Message

From: Adam Rosendorff [/O=THERANOS ORGANIZATION/OU=EXCHANGE ADMINISTRATIVE GROUP (FYDIBOHF23SPDLT)/CN=RECIPIENTS/CN=ADAM ROSENDORFD92]
Sent: 2/19/2014 10:57:01 PM
To: Sunny Balwani [sbalwani@theranos.com]; Daniel Young [dyoung@theranos.com]
CC: Mark Pandori [mpandori@theranos.com]
Subject: RE: Low HDLs- UPDATE

Sunny

The QC drift to the low side would definitely not have helped- but we're still within protocol. For HDL, no significant interference was seen in the predicate assay to 10 mg/dL bilirubin and NSI was seen for the p-protocol to 16 mg/dL Bilirubin. Hemolysis was not tested. I will go down and look at the CTNs in question.

Adam

From: Sunny Balwani
Sent: Wednesday, February 19, 2014 2:44 PM
To: Daniel Young; Adam Rosendorff
Cc: Mark Pandori
Subject: RE: Low HDLs- UPDATE

Can you also see if you see anything pCTN related for these samples that jump at you?

Also, could this drift in QC cause low bias ?

From: Daniel Young
Sent: Wednesday, February 19, 2014 2:42 PM
To: Sunny Balwani; Adam Rosendorff
Cc: Mark Pandori
Subject: RE: Low HDLs- UPDATE

I don't think it is Tecan related since the diluted and undiluted QC results are essentially the same. But we will confirm.

-Daniel

From: Sunny Balwani
Sent: 2/19/2014 2:39 PM
To: Adam Rosendorff
Cc: Mark Pandori; Daniel Young
Subject: RE: Low HDLs- UPDATE

I agree on releasing the results.

Daniel. Can you have Nishit and Tina lead investigation into whether Tecan may be causing any over dilution. We should run exactly the same assays on the 5 orders we had issues with so we recreate the same scenario and compare the results.

Adam. I thought about CTN but not sure why only HDL would be impacted if that were the case. I don't know the answer.

Thanks.

From: Adam Rosendorff
Sent: Wednesday, February 19, 2014 2:37 PM
To: Sunny Balwani
Cc: Mark Pandori; Daniel Young
Subject: RE: Low HDLs- UPDATE

Hi All

Quick update- we redid calibration and controls for p-HDL and D-HDL. For p-HDL, the controls are now as follows:

Level 1:	26.4	(acceptable range 21.6-32.4, ave 27)
Level 2:	42.8	(acceptable range 41.04-61.56, ave 51.3)
Level 3:	61.8	(acceptable range 61.74-92.66, ave 92.66)

It looks like we are ***still*** on the low side of the average for all levels, although level 1 has come up a bit. We are barely passing QC now for levels 2 and 3.

The following patient HDLs have been run today:

55211 41.5 mg/dL

55091 67.4 mg/dL

55152 76.0 mg/dL

These values look ok- and I am inclined to release them if there are no objections.

We also ran 4 venous samples (LiHep) comparing predicate (Siemens) to p-protocols (Theranos) (previous calibration and QC), yesterday.

The data is as follows:

	Siemens	Theranos
1	65.4	60.4
2	43.9	39.2
3	61.8	56.8
4	109	100.9

The data looks quite close.

For the 5 patients with low HDL values, Melissa is checking to see if we have enough sample leftover to run now that we have done recalibration and QC.

My leading theory on the spate of low HDLs are the following:

(1) Tecan overdilution
(2) Preanalytic collection issue (eg, bad CTNs)
(3) Reagent getting old and sporadically producing low results.

Thanks,

Adam

From: Sunny Balwani
Sent: Wednesday, February 19, 2014 7:57 AM
To: Adam Rosendorff
Cc: Mark Pandori; Daniel Young
Subject: FW: Low HDLs

Adam.

Please see below. This was my suspicion and I had team look into the raw data. This is also where we got dinged in the CLIA audit. This should have been caught during regular QC. Is anyone looking at QC for Advias?

From: Daniel Young
Sent: Wednesday, February 19, 2014 7:47 AM
To: Sunny Balwani
Cc: Elizabeth Holmes
Subject: RE: Low HDLs

Beloe is the summary. D-HDL is the Advia default protocol and P-HDL is the Theranos protocol (pre-diluted) run on Advia. The mean bias ranges from -13% to -16%, with little variance. There is little difference between the two protocols. The QC data should have been flagged as I mentioned, for being consistently biased. We have a released SOP in CLIA that was not follows ("Westgard and Levey-Jennings Quality Control Doc # CL SOP-00023").

		QC Data					Assigned			
		Mean	SD	CV	Min	Max	Avg	Min	Max	Mean Bias
D-HDL	Level 1	23.6	0.48	0.02	22.5	24.6	27	21.6	32.4	13%
P-HDL	Level 1	23.6	1.10	0.05	17.1	24.4	27	21.6	32.4	13%
D-HDL	Level 2	43.8	0.90	0.02	41.5	46	51.3	41.04	61.56	15%
P-HDL	Level 2	43.9	1.95	0.04	33.1	47.3	51.3	41.04	61.56	14%
D-HDL	Level 3	65.2	1.39	0.02	61.8	68.5	77.2	61.74	92.66	16%
P-HDL	Level 3	64.8	1.87	0.03	58.1	70.1	77.2	61.74	92.66	16%

-Daniel

From: Daniel Young
Sent: Tuesday, February 18, 2014 6:22 PM
To: Sunny Balwani
Cc: Elizabeth Holmes
Subject: RE: Low HDLs

At first glance, the HDL QC data looks to be running consistently low (very roughly 10% low). These QC data should have raised an alarm flag several weeks ago. The QC results seem similar for both the default Siemens protocol, as well as for the Theranos diluted protocol.

CLIA should have a person who is reviewing the QC data on a periodic basis. This deficiency came up in the last CLIA audit – I am not sure if they are doing this on a regular basis now or not.

-Daniel

On Feb 19, 2014, at 5:04 AM, "Adam Rosendorff" <arosendorff@theranos.com> wrote:

Daniel and Sunny

We have been getting a spate of low HDL values:

- 28 mg/dL
- 35 mg/dL 2/17/2014
- 23.5 mg/dL 2/14/2014→ resulted and reported
- 28.6 mg/dL 2/18/2014
- 34.8 mg/dL 2/17/2014

These are all around the 5th percentile or less- I suspect our HDL assay has failed and I do not want to report out this result until we fix it.

Thanks,

Adam Rosendorff, MD, FASCP

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