maintained when working with multiple cartridges?**
– The manifold (both 48 and 96 place) have a restrictor for each port that is controlled to allow the correct flow. The restrictor will slow flow, (increase back pressure) ensuring equal flow to all the ports regardless if there is column in that position or not. That being said it is much easier to distribute even pressure through 48 ports and the 48 place manifold have the ability to shut of unused rows with a toggle switch on the top of the manifold. The 96 place manifold will have slightly lower flow to the columns if you are only running 10 columns instead of all 96. This is because gas will flow through the path of least resistance even with the restrictor valve. This is easily compensated by increasing pressure using the regulator.

# Application Support & Application Development

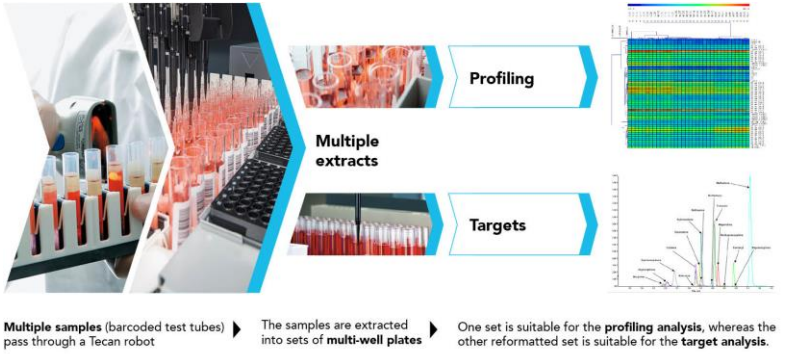
## CORE APPLICATION TEAM EU

Dr. Christian Scherling
Business Development
Analytical Chemistry & MS

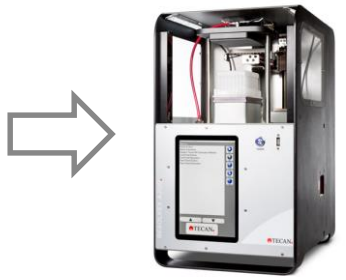
Dr. Jens Lättig
Key Account Management
Analytical Chemistry & MS

Shareef Jarvi Antar
Application Specialist
LCMS

## DEMO LAB IN HAMBURG




Freedom EVO



Resolvex™ A200
Resolvex™ M10-96
Resolvex™ M10-48

Sciex QTRAP 5500