STUDY OF LIPID PROFILE FROM RIQAS QUALITY CONTROL SAMPLE

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ABSTRACT

The laboratory of the present author is a participant of Randox International Quality Assessment Scheme (RIQAS). The author receives twenty six samples for thirty nine general chemistry analysis per year , reports of which are to be sent fortnightly . Amongst thirty nine analytes there are partial lipid profile parameters like total cholesterol and triglycerides. So, the author decided to run a pilot study of full lipid profile from these samples . At the first phase four samples from two different cycles were considered as test materials. The reports of these samples were quite satisfactory. The trial run was given for fifteen consecutive days. (Presented by the author in the Annual Conference of ACBI, 2004).

The success of trial runs for fifteen days proved that EQA samples from RIQAS may be used for full lipid profile analysis. Results were compared against Randox internal quality control samples (IQA) and were found to be accurate and reproducible.

KEYWORDS

EQA, HDL - cholesterol, IQA, LDL - cholesterol, RIQAS.

INTRODUCTION

For any standard laboratory, it is essential to have IQA (internal quality assessment) and EQA (external quality assessment) samples.

The Biochemistry laboratory of Peerless Hospital & B.K.Roy Research Centre is a participant of Randox EQA programme since the year 2000. As IQA, the laboratory procures Randox multisera. But amongst thirty nine analytes for general chemistry quality control sample there are only two parameters from lipid profile, total cholesterol and triglycerides. For full lipid profile there is a separate EQA programme. But that EQA programme is very expensive and budget is such a factor which one can never overlook. So , the necessity implanted the idea of a pilot study of full lipid profile from the general chemistry samples for EQA.

RIQAS samples are based on human matrix and obtained from pooled sera. Hence, if a human sample can be treated directly in an automated system to get

the lipid profile values, the EQA sample from RIQAS may also be treated in a similar manner. The results may differ due to stability factor, as we know during lyophilization there is a chance of changes of few physical properties like solubility and stability . But it has been proved that after reconstitution the sample remains stable for forty five days (1, 2).

The logisticity of EQA programme for lipid profile by RIQAS was : the lipid profile parameters, especially HDL and LDL cholesterol are supplied after special purification and extraction procedures, so that the laboratory using precipitation technique for HDL cholesterol determination may also use it. But sometimes absolutely purified samples behave as pure chemicals which is not exactly the feature of a human sample.

Human sample constitutes so many interfering substances that it is only desirable to have a calibrator of similar matrix .

As the EQA sample supplied by RIQAS possesses the required characteristics, so the idea of estimating full lipid profile occurred in the author's mind.

MATERIALS AND METHOD

1. RIQAS samples :

a) Four samples from cycle 27, R14, R16, R18, R20.

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Duration of the cycle Oct 2002 - Mar 2003.

b) Four samples from cycle 28, R3, R5, R7, R9.
Duration of the cycle Apr 2003 - Sep 2003

(1) The supplied values of total cholesterol (TC) and triglycerides (TG) of samples from cycles 27 and 28 are mentioned in tables 1 - 8.

The values of LDLC and VLDLC calculated from Friedewald's equation have been given, marked (F) in tables 1 - 8.

The samples were reconstituted with 10 ml of double distilled water, kept in 500 micro litre aliquots at -20 degree Celsius, to be thawed only once before use. The stability of the samples is 3 - 4 hrs. at room temperature, 7 days at 2 - 8 degree Celsius and 45 days at - 20 degree Celsius.

2. Total cholesterol and triglycerides determination kits. Total cholesterol was estimated by chod - pod (3) method, triglycerides by GPO - PAP (4) method.

3. HDL and LDL cholesterol determination were done by innovative detergent technology (5,6).

4. Lipid calibrator: obtained along with HDL cholesterol estimation kit.

5. Lipid control: normal and pathological range both obtained from Randox Laboratories.

Total cholesterol, HDL cholesterol, LDL cholesterol and triglycerides were estimated in Synchron CX - 4 system, Beckman (USA).

RESULTS AND DISCUSSION

After reconstitution of the RIQAS sample we get 10 ml sample. We need to prepare EQA report from 10 ml. The remaining part is not sufficient for 45 consecutive days lipid profile estimation. So, in the first phase, the samples were tested everyday upto day 15. The consistency of the results and standard deviations have given confidence to the present author that the pilot study may prove to be a successful one. During this period, a parallel trial run has been given by RIQAS head office, U.K. On the last cycle the author started getting the values of HDL cholesterol from the general chemistry sample from RIQAS U.K. (7). That added to the confidence about the success of the plan. In the previous report on CKMB (1, 2), the author has shown that after reconstitution the sample remains stable upto 45 days. It is evident from the tables that the VLDL cholesterol value (calculated; eliminating HDL and LDL cholesterol from total cholesterol) is not in accordance with the Friedewald's equation (8, 9). Though it has long been proved that HDL and LDL cholesterol when estimated directly, do not match Friedewald's equation. The approval of the validity of the reports (3) presented in the tables

(Tables 1 - 8) came from the lipid control samples procured from Randox Laboratories.

Three types of lipid controls were tested simultaneously with the test samples. The basis for choosing three IQA samples of different range was, it was observed that sometimes reports are reproducible at a particular range but it is not equally reproducible above or below that range. So, the reproducibility of the results have been tested using controls at three different ranges.

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REFERENCES

1. Pal, Shyamali (2002) Estimation of CKMB from RIQAS control serum at 37 degree Celsius. *Ind. J. Clin. Biochem.* 17, 88-90.
2. Pal, Shyamali (2003) Estimation of CKMB from RIQAS control serum at 25 and 30 degree Celsius. *R.G.Kar Medical Bulletin* 9, 8-11.
3. Myers G.L., Kimberly M.M., Waymack P.P., Smith S.J., Cooper G.R. and Sampson E.J. (2000) A reference method laboratory network for cholesterol : a model for standardization and improvement of clinical laboratory measurements. *Clin. Chem.* 46, 1762-1772.
4. Henry, J.B. (1991) *Clinical diagnosis and management by laboratory methods*, 18th Ed. W.B. Saunders, Philadelphia, P. 204-211.
5. Hoang, M.P., Hirany, S.V., Parupia, J., Devaraj, S. and Jialal, I. (1998) Comparison of two homogeneous high density lipoprotein cholesterol assays. *Arch. Patol. Lab. Med.* 122, 1005-1009.
6. Nakamura, M., Tanigati, Y., Yamamoto, M., Hino, K. and Manabe, M. (1997) Homogeneous assay of serum LDL cholesterol on an automatic analyzer. *Clin. Chem.* 43/6, S.260-261.
7. RIQAS external quality assessment reports, general clinical chemistry reports of cycle 29, (RQ9123), RIQAS H.Q., Crumlin, U.K.
8. Friedewald, W.T., Levy, R.I. and Frederickson, D.S. (1972) Estimation of the concentration of low density lipoprotein cholesterol in plasma without use of the preparative ultracentrifuge. *Clin. Chem.* 18, 499-502.
9. Hoffmann, G.E., Schleichner, E., Weiss, L. and Hoffmann, S. (1982) Comparison of two methods for very low density and low density lipoprotein cholesterol determination. *J. Clin. Chem. Clin. Biochem.* 20, 457-460.

Table 1. Lipid profile data of RIQAS sample R14

Days	TC 172	HDLC 50.3	LDLC 103.3 (F)	VLDLC 18.4 (F)	TG 92
1	170	49.7	97.4	22.9	91.6
2	171	50.0	97.8	23.2	92.0
3	169	51.0	97.0	21.0	92.0
4	169	49.5	97.0	22.5	91.8
5	170	49.8	99.0	21.2	91.8
6	168	49.6	98.0	20.4	92.0
7	171	49.0	96.0	26.0	90.0
8	170	49.0	97.0	24.0	89.0
9	175	53.0	97.0	25.0	91.0
10	170	50.0	97.4	22.6	90.0
11	169	51.0	97.3	20.7	89.0
12	171	50.5	96.8	23.7	89.0
13	172	51.0	96.5	24.5	90.0
14	170	51.0	96.0	23.0	91.0
15	169	50.5	97.0	21.5	92.0
RANGE	168-175	49-53	96-99	20.4-26	89-92
MEAN	170.3	50.3	97.1	22.8	90.8
S.D.	3.1	1.8	1.5	2.0	1.6
%CV	1.2	3.5	1.5	0.8	1.7

Table 2. Lipid profile data of RIQAS sample R16

Days	TC 172.8	HDLC 39.2	LDLC 81.1 (F)	VLDLC 12.5 (F)	TG 62.6
1	130	39	82	9	62
2	131	40	82	9	64
3	129	38	83	8	64
4	133	39	84	10	64
5	132	39	82	11	64
6	133	43	80	10	62
7	129	38	80	11	63
8	133	39	82	12	63
9	131	39	80	12	64
10	130	40	80	10	63
11	131	38	80	13	62
12	132	40	80	12	63
13	133	38	82	13	62
14	132	40	82	10	64
15	131	38	80	13	63
RANGE	129-133	38-43	80-84	9-13	62-64
MEAN	131.3	39.2	81.3	10.9	63.1
S.D.	1.4	2.0	1.4	1.2	0.6
%CV	1.1	5.0	1.7	8.2	0.9

Table 3. Lipid profile data of RIQAS sample R18

Days	TC 172.6	HDLC 40.9	LDLC 113.6 (F)	VLDLC 18.1 (F)	TG 90.7
1	170	41	104	25	91
2	173	41	105	27	92
3	172	41	103	28	91
4	173	40	106	27	92
5	171	41	104	26	91
6	170	42	106	22	90
7	170	41	106	23	91
8	171	40	104	27	91
9	172	40	104	28	91
10	171	40	104	27	90
11	173	42	105	26	92
12	173	40	103	30	92
13	172	41	104	27	90
14	170	42	103	25	91
15	171	42	101	28	92
RANGE	170-173	40-42	101-106	22-30	90-92
MEAN	171.4	40.9	104.1	26.4	91.2
S.D.	1.5	0.6	1.7	2.5	1.5
%CV	0.8	1.4	1.6	9.0	1.6

Table 4. Lipid profile data of RIQAS sample R20

Days	TC 152.9	HDLC 45.1	LDLC 85.9 (F)	VLDLC 21.9 (F)	TG 109.7
1	153	45.7	97	10.3	110
2	152	45.6	95	11.4	109
3	151	45.0	97	9.0	110
4	154	45.0	98	11.0	109
5	151	44.8	97	9.2	109
6	150	44.0	96	10.0	110
7	154	46.0	96	12.0	108
8	155	47.0	97	11.0	109
9	151	45.0	96	10.0	106
10	153	45.6	97	10.4	109
11	152	44.0	97	11.0	107
12	153	43.0	98	12.0	108
13	151	45.5	96	9.5	108
14	150	45.0	95	9.0	109
15	155	46.0	98	11.0	110
RANGE	150-155	44-47	95-98	9-12	106-110
MEAN	152.3	45.1	96.6	10.4	108.7
S.D.	1.8	1.6	1.6	0.9	1.5
%CV	1.1	3.5	1.6	8.0	1.7

Table 5. Lipid profile data of RIQAS sample R3

Days	TC 294.2	HDLC 72	LDLC 171.4 (F)	VLDLC 50.8 (F)	TG 254.2
1	294	72	172.2	49.8	254
2	293	72	170.0	51.0	253
3	290	70	170.0	50.0	254
4	292	72	171.0	49.0	253
5	293	72	172.2	48.8	250
6	294	70	171.6	52.4	253
7	294	71	171.4	51.6	252
8	292	72	170.8	49.2	251
9	293	71	170.5	51.5	253
10	293	72	171.6	49.4	254
11	294	70	172.0	52.0	251
12	292	72	171.5	48.5	250
13	293	72	170.7	50.3	255
14	294	70	170.4	53.6	255
15	294	70	171.8	52.2	254
RANGE	290-294	70-72	170-172.2	48.5-53.6	250-255
MEAN	293	71.2	171.2	50.6	252.8
S.D.	2.0	0.7	0.8	1.8	1.5
%CV	0.7	0.9	0.4	3.5	0.6

Table 6. Lipid profile data of RIQAS sample R5

Days	TC 148.1	HDLC 42.4	LDLC 86.7 (F)	VLDLC 19 (F)	TG 95
1	148	42.4	88.5	17.1	95.0
2	149	42.0	89.0	18.0	96.0
3	148	42.6	88.0	17.4	95.5
4	148	43.0	89.1	15.9	96.1
5	147	43.0	89.5	14.5	96.2
6	148	42.6	88.8	16.6	95.0
7	147	42.1	88.5	16.4	96.0
8	149	41.8	88.0	19.2	95.8
9	149	41.9	89.0	18.1	95.9
10	149	42.0	89.4	17.6	95.0
11	148	41.5	89.3	17.2	96.2
12	147	41.4	88.6	17.0	96.8
13	147	42.8	88.0	16.2	95.0
14	149	43.0	87.9	18.1	96.9
15	148	42.1	87.0	18.9	95.0
RANGE	147-149	41.4-43	87-89.5	16.2-19.2	95-96.9
MEAN	148	42.2	88.5	17.2	95.7
S.D.	0.9	0.6	0.8	1.1	0.7
%CV	0.6	1.1	0.8	6.0	0.7

Table 7. Lipid profile data of RIQAS sample R7

Days	TC 106.7	HDLC 31.4	LDLC 64 (F)	VLDLC 11.3 (F)	TG 56.5
1	106.5	31.1	66.0	9.4	56.6
2	107.0	32.0	65.0	9.6	55.0
3	105.0	31.5	65.0	8.5	56.0
4	104.0	31.6	64.0	8.4	57.0
5	106.8	31.6	66.8	8.4	55.0
6	107.0	31.1	67.4	8.5	56.6
7	105.0	31.4	64.8	8.8	57.1
8	105.5	31.6	65.5	8.4	55.8
9	106.7	31.7	66.0	9.0	55.5
10	107.0	32.0	65.2	9.8	56.8
11	106.8	30.8	67.4	8.6	57.0
12	106.5	30.6	67.5	8.4	57.0
13	107.0	31.0	67.0	9.0	56.8
14	109.0	32.0	68.0	9.0	57.4
15	105.0	30.8	64.8	9.4	57.5
RANGE	104-109	30.8-32	64-67.5	8.4-9.8	55-57.5
MEAN	106.3	31.4	66	8.8	56.4
S.D.	2.0	0.4	1.1	0.5	0.8
%CV	1.8	1.2	1.5	5.0	1.4

Table 8. Lipid profile data of RIQAS sample R9

Days	TC 278	HDLC 77.6	LDLC 149.7 (F)	VLDLC 50.7 (F)	TG 253.8
1	279	78.6	155.8	44.6	253
2	278	77.0	154.0	47.0	254
3	277	78.5	155.5	43.0	255
4	282	77.6	154.1	50.3	253
5	280	77.5	155.0	47.5	253
6	279	77.0	156.0	46.0	254
7	278	76.8	156.5	44.7	255
8	279	78.0	156.0	45.0	255
9	281	78.5	154.9	47.6	254
10	280	78.0	155.0	47.0	256
11	281	77.0	155.0	49.0	256
12	279	78.0	155.4	45.6	255
13	278	77.5	154.0	46.5	253
14	279	77.4	156.0	45.6	254
15	280	77.0	156.5	46.5	254
RANGE	277-282	76.8-78.6	154-156.5	43-50.3	253-256
MEAN	279.3	77.6	155.3	46.4	254.2
S.D.	1.2	0.6	0.8	2.0	1.0
%CV	0.5	0.7	0.5	4.0	0.3