Lab Advisory Committee Meeting

Proposed Changes to CDCB Guidelines

Paul Sauvé, CLS
jpsauve@bellnet.ca

September 20, 2006
Anaheim California

Auditing of Infrared Instruments for Sample Unknowns

Effective January 1, 2003

The mean difference must not exceed 0.05% and the standard deviation of differences must not exceed 0.06% in three of the previous four trials.

The rolling mean difference over the previous six trials must not exceed 0.02%.

****

The tolerance for MD and SDD are very high given the capabilities of current technology.
Some labs are intentionally biasing instruments to reduce the RMD.

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The rolling mean difference over the previous six trials must not exceed 0.02%.

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The reduced MD and SDD are better suited to current technologies. It will be much more difficult to intentionally bias results to reduce the RMD.

Auditing of Records Related to Reagents

Records of preparation of key solutions and reagents should be maintained. Of particular importance are records associated with preparation of lots of dye used in somatic cell counters.

Records should include:

- date prepared
- Technician
- lot or batch number of any stock solutions or chemicals
- quantity prepared
- expiry date (if applicable)
- date, time and instrument when batch put into service

The Assessor should be able to identify the batch used during the analysis of any routine sample processed in the laboratory.

Auditing of Preparation of Pilot Samples

Pilot samples should be prepared on a weekly basis. A representative bulk sample should be obtained, preserved and split accurately into individual vials for use during the following week. Care must be taken to ensure that raw samples are well agitated while splitting.

A periodic check of the homogeneity of pilot samples should be conducted by analyzing a minimum of ten separate sample vials in succession. The range for fat and protein should not exceed .03% and the range for somatic cell count should not exceed 5% of the average count. A record of the homogeneity check should be maintained.

Target samples should be determined immediately following preparation and instrument calibration by repeated analysis on all test lines. A preparation log should be maintained.

Target values should be held constant throughout the week and should not differ among test lines.

Progress Report on Lab QC Evaluations

Paul Sauvé, CLS
jpsauve@bellnet.ca

North American Lab Managers Association

September 20, 2006
Anaheim California

1. Summary of the QC Evaluation Process
2. Observations from the QC Evaluations
3. Developing and Using SOP's
   (an example)
4. How to Prepare for an Evaluation
5. Sample Unknowns
   Proposed Change to Tolerances

Overview of Laboratory Certification:

The *Council on Dairy Cattle Breeding (CDCB)* publishes the guidelines for certification of DHI laboratories.

www.quality-certification.com/guidelines.asp

There are two components associated with laboratory certification.

1. Sample unknown program

2. On-site laboratory evaluations (NOT audits)

The Sample Unknown Program:

Certified laboratories receive a set of 24 samples which cover a typical range for fat, protein, somatic cell count (SCC) and milk urea nitrogen (MUN). Reference values are not provided.

The samples are tested on each analyzer and results are reported on a web-site.

Performance reports summarizing both precision and accuracy are generated and are made available to the participants.

Tolerances, as published in the CDCB Guidelines, must be satisfied for a laboratory to maintain certification.

On-Site Laboratory Evaluations:

On-site evaluations are conducted once every two years.

The laboratory being assessed must have routine samples available for testing on the day of the visit. If no samples are available, the assessor cannot certify the laboratory.

The regular testing staff must be on-site and must be testing samples according to their routine procedures.

Lab QC records spanning a period of at least two years must be on-site and available for review by the assessor. Electronic records are acceptable.

Objectives of The On-Site Evaluation:

The goal of the on-site evaluation is to identify areas of nonconformance and to assist Management in taking corrective action.

No lab that is willing to work with the assessor to correct deficiencies will be decertified.

Whenever possible, the assessor will work with the staff to correct issues immediately.

Lab Management should view the evaluation as an opportunity to improve procedures and to assist with training and development of Technicians.

The Evaluation Process:

1. An opening meeting is conducted. The Assessor explains the process and meets the key testing staff.
2. The assessor tours the facility and makes a list of the key testing equipment being used.
3. The assessor observes the routine lab procedures including sample receipt and log-in, sample analysis and quality control. Technician competence is assessed.
4. The condition of test equipment and supplies (vials, lids, preservative, etc.) is assessed.
5. QC records including maintenance documentation and standard operating procedures are reviewed.
6. A closing meeting is conducted and a summary report is presented to Lab Management.
7. A full report is forwarded to the Lab and to QCS within two weeks. Lab Management may be required, within a specified time, to respond to certain issues.
8. The Assessor reviews lab responses and works with Management to satisfy the CDCB requirements.
9. A certificate is issued by QCS.

In the following slides I will address each element assessed during the QC evaluations and provide an overall score (GOOD, FAIR or POOR) based on observations from the last two years.

General Record Keeping -- FAIR

Every QC records should include ALL of the following information:

- date and time (if conducted more than once daily);
- instrument and operator identification;
- QC result any required calculations;
- tolerances for the check (pass or fail);
- details of any follow-up if tolerances are exceeded.

Often some of these items are missing. With well designed forms (worksheets or electronic) this should not occur.

Maintenance Documentation -- POOR

Schedules of routine maintenance procedures should be documented.
Details of all service should be recorded.
Frequently we see maintenance logs for an analyzer showing only one or two entries for an entire year.
Often critical information such as the Technician or a list of the parts replaced or repaired is missing.

Reference Documents -- POOR

Lab Managers have been given ample guidance and direction for developing and maintaining functional standard operating procedures (SOP's) and for linking these to the forms and records within their laboratories.
Unfortunately many don't see this as a priority and progress is far too slow in this area. More about this later!

Sample Handling and Analysis -- GOOD

Condition of Supplies (Vials and Lids) -- GOOD

Training of Laboratory Technicians -- POOR

All labs should have an SOP summarizing Technician training.
Records of training should be maintained.
A checklist should be used showing which tasks each Technician is qualified and approved to perform.

Training of Laboratory Managers -- FAIR

CDCB guidelines require that Managers participate in on-going training. About 50% do.
The annual NALMA meeting is well attended but usually by the same group of Lab Managers.

Calibration Checks (IR) -- GOOD

Calibration Adjustments (IR) -- FAIR

Many operators are still making arbitrary adjustments on a regular basis.

"Our pilot sample was low so we brought it up a bit."

Frequently there is no record of these adjustments.
At times adjustments are made which result in a decrease in accuracy. This usually occurs when a bias is used to try and correct a slope problem.
Failure to identify outliers often results in incorrect adjustments.

Homogenization Efficiency Check (IR) -- GOOD

Pilot Sample Check (IR) -- FAIR

The most common problem is failure to maintain a consistent target value.
Pilots should be tested immediately following routine milk samples and before rinsing or zeroing the analyzer. Why?

Purging Efficiency Check (IR) -- GOOD

Repeatability Check (IR) -- GOOD

Zero Check (IR) -- POOR

This check provides a tremendous amount of valuable data regarding instrument stability which is generally ignored.
Frequent auto-zero adjustments make tracking drift impossible.
Accepting adjustments even when tolerances are satisfied should be avoided.

Calibration Checks (SCC) -- FAIR

Often the performance statistics and tolerances are not defined or understood. This makes it difficult to determine if an adjustment is required.

Calibration adjustments (SCC) -- FAIR

The biggest problem is a failure to keep accurate records of the calibration changes.
Calibration procedures are not well defined.
Interpretation of a calibration set involving only four samples requires considerable care and experience.

Pilot Sample Checks (SCC) -- GOOD

Repeatability Checks (SCC) -- FAIR

Many Technicians do not understand that all replicate determinations must fall within the allowable range. The average ALWAYS falls within the range.
If a spreadsheet is being used to perform the calculations it must be completed before testing begins. It is of no value to discover the the instrument failed the repeatability check at the end of the working day.
For Bentley 500 analyzers, the repeatability check must be done separately for each “side”.

Zero Checks (SCC) -- GOOD

Sample Unknowns -- GOOD

Developing and using SOP's:

This topic was introduced at the 2004 meeting and covered in detail at the 2005 meeting.
Guidelines, templates and copies of the presentations have been made available to all Lab Managers.
Those who have taken advantage of this reference material have developed an excellent set of functional SOP's.
By the end of 2006 all labs are required to have functional and current SOP's for all relevant aspects of lab operation.
SOP's should be linked to forms and forms used to generate records which satisfy the CDCB requirements.
A list of SOP's for a typical DHI laboratory follows.

- start-up of analyzers
- shut-down of analyzers
- repeatability checks (IR)
- repeatability checks (SCC)
- pilot sample checks (IR)
- pilot sample checks (SCC)
- zero checks (IR)
- zero checks (SCC)
- calibration checks (IR)
- calibration adjustments (IR)
- calibration checks (SCC)
- calibration adjustments (SCC)
- homogenization checks (IR)
- purging efficiency checks (IR)
- sample receipt and log-in
- sample analysis
- sample disposal
- handling of test results
- cleaning of vials and lids
- preparation of field supplies
- testing sample unknowns
- submitting sample unknowns
- Technician training
- routine daily maintenance
- routine weekly maintenance
- routine monthly maintenance

And any other specific tasks conducted on a regular basis in the lab.

SOP #132	Hourly Zero Checks and Zero Adjustments (IR)
REVISION #002	February 15, 2005

Scope:

Hourly zero checks and/or adjustments are performed in order to monitor the stability of infrared analyzers on an hourly basis during routine testing of all DHI client samples.

Responsibility:

All Instrument Operators are responsible for performing the hourly zero checks in accordance with the following procedure.

- PAGE 1 OF 2 -

SOP #132	Hourly Zero Checks and Zero Adjustments (IR)
REVISION #002	February 15, 2005

Procedure:

1. Sealed vials of zero solution (0.1% TX-100 ref. SOP #119) are held in the 42C waterbaths until needed.
2. Immediately following the hourly pilot sample check (ref. SOP #131), one vial of zero solution is tested manually three times in succession.
3. The second two fat and protein results are averaged and the values are recorded in the appropriate fields on Form #17C.
4. If drift for either component exceeds +/- 0.03%, the zero is reset and the adjustment is noted by checking the appropriate box on Form #17C.
5. If drift for either component exceeds +/- 0.06%, testing is discontinued and the Lab Manager or Shift Supervisor is consulted.

- PAGE 2 OF 2 -

XYZ DHIA	Daily IR Worksheet	Form #17C

Date: _____ Operator: _____
Line: _____ Supervisor: _____

Target Values: Fat: _____ (+/- .04%) Protein: _____ (+/- .04%)

Time	Pilots (+/- .04%)			Zeros (+/- .03%)			Comments
	Fat	Pro.	Status	Fat	Pro.	Reset	
			[] IN [] OUT			[] YES [] NO	
			[] IN [] OUT			[] YES [] NO	
			[] IN [] OUT			[] YES [] NO	
			[] IN [] OUT			[] YES [] NO	
			[] IN [] OUT			[] YES [] NO	

XYZ DHIA	Daily IR Worksheet	Form #17C

Date: March 15, 05 Operator: Paul Sauvé
Line: Bentley #1 Supervisor: Brian Corrigan

Target Values: Fat: 3.50 (+/- .04%) Protein: 3.15 (+/- .04%)

Time	Pilots (+/- .04%)			Zeros (+/- .03%)			Comments
	Fat	Pro.	Status	Fat	Pro.	Reset	
8:30	3.50	3.16	[X] IN [] OUT	0.02	0.00	[] YES [X] NO	OK
9:28	3.52	3.10	[] IN [X] OUT	-0.01	-0.07	[X] YES [] NO	Supervisor contacted. Repair documented in log.
10:32	3.48	3.15	[X] IN [] OUT	0.00	0.01	[] YES [X] NO	OK
11:25	3.49	3.14	[X] IN [] OUT	0.02	-0.01	[] YES [X] NO	OK
11:45	3.50	3.16	[X] IN [] OUT	0.00	0.01	[] YES [X] NO	End of shift.

How to Prepare for an Evaluation:

DON'T

The Assessor needs to see your lab operate as it does on any routine day.
QC records, reports, lab documentation and reference material should be available, up to date and and readily retrievable at all times.
In a well organized facility there should be no need for any significant preparation.
Simply advise staff that the assessment will be taking place and ensure that there are sufficient samples available.

Auditing of Infrared Instruments for Sample Unknowns

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The rolling mean difference over the previous six trials must not exceed 0.02%.

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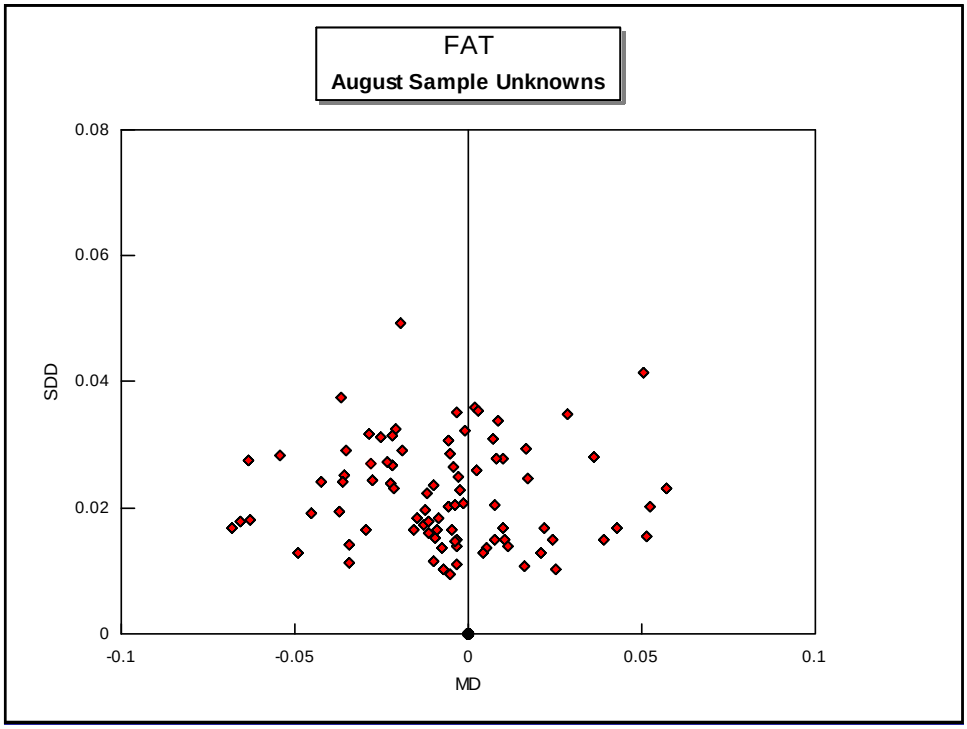
The tolerance for MD and SDD are very high given the capabilities of current technology.
Some labs are intentionally biasing instruments to reduce the RMD.


FAT
August Sample Unknowns
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0.06
0.04
0.02
0
SDD
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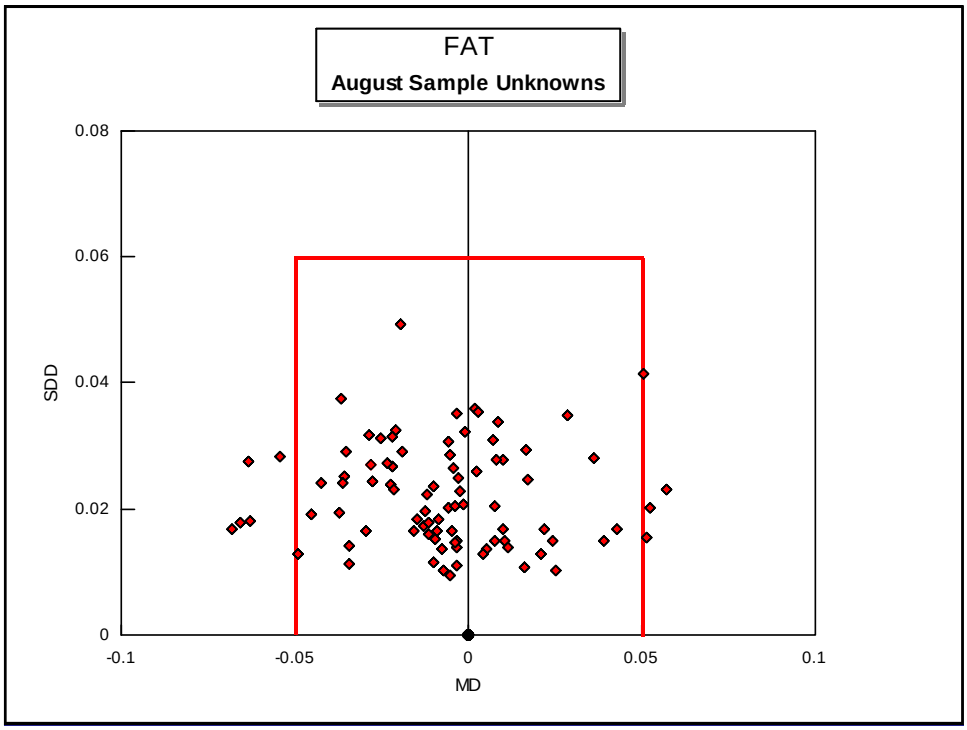
-0.05
0
0.05
0.1
MD


FAT
August Sample Unknowns
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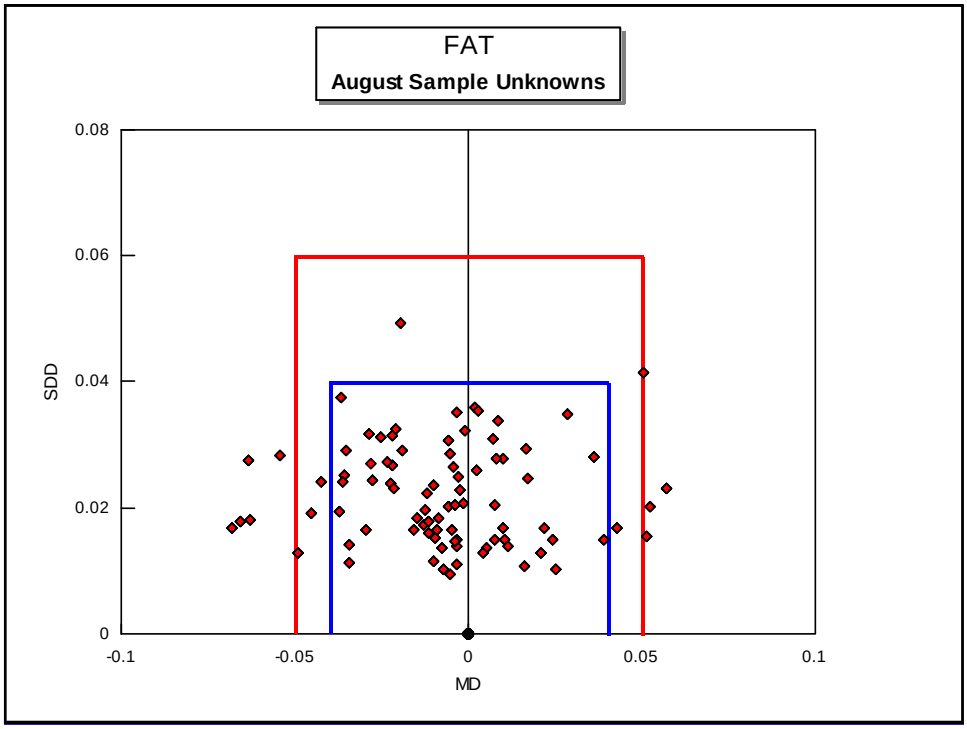
0.06
0.04
0.02
0
SDD
-0.1
-0.05
0
0.05
0.1
MD


FAT
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SDD
MD
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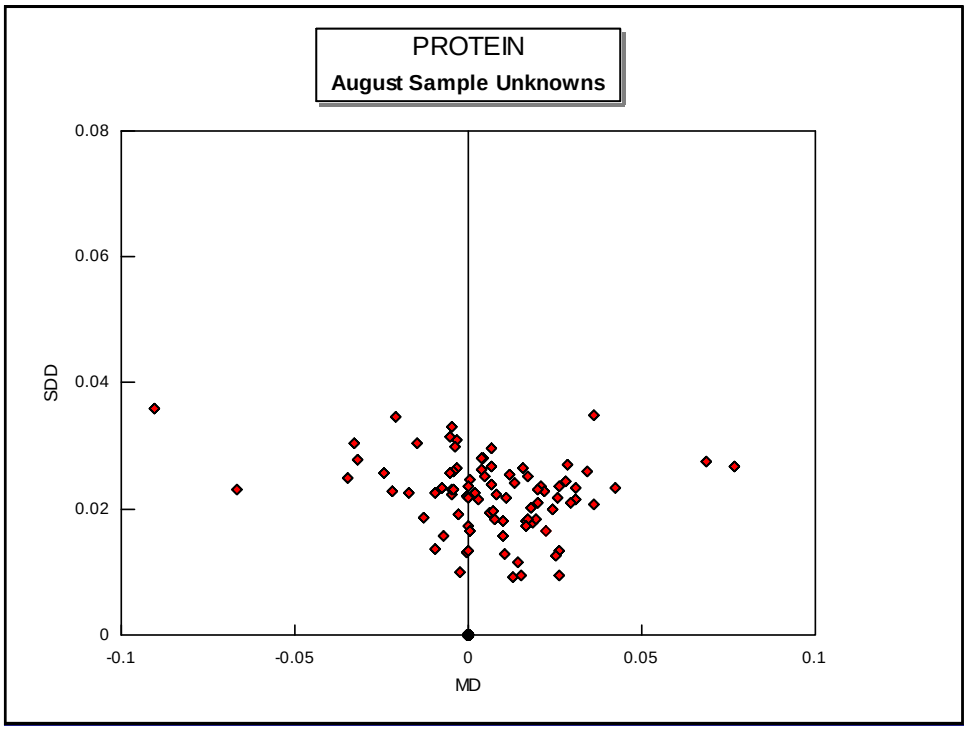
PROTEIN
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MD
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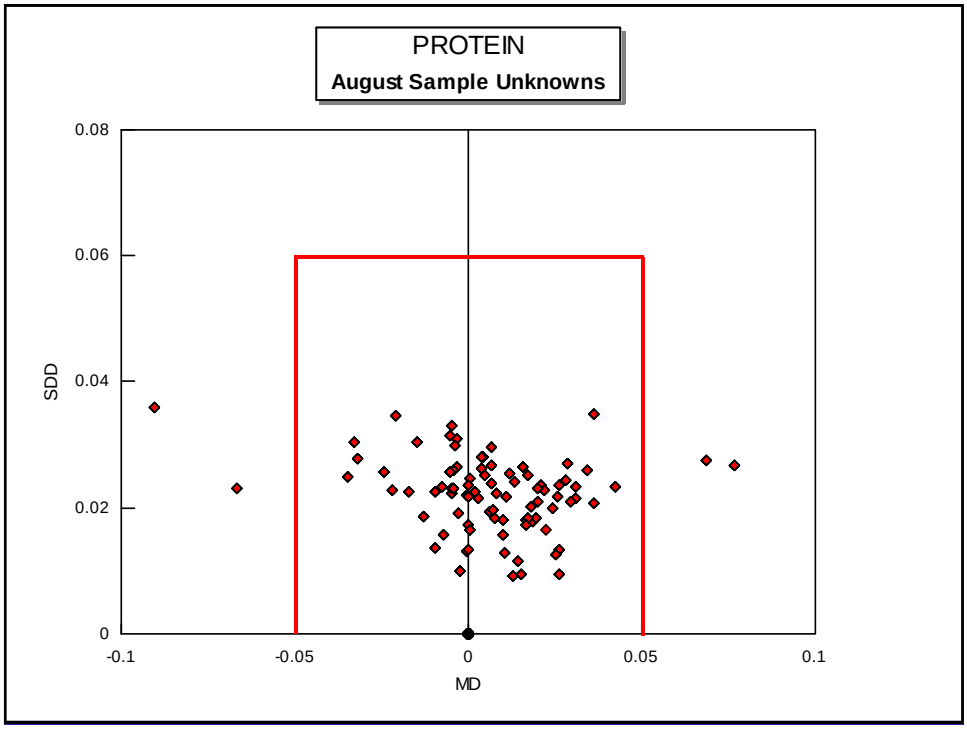
PROTEIN
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SDD
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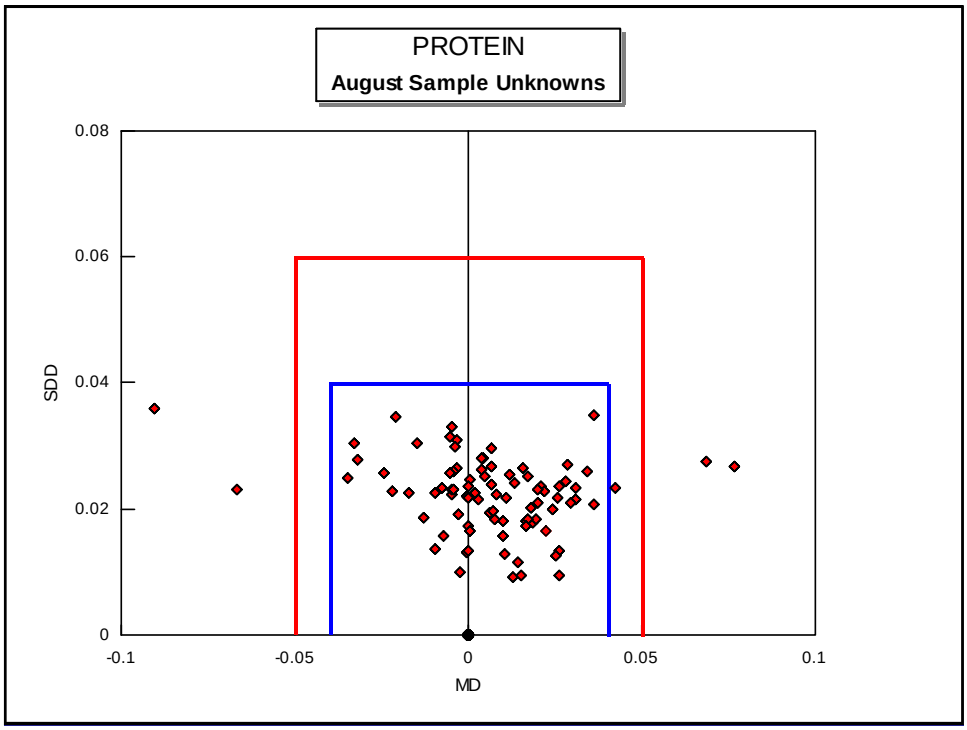
MD


PROTEIN
August Sample Unknowns
0.08
0.06
0.04
0.02
0
SDD
-0.1
-0.05
0
0.05
0.1
MD

Auditing of Infrared Instruments for Sample Unknowns

Proposed Change

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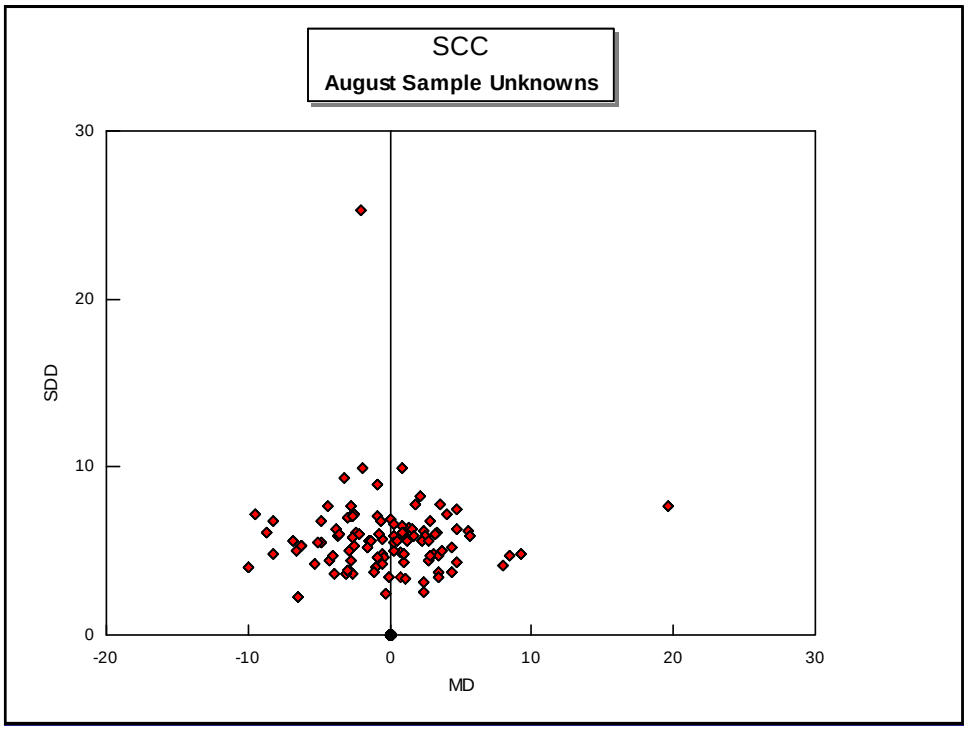

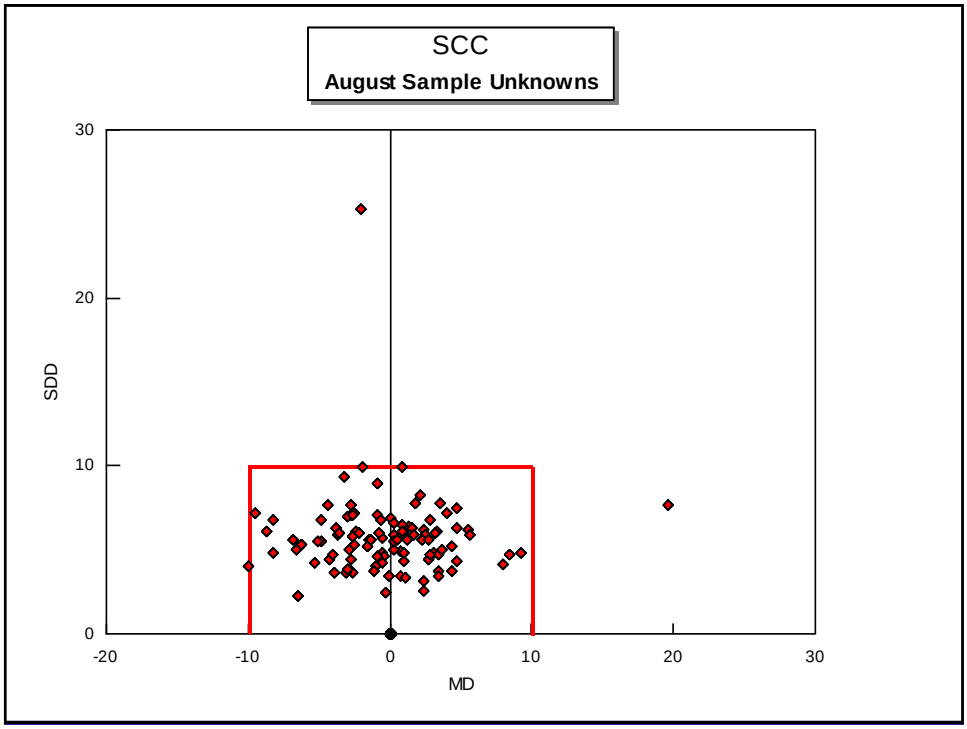

Auditing of SCC Instruments for Sample Unknowns

Effective January 1, 2003

The mean percent difference must not exceed 10% and the standard deviation of percent differences must not exceed 10% in three of the previous four trials.

The rolling mean percent difference over the previous six trials must not exceed 5.

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NO PROPOSED CHANGES

Key Numbers for Laboratory Management

Paul Sauvé, CLS
jpsauve@bellnet.ca

North American Lab Managers Association

September 20, 2006
Anaheim California

Certified labs collect a significant amount of data as part of their on-going quality control activities. This data is recorded and stored in the lab records.

Traditionally these results are used to identify an immediate problem at which time corrective action is taken. The records are then filed away for review by the Assessor and generally are not used for any other purpose.

This PASS or FAIL approach to quality control is effective however there are additional ways to take advantage of the quality control data at hand. REACTIVE APPROACH TO QC

This session is designed to demonstrate how QC data can be analyzed to spot trends and make management decisions to improve lab operations. PROACTIVE APPROACH TO QC

Examples:

- The homogenization efficiency check fails. A new homogenizer is ordered, installed and tested. The instrument is down for three days.

REACTIVE APPROACH TO QC

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- By analyzing the lab's QC data to monitor the degradation of equipment, the Manager determines that a homogenizer will be needed within the next month. The part is ordered and held in inventory. The homogenization efficiency check fails, the new part is installed and tested. The instrument is down for one hour.

PROATIVE APPROACH TO QC

Examples:

- The IR zeros are checked hourly and, when necessary, adjusted to ensure that biases are not introduced into the test results.

REACTIVE APPROACH TO QC

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- The Manager plots the zero drift and notices a trend. Fat and protein zeros are both drifting down during the working day. Every morning there is a large positive adjustment to account for the previous days drift. He investigates and determines that the temperature and humidity in the lab are not well controlled and increase significantly throughout the working day. The problem is corrected, zeros stabilize and more accurate test results are generated.

PROATIVE APPROACH TO QC

Examples:

- The lab operates three identical test lines. Normal start-up and shut-down procedures are followed. All machines undergo annual PM which includes replacement of the cell.

REACTIVE APPROACH TO QC

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- The Manager notices that pilot sample results on two of the test lines are fairly stable but are drifting up during the day on the third line. He determines that the operator of this line is not following proper shut-down procedures such that cleaning is inadequate. This is causing excessive wear on the cell. Additional training is provided to this Technician, pilot sample results stabilize and wear on the cell is minimized.

PROATIVE APPROACH TO QC

Examples:

- The lab operates three test lines. Calibration samples are received and the required adjustments are made to all machines.

REACTIVE APPROACH TO QC

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- The calibration samples are tested on all lines. The Manager reviews the results and notices that all his machines appear to be testing .03% low on protein. He contacts the supplier of the calibration samples who investigates and confirms that there is in fact an error in the protein data. New reference results are issued and the Manager determines that none of his analyzers need to be adjusted.

PROATIVE APPROACH TO QC

These examples have shown how management decisions based on appropriate use of the QC data can be of significant value.

Example #1 (failing homogenizer)
- reduced down time
- $

Example #2 (temperature problem in the lab)
- increased instrument stability
- provide more reliable results to the customers
- $

Example #3 (improper cleaning)
- identified training needs
- reduced wear on equipment parts
- provide more reliable results to the customers
- $

Example #4 (error in the calibration samples)
- avoided making improper calibration adjustments
- maintained accuracy of the instruments
- ensured value for $ from the supplier of the calibration standards
- $

What QC data is collected?

Weekly
- Calibration checks (MD, SDD, M%D, SD%D)
- Calibration adjustments (slope, intercept)
- Homogenization efficiency (allowable vs actual)
- Purging efficiencies (milk to water, water to milk)

Daily
- Repeatability checks (range, allowable range)
- Zero checks (SCC)

Hourly
- Zero checks (IR)
- Pilot sample checks (actual - target)

Other
- purge volumes
- voltages
- temperatures (sample, bath)
- throughput (samples / hour)

Homogenization Efficiency Check (IR):

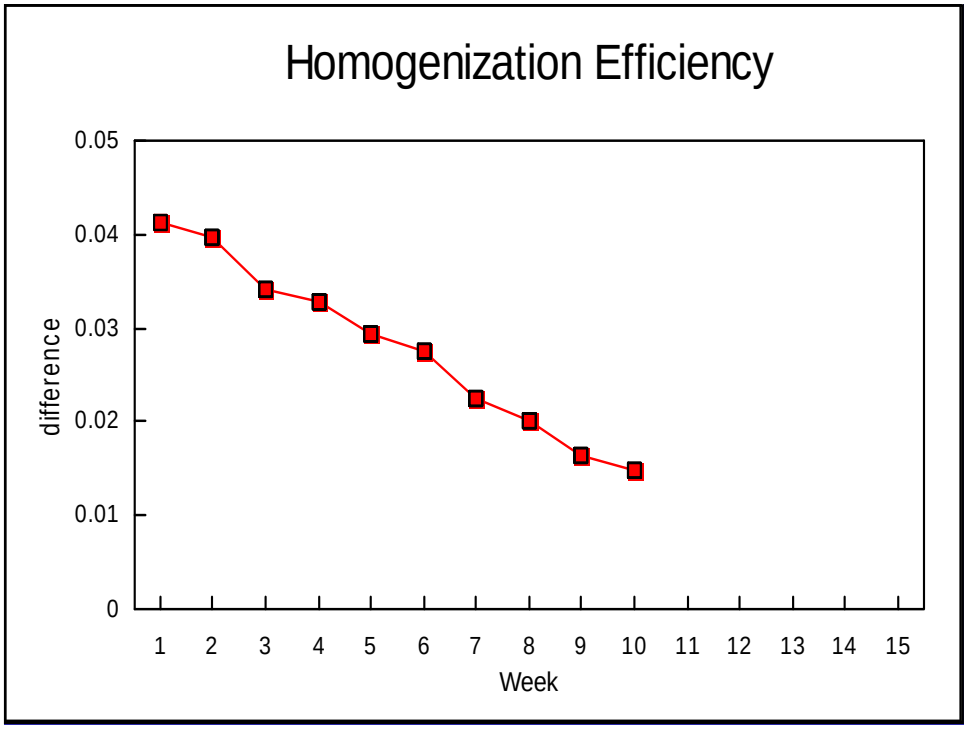
First Five Results	Second Five Results
3.801	3.829
3.801	3.830
3.800	3.829
3.802	3.829
3.801	3.831
Avg 3.801	Avg 3.829

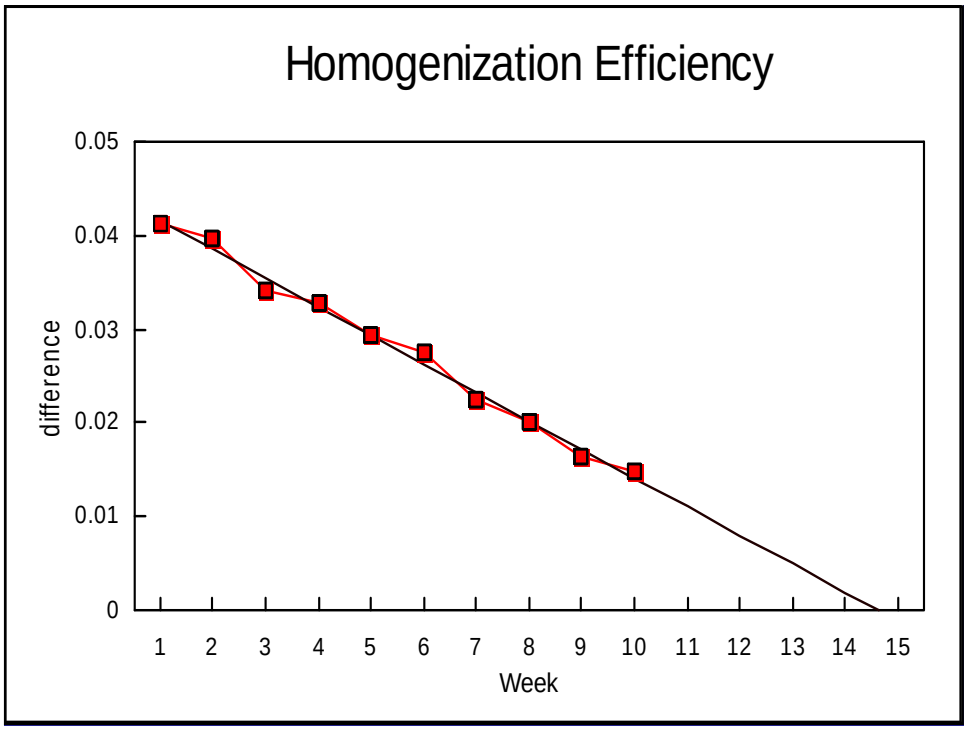
Difference: 3.829 - 3.801 = 0.028
Allowable Difference: 3.801 x 0.0143 = 0.054

Status: PASS

Homogenization Efficiency (trend analysis):

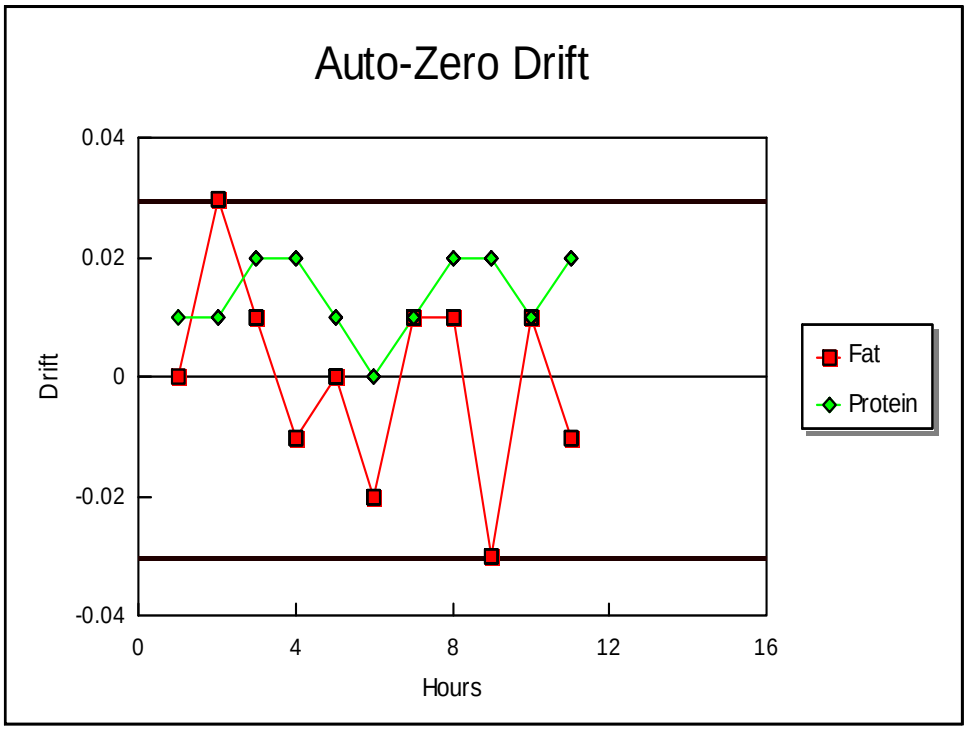
Week	Avg 1	Avg 2	Diff.	Allowable	Status	Allowable - Actual
1	3.236	3.241	0.005	0.046	pass	0.041
2	3.476	3.492	0.010	0.050	pass	0.040
3	4.138	4.157	0.025	0.059	pass	0.034
4	3.687	3.710	0.020	0.053	pass	0.033
5	3.801	3.829	0.025	0.054	pass	0.029
6	3.386	3.417	0.021	0.048	pass	0.027
7	4.026	4.061	0.035	0.058	pass	0.023
8	3.720	3.757	0.033	0.053	pass	0.020
9	3.600	3.639	0.035	0.051	pass	0.016
10	3.964	4.006	0.042	0.057	pass	0.015
11						
12						
13						
14						
15						


Homogenization Efficiency
0.05
0.04
0.03
0.02
0.01
0
difference
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Week


Homogenization Efficiency
0.05
0.04
0.03
0.02
0.01
0
difference
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
Week

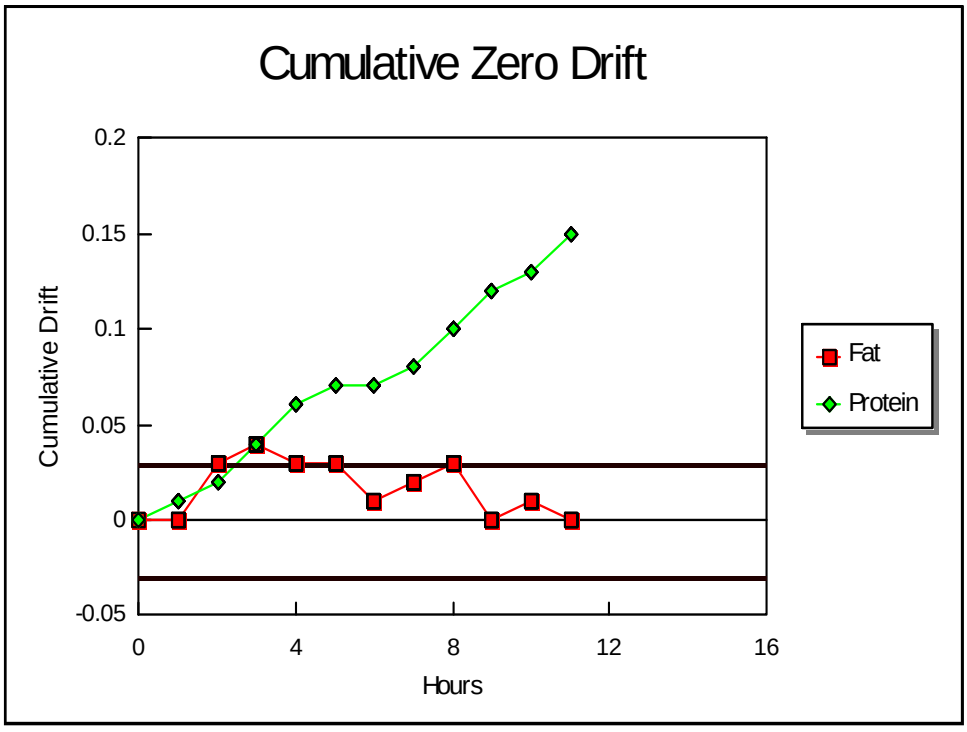
Record of IR Auto-Zeros (IR) - Tolerances +/- 0.03%

Hour	F Zero	P Zero	Status
1	0.000	0.010	pass
2	0.030	0.010	pass
3	0.010	0.020	pass
4	-0.010	0.020	pass
5	0.000	0.010	pass
6	-0.020	0.000	pass
7	0.010	0.010	pass
8	0.010	0.020	pass
9	-0.030	0.020	pass
10	0.010	0.010	pass
11	-0.010	0.020	pass
12			
13			
14			
15			



Record of IR Auto-Zeros (IR) - Tolerances +/- 0.03%

Hour	F Zero	P Zero	Status	Cum. F	Cum. P
1	0.000	0.010	pass	0.000	0.010
2	0.030	0.010	pass	0.030	0.020
3	0.010	0.020	pass	0.040	0.040
4	-0.010	0.020	pass	0.030	0.060
5	0.000	0.010	pass	0.030	0.070
6	-0.020	0.000	pass	0.010	0.070
7	0.010	0.010	pass	0.020	0.080
8	0.010	0.020	pass	0.030	0.100
9	-0.030	0.020	pass	0.000	0.120
10	0.010	0.010	pass	0.010	0.130
11	-0.010	0.020	pass	0.000	0.150
12					
13					
14					
15					



Repeatability Check (SCC):

Replicates
542
568
571
543
552
573

+7% Range: 597
- 7% Range: 519

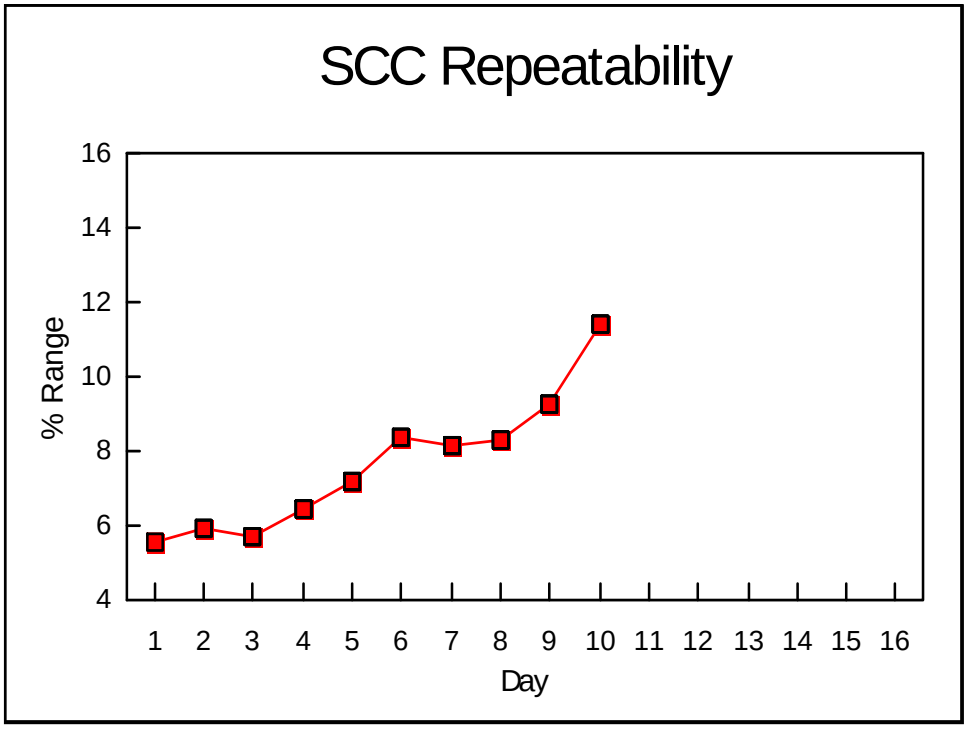
Status: PASS OR FAIL

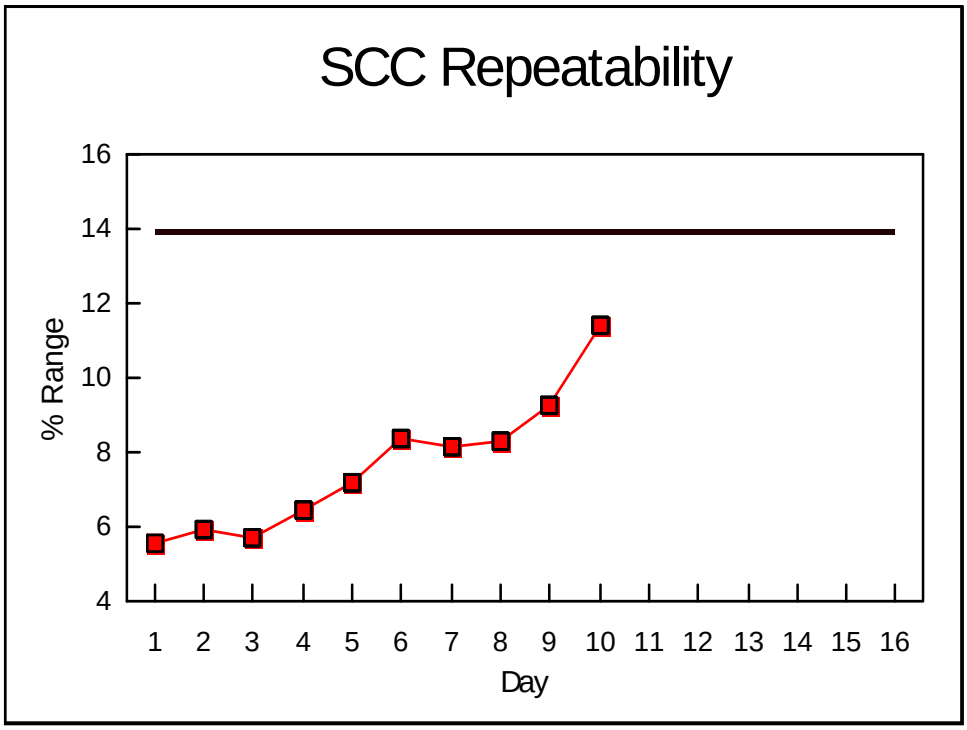
Average: 558

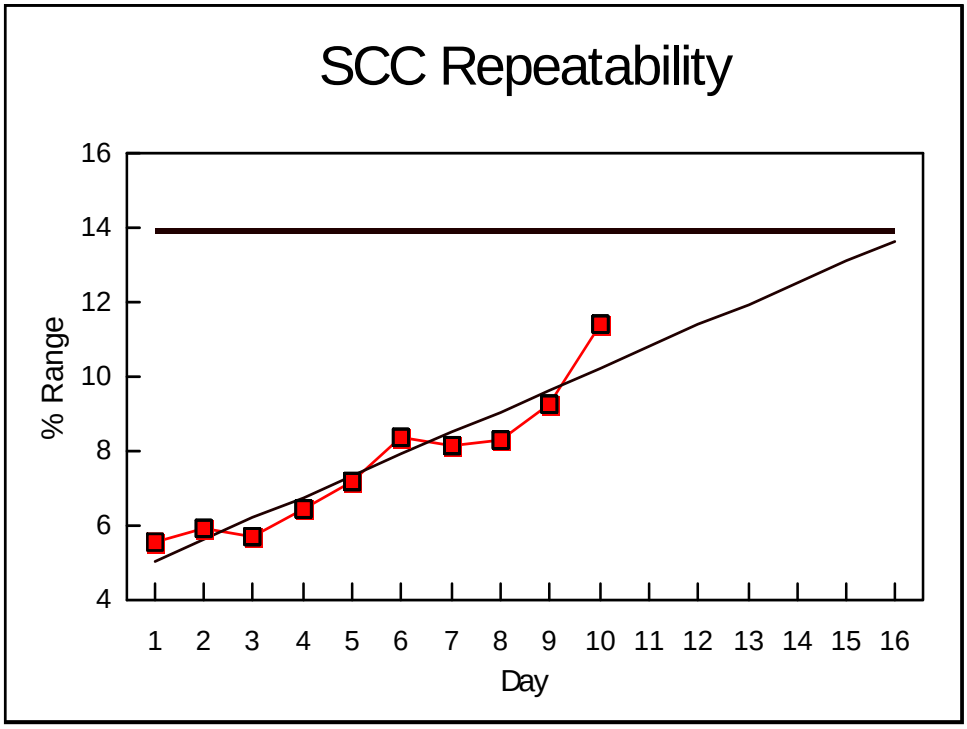
The instrument passes because ALL six readings fall within the allowable range.

SCC Repeatability Check (trend analysis):

Day	Avg	All. High	All. Low	Act. High	Act. Low	Status	Range	% Range
1	558	597	519	573	542	pass	31	5
2	542	580	504	570	538	pass	32	6
3	530	567	493	555	525	pass	30	6
4	482	516	448	500	469	pass	31	7
5	460	492	428	483	450	pass	33	7
6	421	450	392	432	397	pass	35	8
7	430	460	400	448	413	pass	35	8
8	411	440	382	431	397	pass	34	9
9	389	416	362	400	364	pass	36	10
10	335	358	312	356	318	pass	38	10
11								
12								
13								
14								
15								


SCC Repeatability
% Range
16
14
12
10
8
6
4
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Day


SCC Repeatability
% Range
16
14
12
10
8
6
4
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16
Day



Calibration Check (IR):

Reference	Infrared	Difference
2.620	2.610	-0.010
3.390	3.390	0.000
3.710	3.700	-0.010
3.510	3.480	-0.030
3.730	3.730	0.000
4.330	4.340	0.010
4.120	4.110	-0.010
3.940	3.940	0.000
3.780	3.790	0.010
3.840	3.820	-0.020
4.690	4.680	-0.010
	MD	-0.006
	SDD	0.012

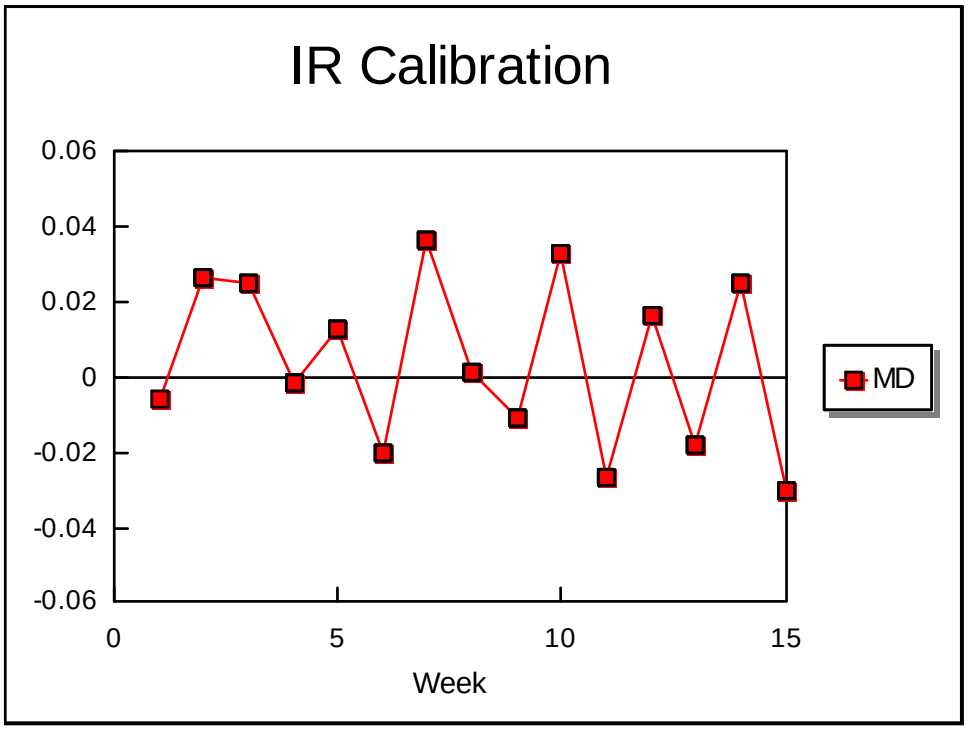
Tolerances

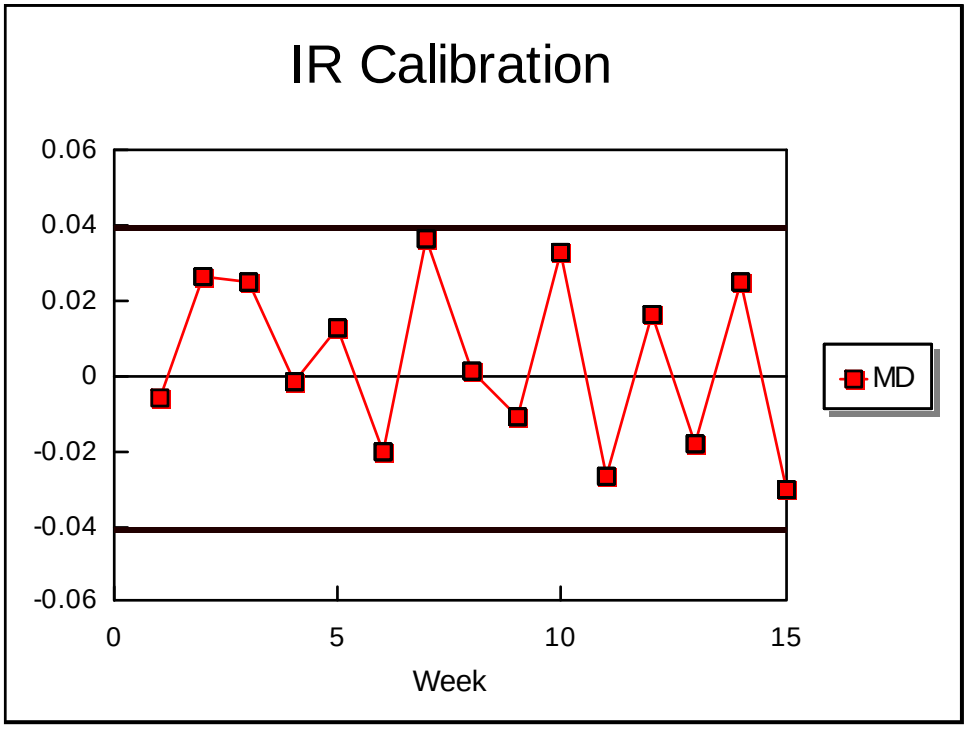
MD < +/- 0.040
SDD < 0.040

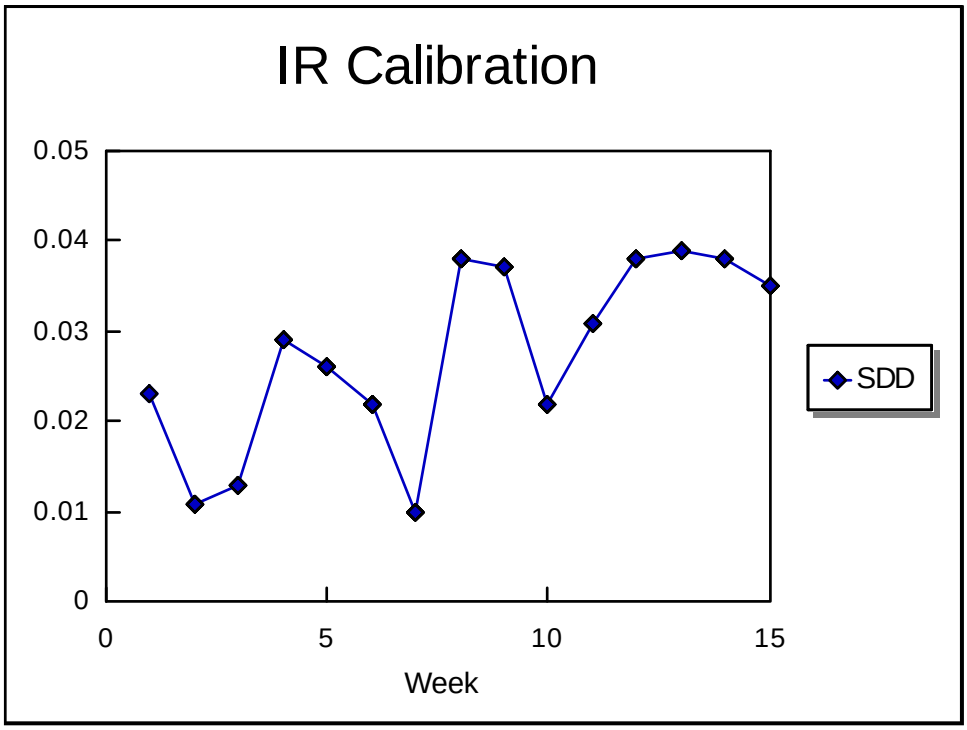
Status: PASS

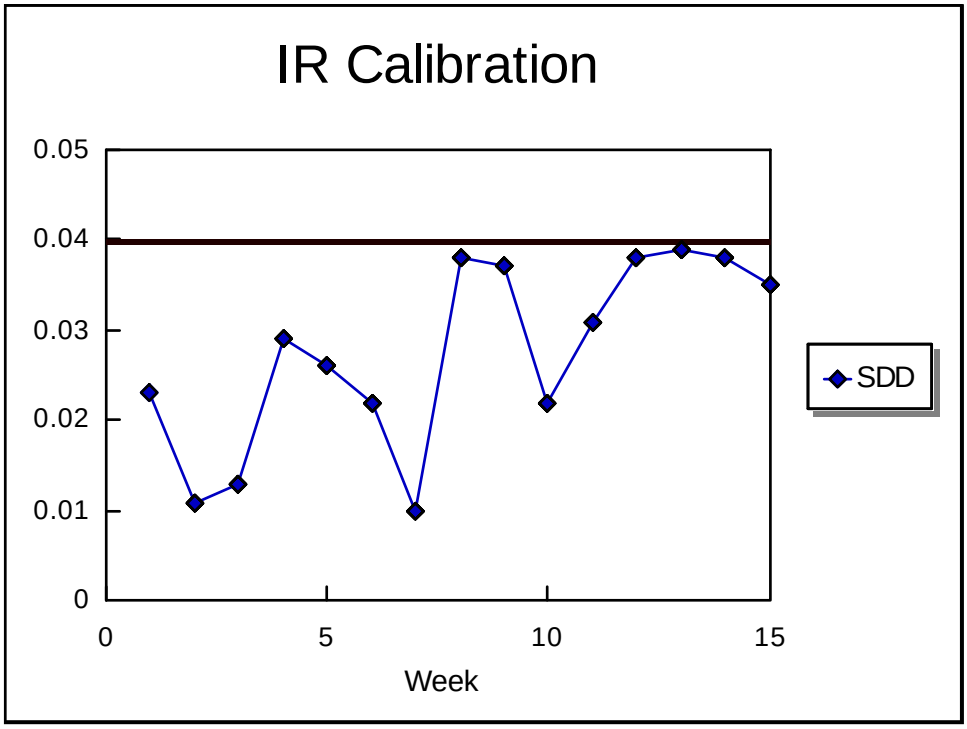
Calibration Check (trend analysis):

Week	MD	SDD	Status
1	-0.006	0.023	pass
2	0.026	0.011	pass
3	0.025	0.013	pass
4	-0.002	0.029	pass
5	0.013	0.026	pass
6	-0.020	0.022	pass
7	0.036	0.010	pass
8	0.001	0.038	pass
9	-0.011	0.037	pass
10	0.033	0.022	pass
11	-0.027	0.031	pass
12	0.016	0.038	pass
13	-0.018	0.039	pass
14	0.025	0.038	pass
15	-0.030	0.035	pass



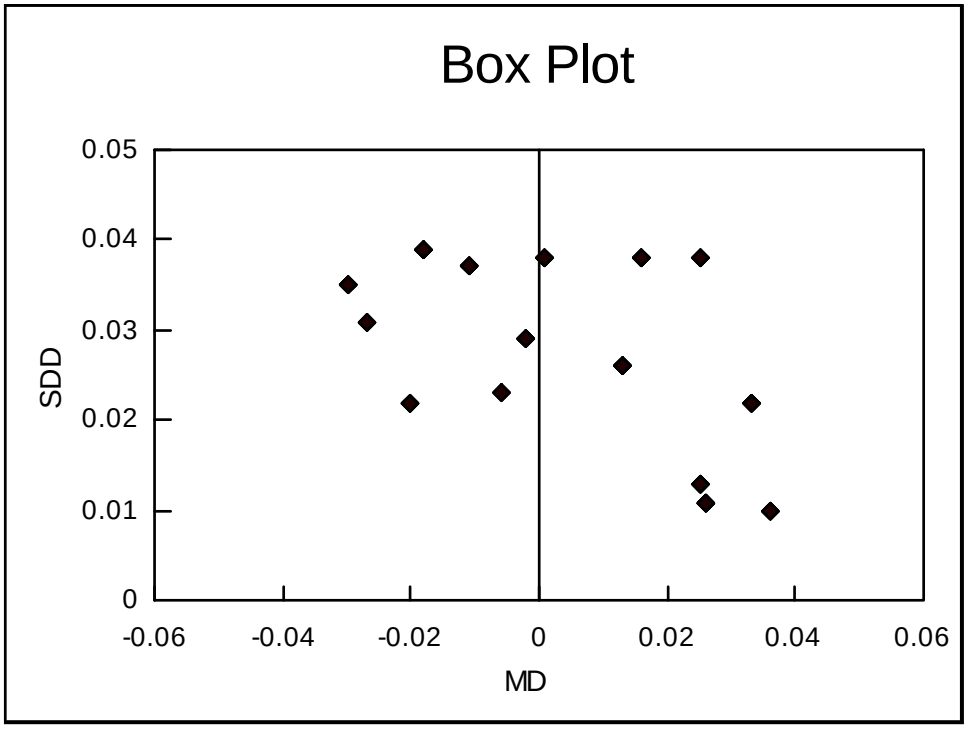

IR Calibration
0.06
0.04
0.02
0
-0.02
-0.04
-0.06
0
5
10
15
Week
MD

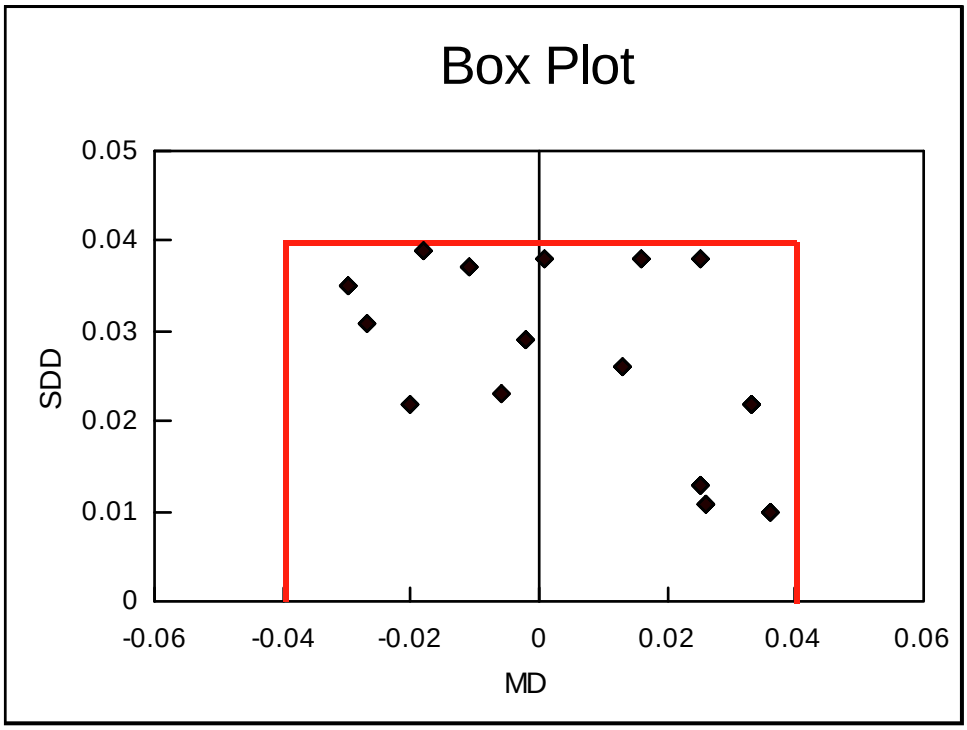

IR Calibration
0.05
0.04
0.03
0.02
0.01
0
0
5
10
15
Week
SDD

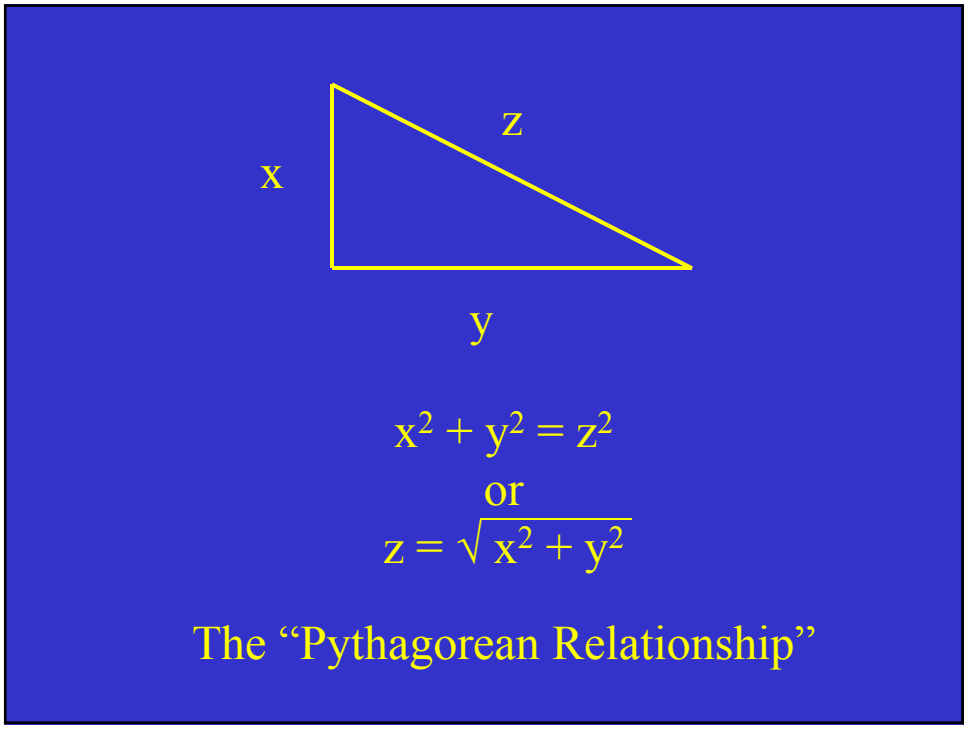


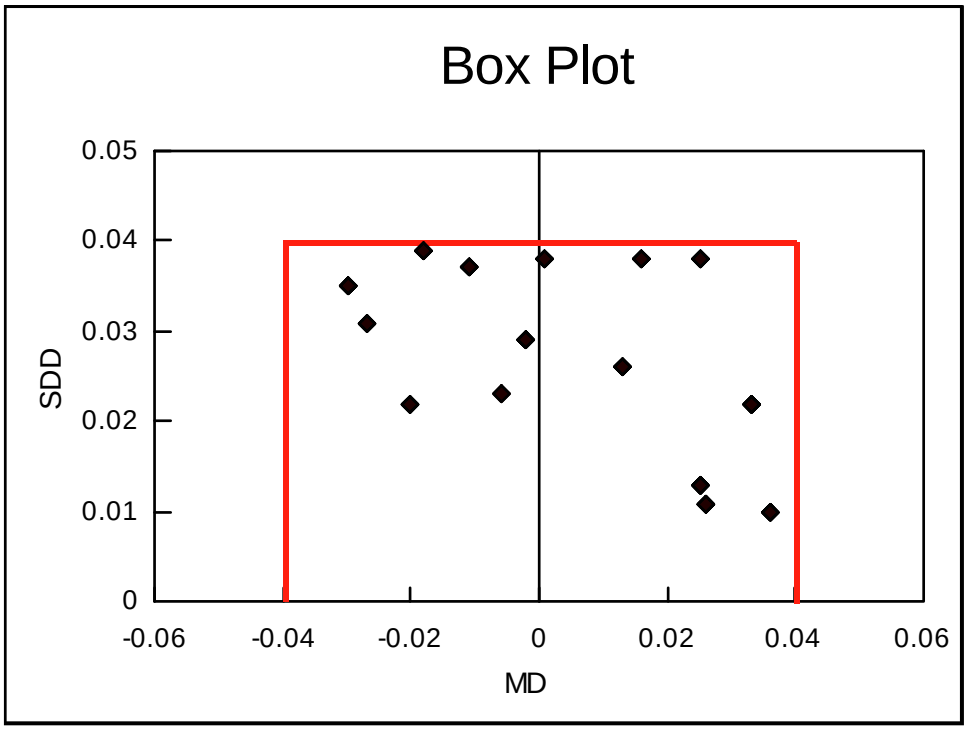
Calibration Check (trend analysis):

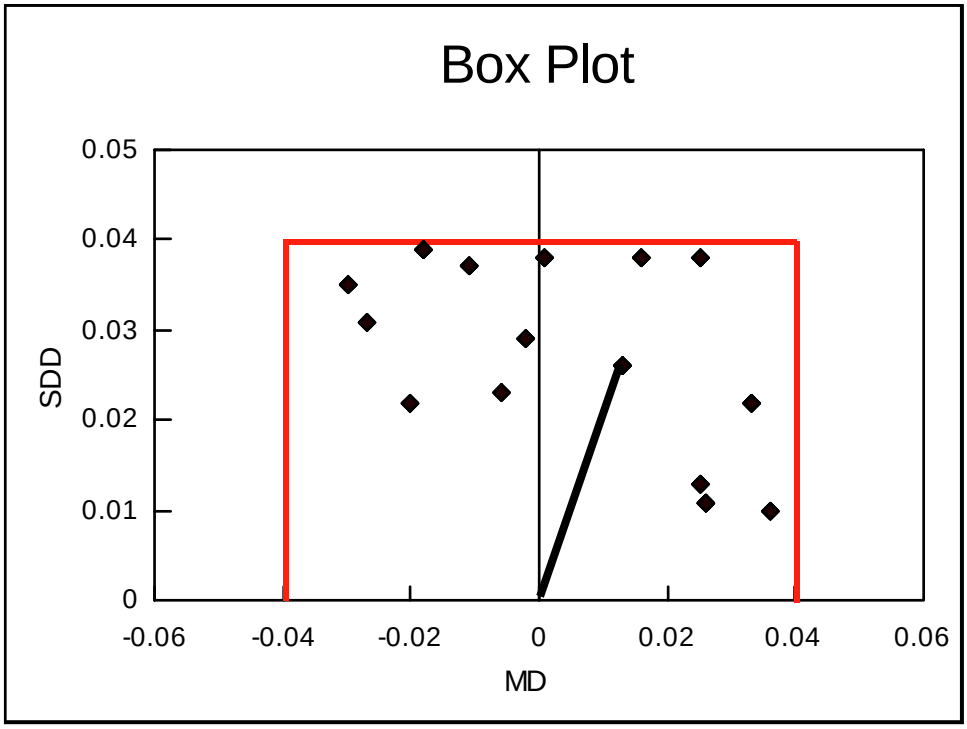
Week	MD	SDD	Status
1	-0.006	0.023	pass
2	0.026	0.011	pass
3	0.025	0.013	pass
4	-0.002	0.029	pass
5	0.013	0.026	pass
6	-0.020	0.022	pass
7	0.036	0.010	pass
8	0.001	0.038	pass
9	-0.011	0.037	pass
10	0.033	0.022	pass
11	-0.027	0.031	pass
12	0.016	0.038	pass
13	-0.018	0.039	pass
14	0.025	0.038	pass
15	-0.030	0.035	pass

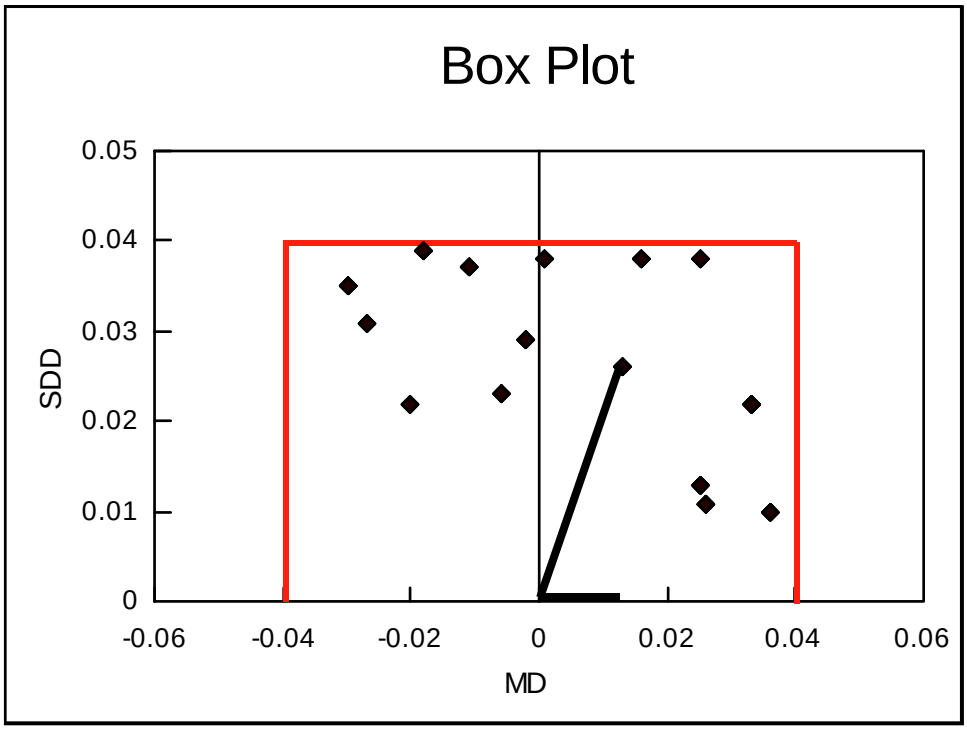

Box Plot
0.05
0.04
0.03
0.02
0.01
0
SDD
-0.06
-0.04
-0.02
0
0.02
0.04
0.06
MD

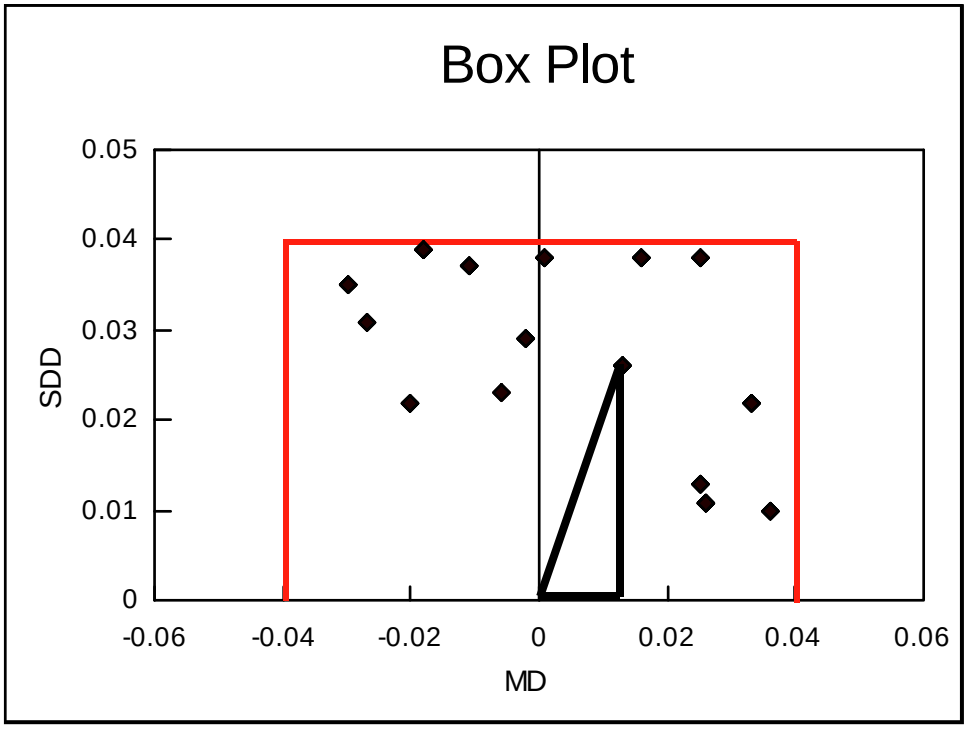

Box Plot
0.05
0.04
0.03
0.02
0.01
0
SDD
-0.06
-0.04
-0.02
0
0.02
0.04
0.06
MD

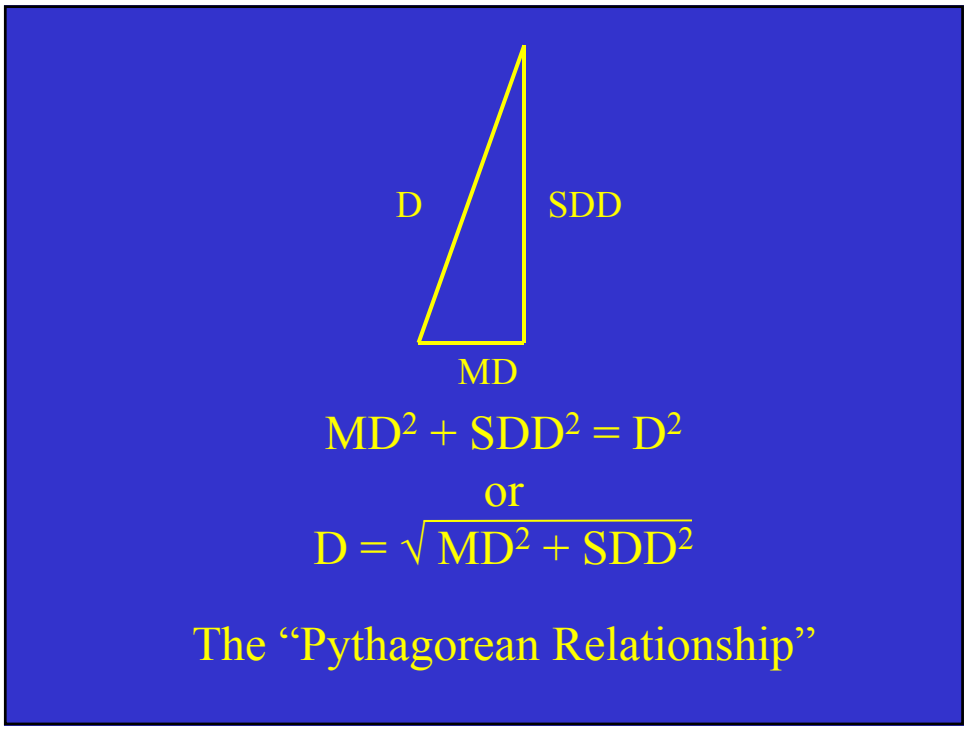

z
x
y
$x^2 + y^2 = z^2$
or
$z = \sqrt{x^2 + y^2}$
The "Pythagorean Relationship"


Box Plot
SDD
0.05
0.04
0.03
0.02
0.01
0
-0.06
-0.04
-0.02
0
0.02
0.04
0.06
MD


Box Plot
0.05
0.04
0.03
0.02
0.01
0
SDD
-0.06
-0.04
-0.02
0
0.02
0.04
0.06
MD


Box Plot
0.05
0.04
0.03
0.02
0.01
0
SDD
-0.06
-0.04
-0.02
0
0.02
0.04
0.06
MD


Box Plot
0.05
0.04
0.03
0.02
0.01
0
SDD
-0.06
-0.04
-0.02
0
0.02
0.04
0.06
MD

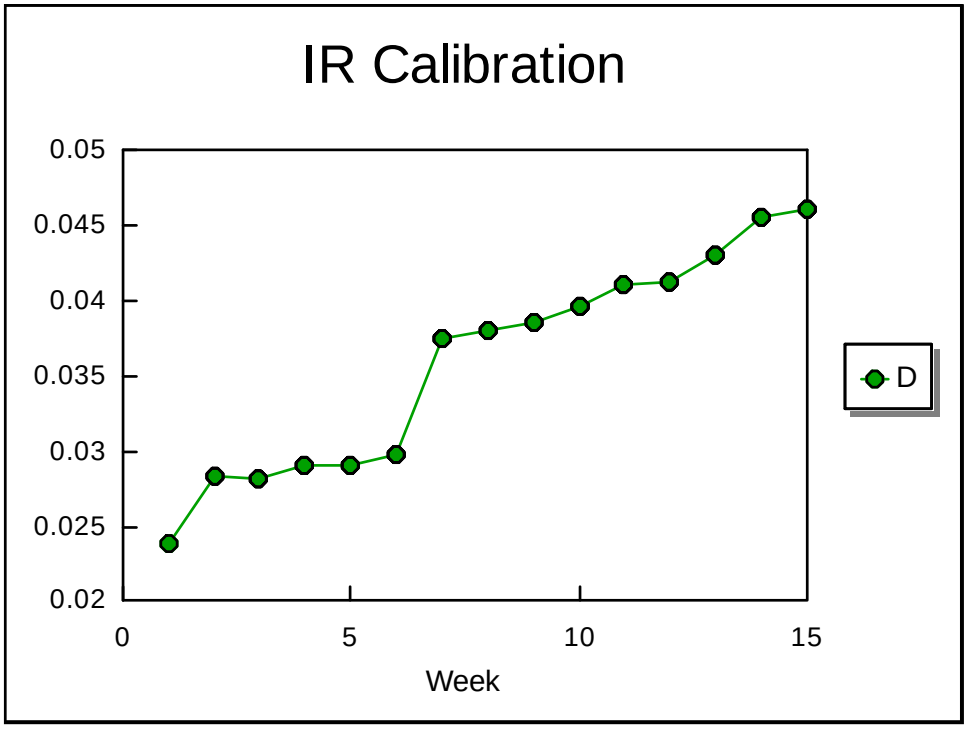

D
SDD
MD
$MD^2 + SDD^2 = D^2$
or
$D = \sqrt{MD^2 + SDD^2}$
The "Pythagorean Relationship"

Calibration Check (trend analysis):

Week	MD	SDD	Status
1	-0.006	0.023	pass
2	0.026	0.011	pass
3	0.025	0.013	pass
4	-0.002	0.029	pass
5	0.013	0.026	pass
6	-0.020	0.022	pass
7	0.036	0.010	pass
8	0.001	0.038	pass
9	-0.011	0.037	pass
10	0.033	0.022	pass
11	-0.027	0.031	pass
12	0.016	0.038	pass
13	-0.018	0.039	pass
14	0.025	0.038	pass
15	-0.030	0.035	pass

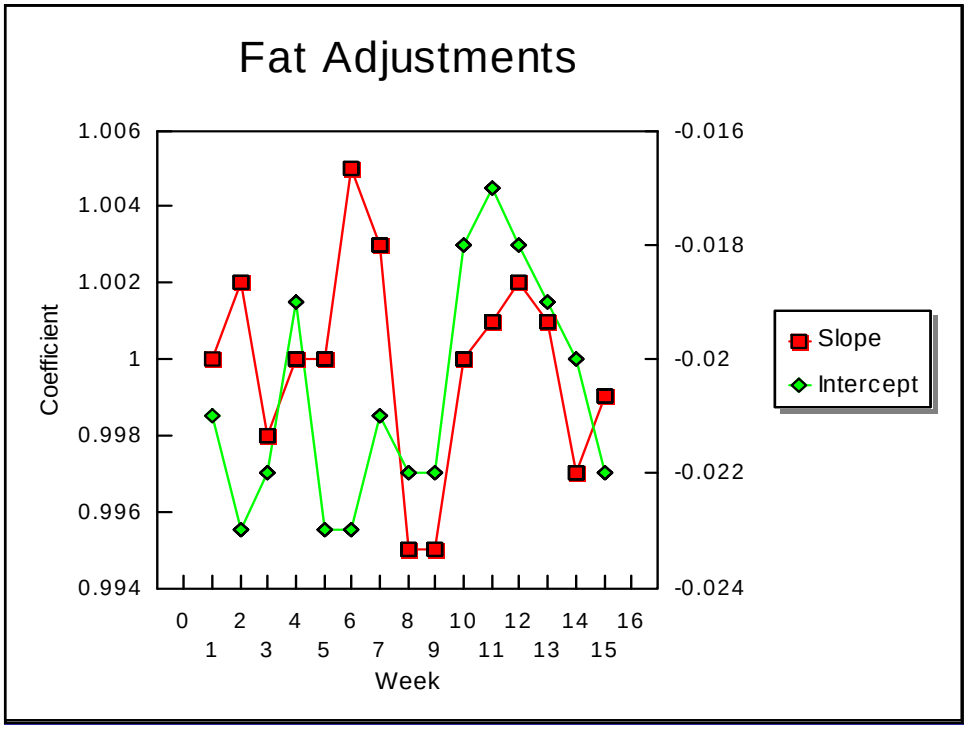
Calibration Check (trend analysis):

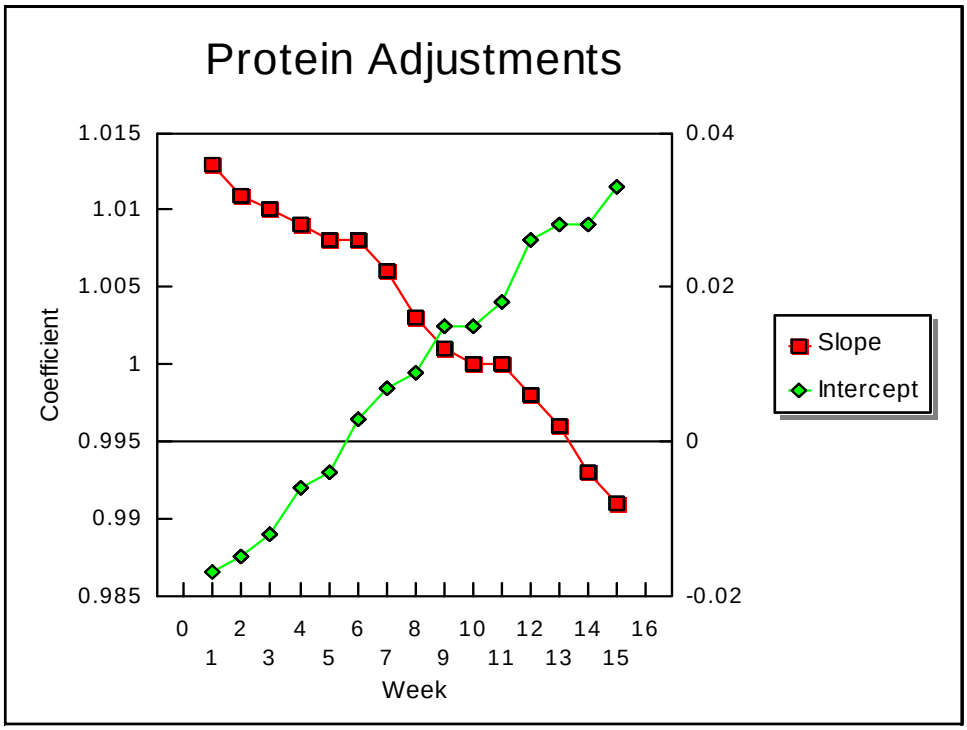
Week	MD	SDD	Status	D
1	-0.006	0.023	pass	0.024
2	0.026	0.011	pass	0.028
3	0.025	0.013	pass	0.028
4	-0.002	0.029	pass	0.029
5	0.013	0.026	pass	0.029
6	-0.020	0.022	pass	0.030
7	0.036	0.010	pass	0.037
8	0.001	0.038	pass	0.038
9	-0.011	0.037	pass	0.039
10	0.033	0.022	pass	0.040
11	-0.027	0.031	pass	0.041
12	0.016	0.038	pass	0.041
13	-0.018	0.039	pass	0.043
14	0.025	0.038	pass	0.045
15	-0.030	0.035	pass	0.046



IR Calibration Adjustments (trend analysis):

Week	Fat Slope	Fat Intercept	Protein Slope	Protein Intercept
1	1.000	-0.021	1.013	-0.017
2	1.002	-0.023	1.011	-0.015
3	0.998	-0.022	1.010	-0.012
4	1.000	-0.019	1.009	-0.006
5	1.000	-0.023	1.008	-0.004
6	1.005	-0.023	1.008	0.003
7	1.003	-0.021	1.006	0.007
8	0.995	-0.022	1.003	0.009
9	0.995	-0.022	1.001	0.015
10	1.000	-0.018	1.000	0.015
11	1.001	-0.017	1.000	0.018
12	1.002	-0.018	0.998	0.026
13	1.001	-0.019	0.996	0.028
14	0.997	-0.020	0.993	0.028
15	0.999	-0.022	0.991	0.033


Fat Adjustments
1.006
1.004
1.002
1
0.998
0.996
0.994
Coefficient
-0.016
-0.018
-0.02
-0.022
-0.024
0 2 4 6 8 10 12 14 16
1 3 5 7 9 11 13 15
Week
Slope
Intercept


Protein Adjustments
1.015
1.01
1.005
1
0.995
0.99
0.985
Coefficient
0.04
0.02
0
-0.02
0 2 4 6 8 10 12 14 16
1 3 5 7 9 11 13 15
Week
Slope
Intercept