

# Optimizing Your Laboratory Workflow in a Contract Research Environment

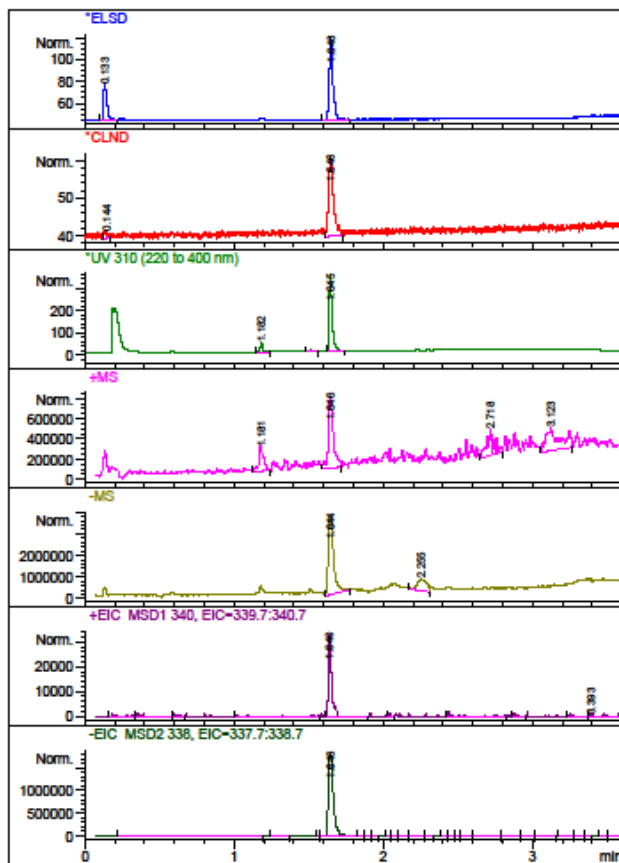


Kenneth Lewis, Ph.D.  
OpAns, LLC  
RTP, NC

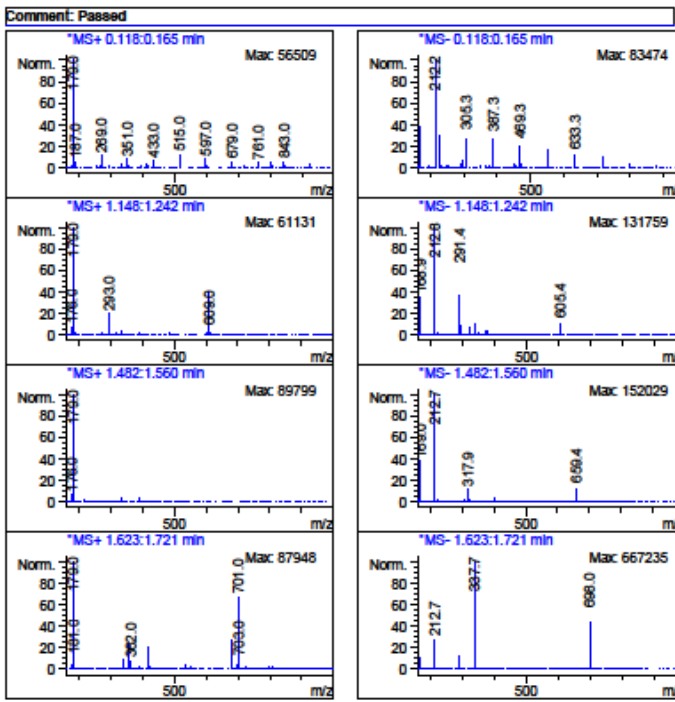


# Synthesis Support - HPLC/DAD/ELSD/CLND/±MS

ID Tox21\_400050 Plate Batch2-SP109720 Well P1-A-17 File SP109720-A17.D Inj Date: 21 Aug 11 7:40 pm MF C14H13NO7S MW 339.0 Expected Conc: 3.00 mM

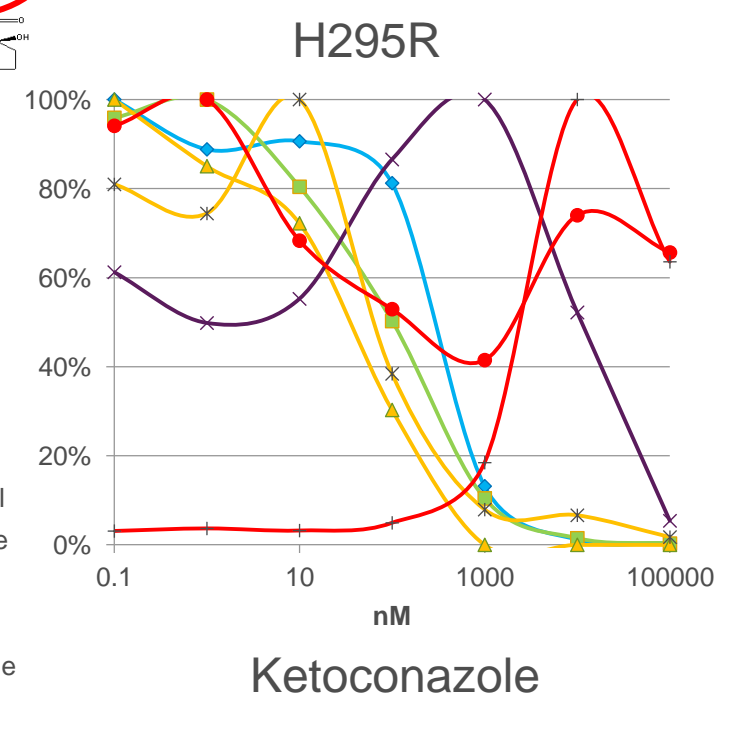
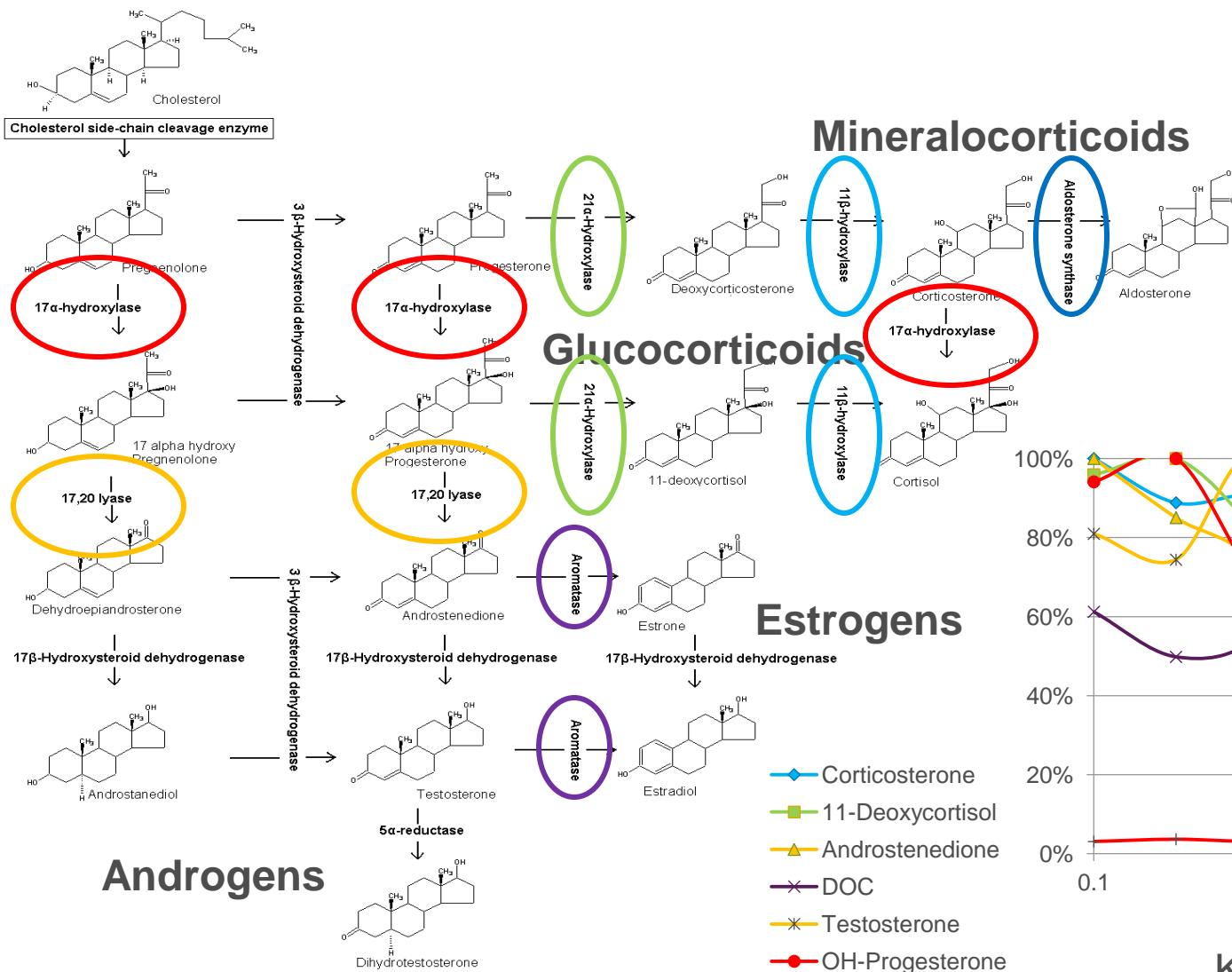


| RT   | Found | ELS% | UV % | ELS[mg/mL] | Adj [ELS] | [N mM]  | Adj [CLN] | #N  |
|------|-------|------|------|------------|-----------|---------|-----------|-----|
| 0.13 |       | 26.6 | 0.0  | 0.2        |           | 0.1 mM  |           | 1.0 |
| 1.18 |       | 0.0  | 9.6  |            |           |         |           | 1.0 |
| 1.52 |       | 0.0  | 1.7  |            |           |         |           | 1.0 |
| 1.65 | Yes   | 73.4 | 88.8 | 0.53       | 1.55 mM   | 1.74 mM | 1.74 mM   | 1.0 |

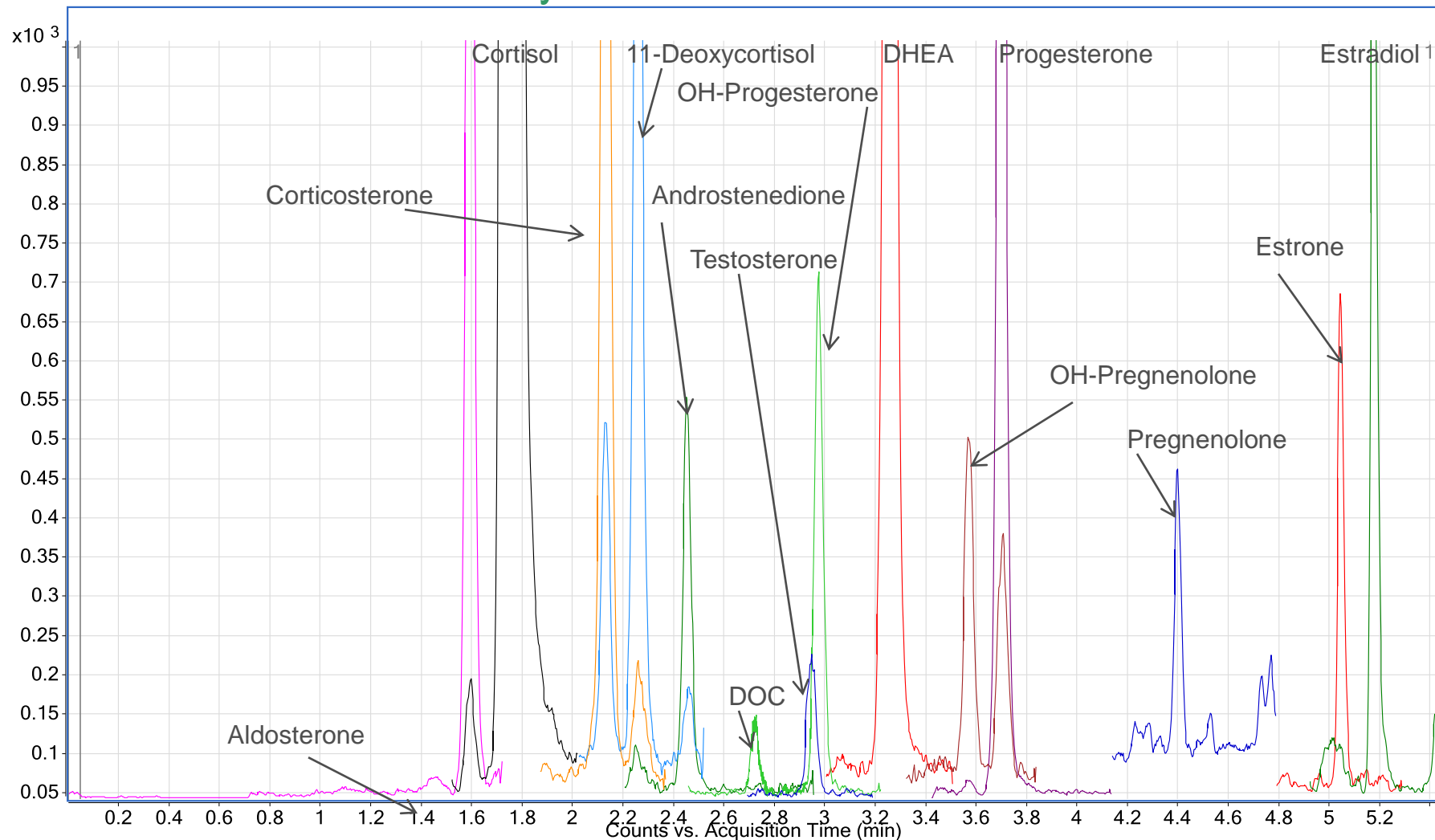


OpAns\_Process.MAC Version A.01.10 - Dec 9, 2010

# In-Vitro Assay - H295R Example -



# In-Vivo - Female Monkey Plasma

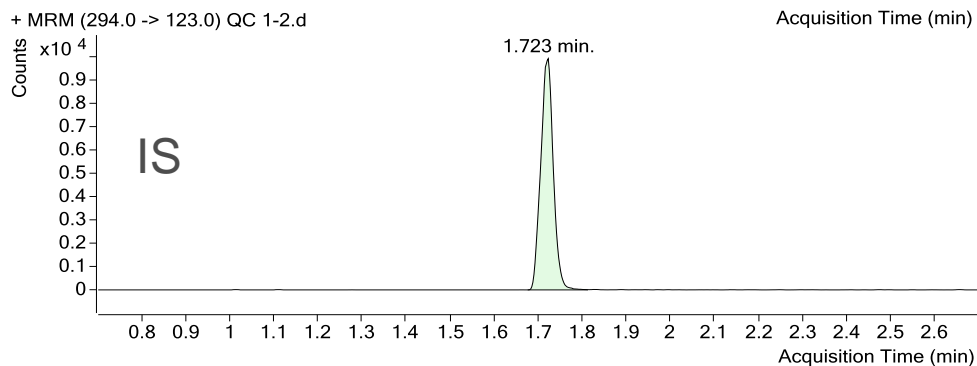
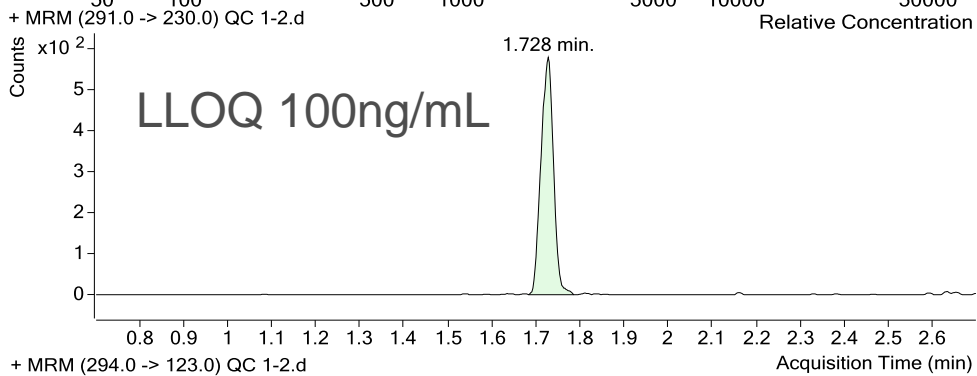
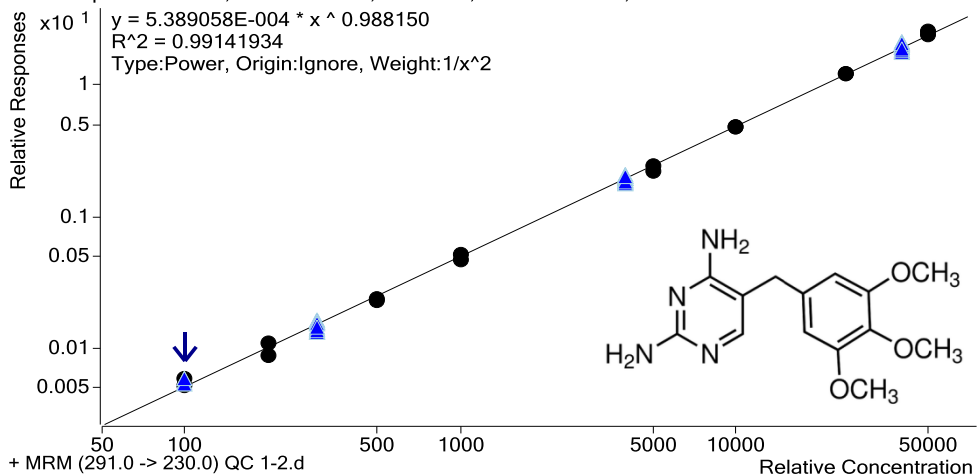


200uL plasma extracted/ 10uL injected

Reversed Phase HPLC on Agilent 1200SL/6430 QQQ with ESI

# Clinical Trial - Trimethoprim DBS

Trimethoprim - 8 Levels, 8 Levels Used, 16 Points, 16 Points Used, 72 QCs



| Spot Volume | Specified Conc. | Measured Conc. | Accuracy | (%CV) |
|-------------|-----------------|----------------|----------|-------|
| 15 $\mu$ L  | 4000 ng/mL      | 4037.62        | 98.9     | 2.1   |
|             |                 | 3918.52        |          |       |
| 3850.77     |                 |                |          |       |
| 3938.95     |                 |                |          |       |
| 4042.32     |                 |                |          |       |
| 45 $\mu$ L  |                 | 4026.06        | 101.7    | 2.1   |
|             |                 | 4147.27        |          |       |
|             |                 | 4036.52        |          |       |
|             | 4172.00         |                |          |       |
|             |                 | 3967.94        |          |       |

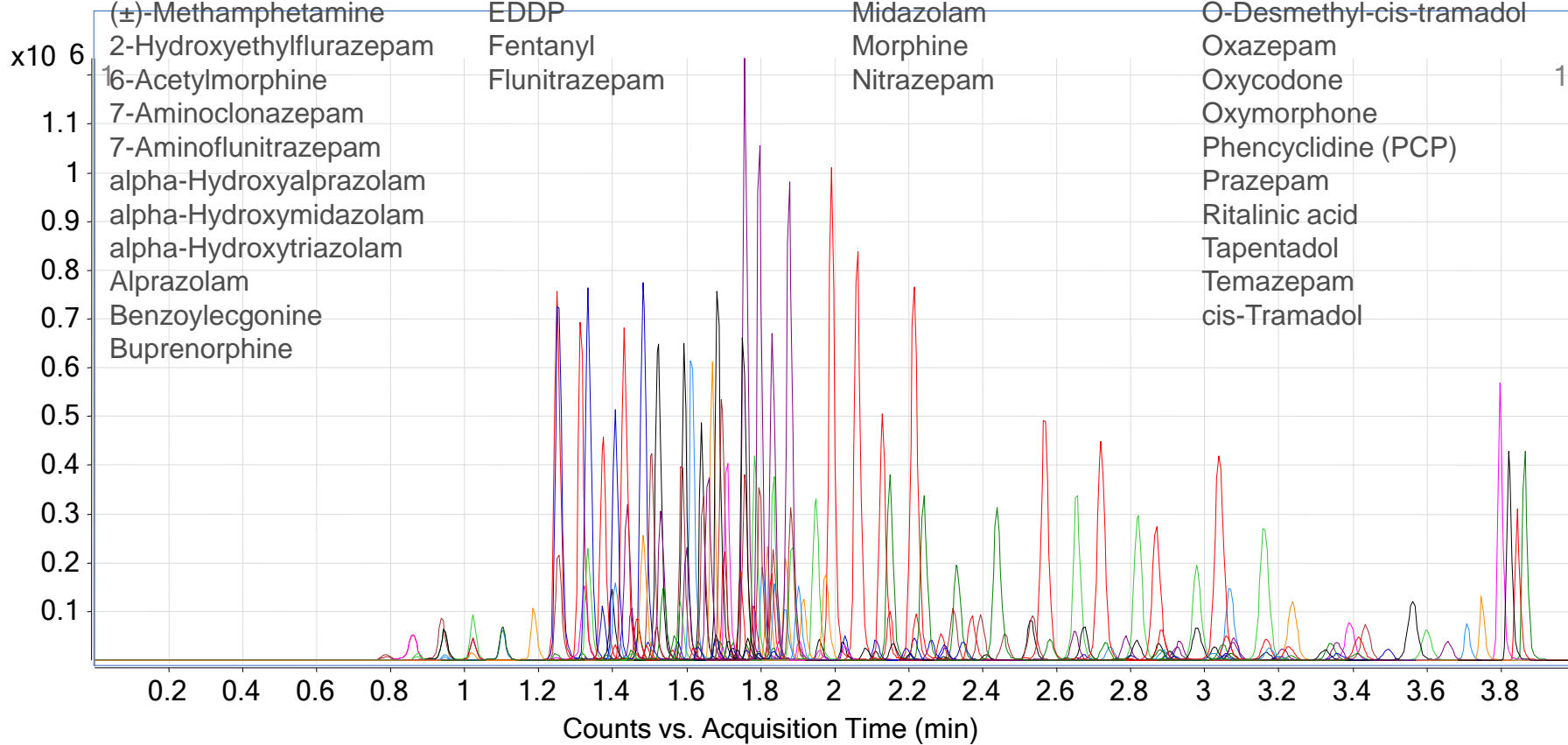
| Hematocrit | Specified Conc. | Measured Conc. | Accuracy | Precision (%CV) |
|------------|-----------------|----------------|----------|-----------------|
| 25 %       | 300 ng/mL       | 267.06         | 88.5     | 2.7             |
|            |                 | 260.02         |          |                 |
|            |                 | 261.70         |          |                 |
|            |                 | 261.06         |          |                 |
|            |                 | 277.21         |          |                 |
| 75 %       |                 | 263.15         | 93.4     | 6.0             |
|            |                 | 280.94         |          |                 |
|            |                 | 306.70         |          |                 |
|            |                 | 282.22         |          |                 |
|            |                 | 268.03         |          |                 |
| 25 %       | 40,000 ng/mL    | 36802.57       | 94.9     | 3.0             |
|            |                 | 38513.23       |          |                 |
|            |                 | 36722.89       |          |                 |
|            |                 | 39216.33       |          |                 |
|            |                 | 38616.87       |          |                 |
| 75 %       |                 | 44918.08       | 106.6    | 5.8             |
|            |                 | 42689.11       |          |                 |
|            |                 | 44020.08       |          |                 |
|            |                 | 38486.66       |          |                 |
|            |                 | 43178.73       |          |                 |

Agilent 6410, Poroshell EC C18



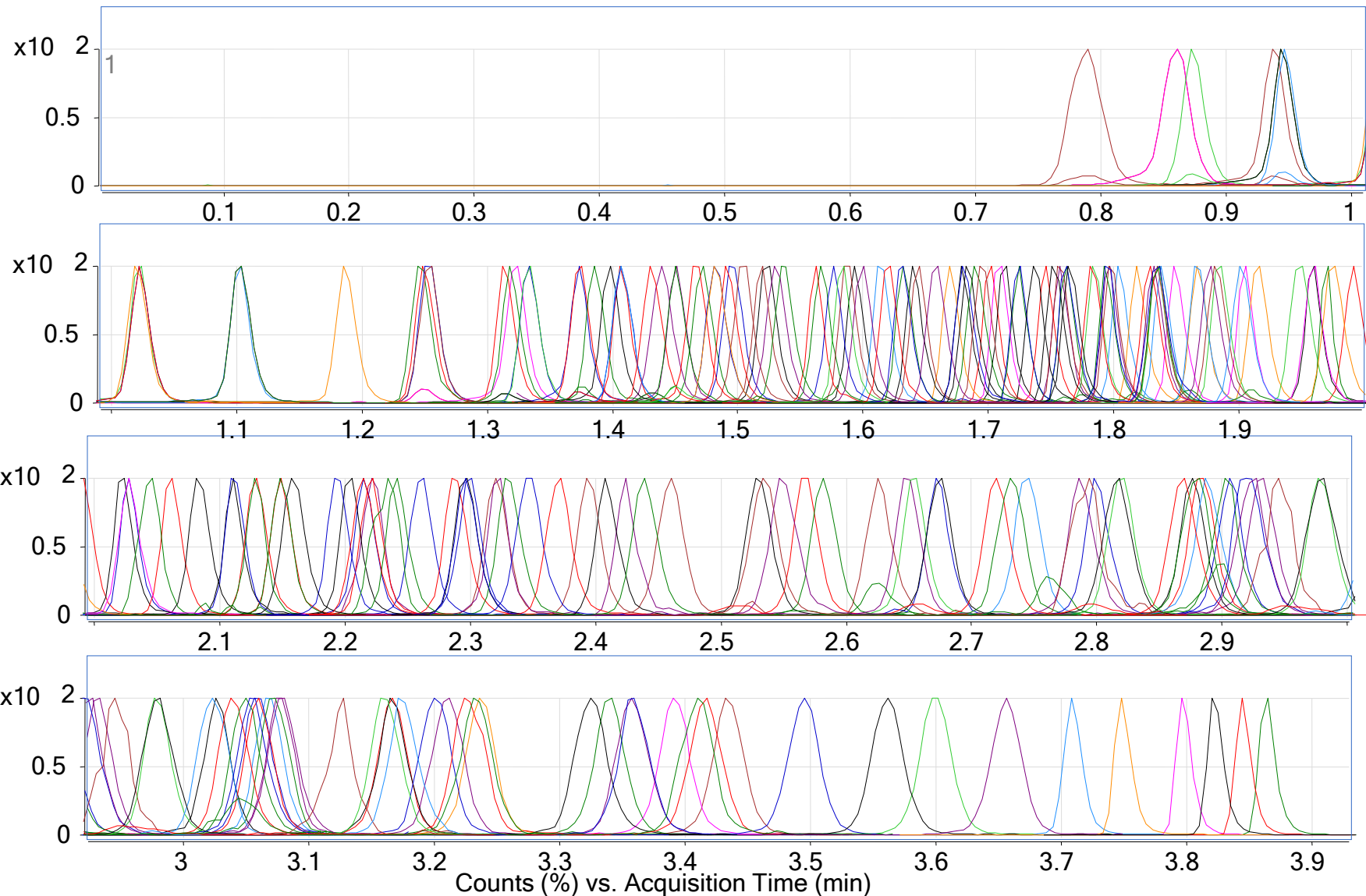
# Clinical Diagnostics - Pain Management Multianalyte Assay

- |                             |                  |                           |                          |
|-----------------------------|------------------|---------------------------|--------------------------|
| (+)-Norpropoxyphene Maleate | Carisoprodol     | Flurazepam                | Norbuprenorphine         |
| (+)-Propoxyphene            | Chlordiazepoxide | Hydrocodone               | Norcodeine               |
| (±)-Amphetamine             | Clonazepam       | Hydromorphone             | Nordiazepam              |
| (±)-MDA                     | Cocaine          | Lorazepam                 | Norfentanyl oxalate      |
| (±)-MDEA                    | Codeine          | Meperidine                | Norhydrocodone           |
| (±)-MDMA                    | Diazepam         | Meprobamate               | Normeperidine            |
| (±)-Methadone               | Dihydrocodeine   | Methylphenidate (Ritalin) | Noroxycodone             |
| (±)-Methamphetamine         | EDDP             | Midazolam                 | O-Desmethyl-cis-tramadol |
| 2-Hydroxyethylflurazepam    | Fentanyl         | Morphine                  | Oxazepam                 |
| 6-Acetylmorphine            | Flunitrazepam    | Nitrazepam                | Oxycodone                |



Water/MeOH gradient with Formic Acid on 3.0x50mm Poroshell 120 C18 2.7µm and Agilent 1200SL/6430

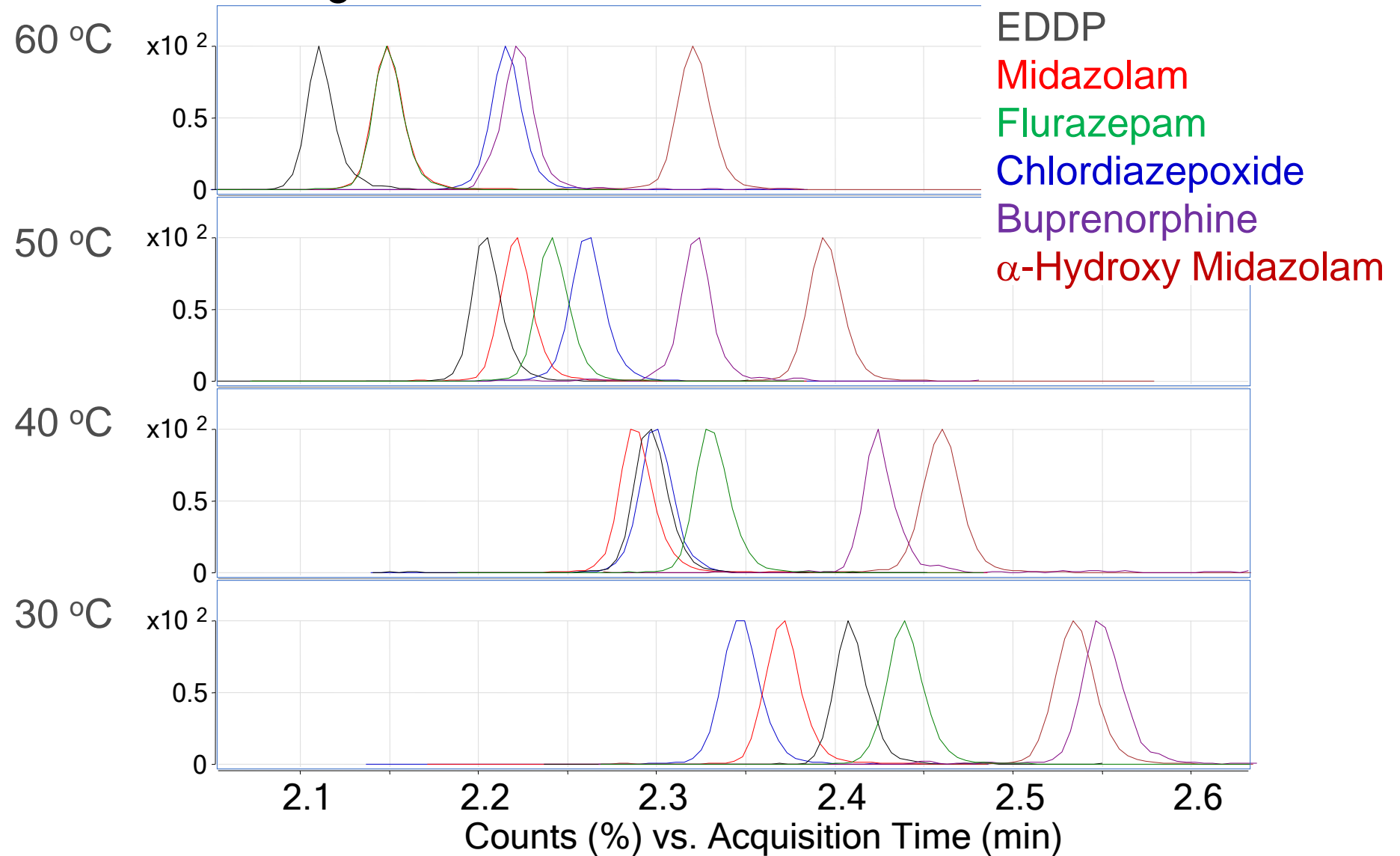
# Clinical Diagnostics - Pain Management Multianalyte Assay



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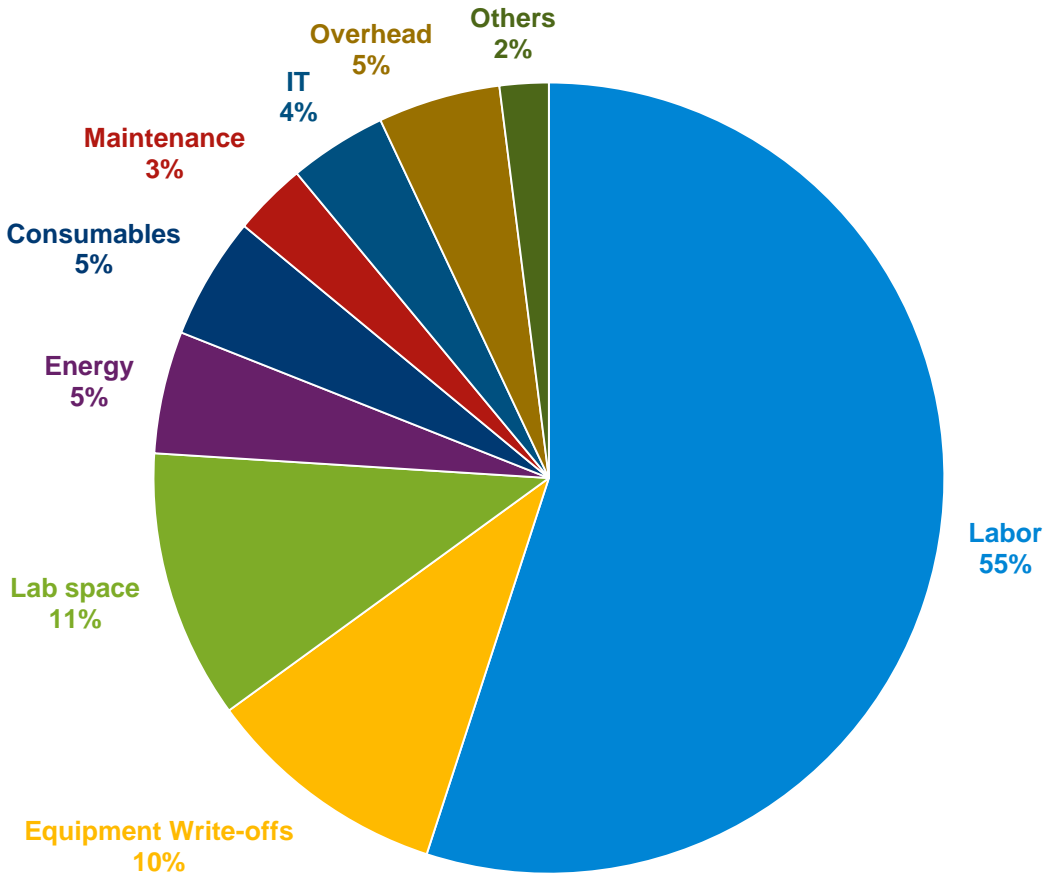
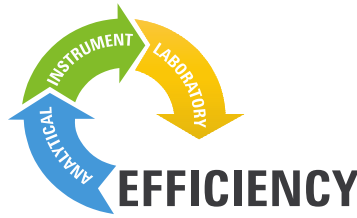


# Clinical Diagnostics - Optimization



Water/MeOH gradient with Formic Acid on 3.0x50mm Poroshell 120 C18 2.7 $\mu$ m and Agilent 1200SL/6430

# Cost of Laboratory Analysis



Adapted from Wolfgang Kreiss, Forum Labmanager 2014

# Lab Efficiency Challenges

## Where is labor exerted?

- Method development
- Method transfer
- Maintenance
- Sample Analysis
- Rework

## Limits to Productivity

- User training
- Access to instruments

# Labor - Method Development

- Requires the systematic evaluation of conditions
- Human guidance required for direction but not execution
- Lack of automation results in manual labor
  - Lots of time required
  - Poor use of instrumentation
- Matthias Pursch - Maximize Instrument Efficiency Through Automation of Method Development and Data Analysis
  - 3 weeks for manual method development
  - A few days for automated method development
  - Possible because of Agilent Automation

# Labor - Method Transfer

## Between Labs with Different Vendors

- The customer supplies a method
  - Requires the same results as previously generated
  - Wants the method implemented quickly
  - Unwilling to pay much for implementation

## Within Labs on Different Vintage Instruments

- Standardized but not Identical is the reality
  - As the lab grows, new instrumentation is acquired
  - Complete update not possible
    - Disruptive
    - Too much capital expense in one year
  - Need flexibility
    - Redundancy
    - Project growth

ISET provides seamless transfer

# Labor - Maintenance

## Downtime is Expensive

- Revenue is not being generated
- Timelines are not being met

The disposable economy and specialization of career has resulted in staff that are not comfortable with both hardware and chemistry

- Advanced diagnostics identify the problem
- Instructions show how to repair

# Labor – Sample Analysis

## Preparing the system to run

- Purging solvents
- Equilibrating columns
- Demonstrating system suitability acceptance

## Loading Samples

- Data Entry takes time and is error prone
- Drag and drop or barcode driven sequence setup

## Acquisition of Data

- Increased analytical efficiency results in faster analyses

## Processing Data

- Identification of outliers
- Many tasks required to generate the report
- Peak Explorer and scripting tools facilitate processing

## Reporting Results

- ECM – Data Management
- ECM – Business Process Automation

# Labor - Rework

Rework is the antithesis of Efficiency

- No revenue for work performed
- Missed timelines

Carryover

- Excessively high samples means the following sample must be reanalyzed
- Multisampler has advanced options to reduce

Failed Runs due to instrument errors

- Advanced EMF
- Intelligent error handling

Lab Advisor



# Productivity - User Training

Operators must be comfortable with how to perform the tasks required

## Goals for training

- Reduce the need – Intuitive
- Provide quickly
- Easy Reference

## Our Experience with vendor solutions

- Integrated Acquisition Interface is key
- Maintained historic features while adding new capabilities
- Easy Integration with standard office software

# Productivity - Access to Instruments

Users desire a dedicated system for each method

- too much space
- too much capital expense
- idle machines don't work on startup

Solutions

- faster analysis times means more can be done on each
- advanced automation facilitates unattended method change

# Upgrade Comparison – 20 years

## Personal Computer

Word Processing

Calculations

E-Mail

We are not still using

- x486 computer
- Windows 3.1
- Word Perfect
- Lotus 1-2-3

Computers are upgraded because

- Performance is faster
- Interoperability is better
- Graphical UI is easier to use
- We accomplish more in less time

## HPLC

Separation of compounds

Are you still using

- 400 bar pump with large delay volume?
- 4.6mm ID columns
- 5 micron packing

HPLCs are upgraded because

- Performance is faster
- Interoperability is better
- The system is easier to use
- We accomplish more in less time

# The OpAns Team

