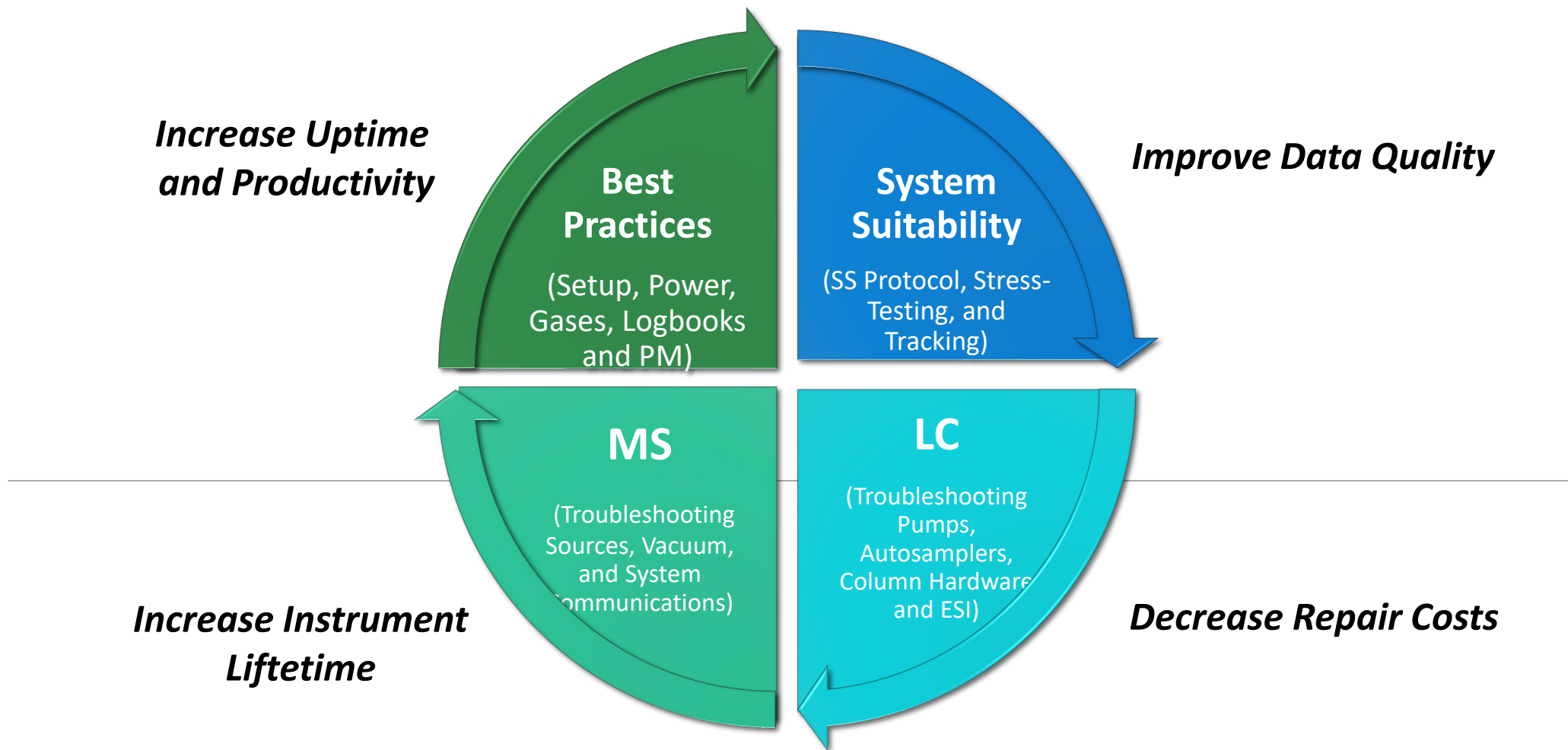


# Practical LC-MS Troubleshooting and Maintenance

Sue Abbatiello, Ph.D. (Northeastern University) and J. Will Thompson, Ph.D. (Duke University)



Every LC-MS user can work to hone their skills in troubleshooting and maintenance.

# Developing and Using System Suitability Testing (SST)

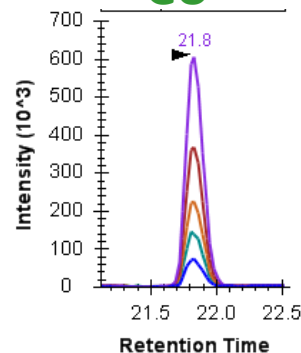
Establish Instrument Specific Ranges for

- RT Variability
- Peak Area
- Peak Width
- Carry over
- Column conditioning
- Sensitivity

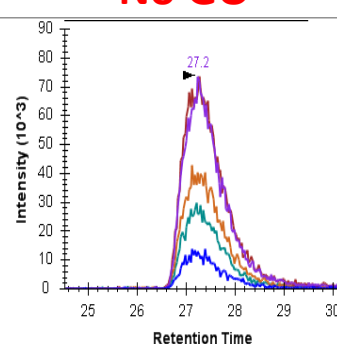


Define Pass/Fail Criteria

GO



No GO



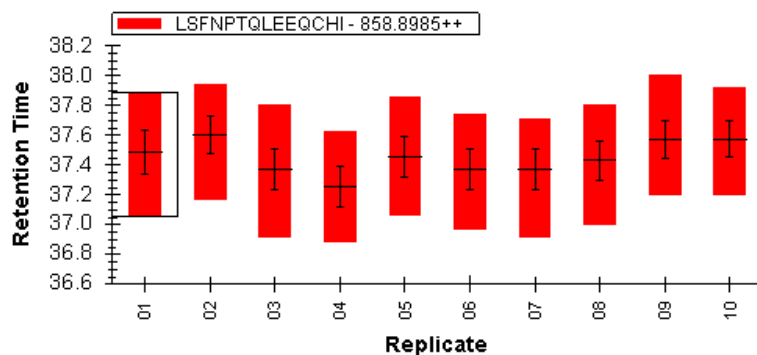
Troubleshoot Problems

- Autosampler
- HPLC pumps
- HPLC plumbing
- ESI stability
- MS sensitivity
- Sample loss

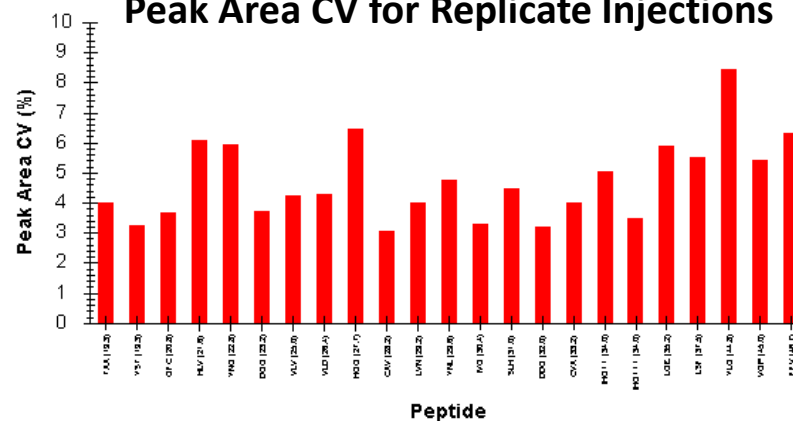


Track system performance over time




Retention Time Stability of Replicate Injections



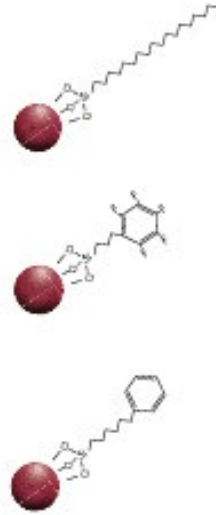
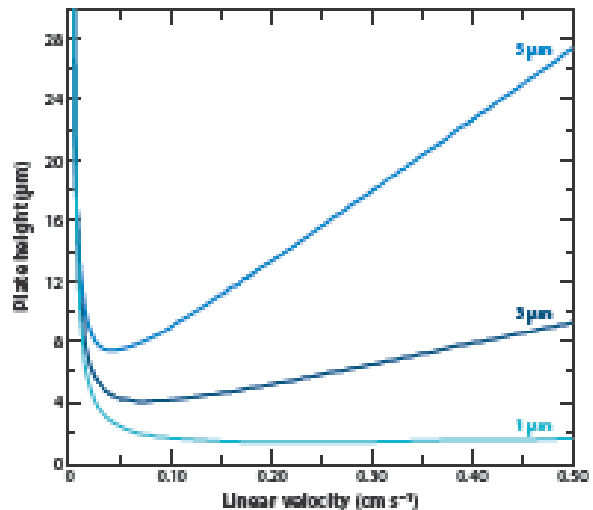
Peak Area CV for Replicate Injections



# Troubleshooting Chromatography Columns and Pumping Hardware

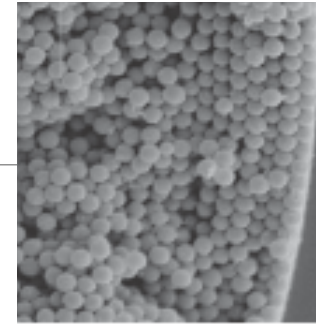
Column ID		
		
4.6 mm analytical	0.2 mm capillary	75 µm nano
1 mL/min	10-100 µL/min	200-600 nL/min

*Particle Diameter and Performance*



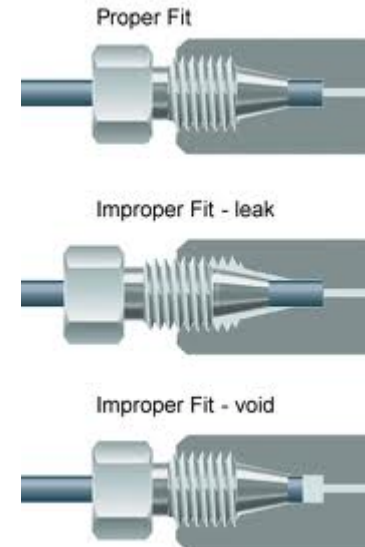
## Column Packing Material

- Stationary Phase
- Cation Exchange
- Normal Phase
- HILIC
- Reversed Phase (C18)



## Column Connections!

*Peak Shape and Sensitivity*



## To Trap or Not to Trap?



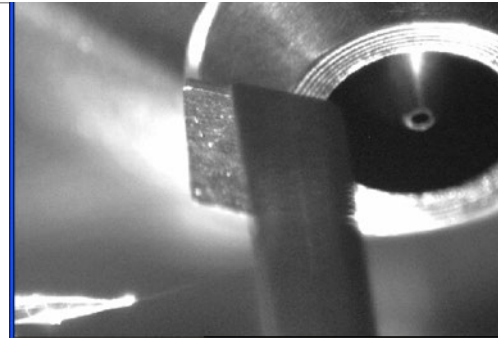
*Leaks, Gaps, and Overpressure Errors*

# Troubleshooting and Cleaning MS and Integrated System

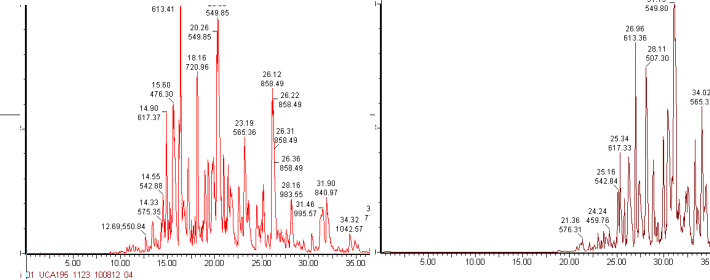
## Communications Issues

```
Thermo LTQ Orbitrap XL Instrument Console
1286 Trap Offset Calibration:
1287   Min value = 0.000000   Max value = 0.000000
1288 End Section Offset Calibration:
1289   endscope = 0.000000   endscint = 12.000000
1290 Reagent Ion Isolation Calibration:
1291   HD1slope = 5.990099   HD1int = -7.433474
1292 ITO executed: RECOMPILE(TempITCL2),TempITCL2():
1293   result = 0.000000
1294 Adjusting Readbacks.
1295 Initializing waveform buffer...
1296 Initializing background waveform...
1297 Background Ionization Waveform Rescale Factor: 501.091937
1298 Background Isolation Waveform Rescale Factor: 899.818604
1299 Background High Mass Isolation Waveform Rescale Factor: 791.732178
1300 Initializing tuning parameters...
1301 Source ID Readback Voltage is 1.946718
1302 Ion source type = ESI.
1303 Testcode ID(0): 3.000000 0.000000 0.000000 0.000000
1304 Recompile function TempITCL1
1305 Testcode 300(0): 0.000000 0.000000 1.000000 0.000000 0.000000
1306 Testcode 300(0): 0.000000 0.000000 1.000000 0.000000 0.000000
1307 Testcode 300(0): 0.000000 0.000000 1.000000 0.000000 0.000000
1308 Testcode 300(0): 0.000000 0.000000 1.000000 0.000000 0.000000
1309 Signal 11
```

## ESI Assembly, Cleaning and Tuning



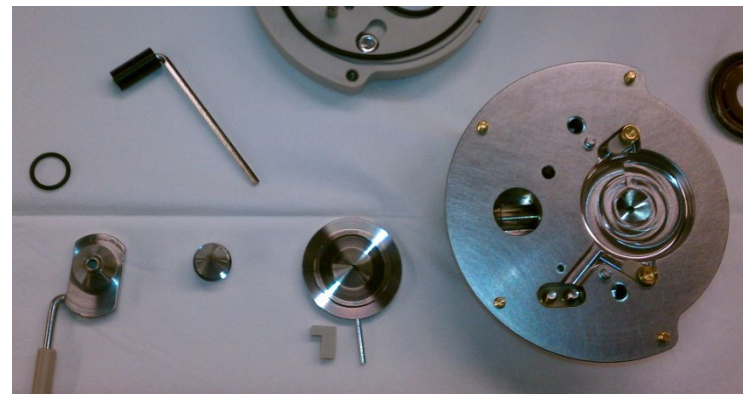
## Retention Shift and Peakshape Degradation



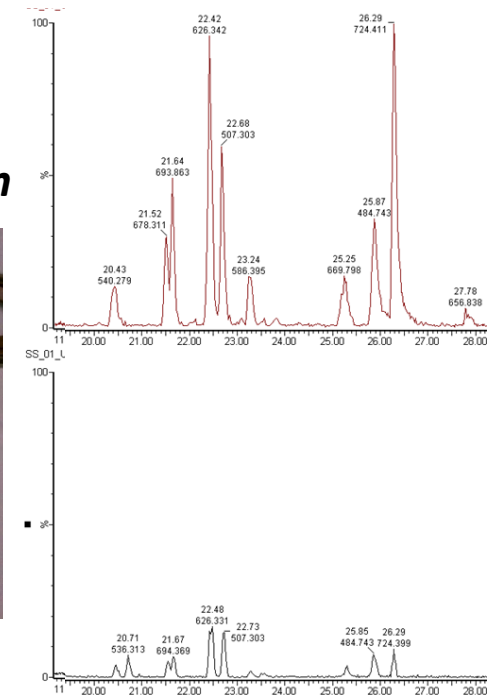
## Cleaning Techniques



## Source and Ion Optics Contamination



## Sensitivity Losses



Among others...