ERNDIM Administration Office
c/o EMQN CIC
Third Floor, ICE Building,
3 Exchange Quay, Salford
M5 3ED, United Kingdom
Tel: +44 161 757 4952
Email: admin@erndim.org

Scientific Coordination
Dr Joachim Janda
Metabolic Center Heidelberg
Im NeuenheimerFeld 669
69120 Heidelberg
Germany
e-mail: Joachim.Janda@med.uni-heidelberg.de

Scheme Organisation
CSCQ (Quality Control Centre, Switzerland)
Alessandro Salemma
2 chemin du Petit-Bel-Air
1225 Chêne-Bourg
Switzerland,
Tel: +41 22 305 52 36
Email: erndim.survey@cscq.ch

Published: 30 April 2025[1]

Acylcarnitines in dried blood spots

Centre: Germany

Final Report 2024

prepared by
Dr Joachim Janda

Note: This annual report is intended for participants of the ERNDIM Acylcarnitines in dried blood spots (ACDB) scheme. The contents should not be used for any publication without permission of the Scientific Advisor.

The fact that your laboratory participates in ERNDIM schemes is not confidential, however, the raw data and performance scores are confidential and will only be shared within ERNDIM for the purpose of evaluating performance of your laboratory, unless ERNDIM is required to disclose performance data by a relevant government agency. For details please see 'ERNDIM Terms and conditions' and the ERNDIM Privacy Policy on www.erndim.org.

1. Introduction

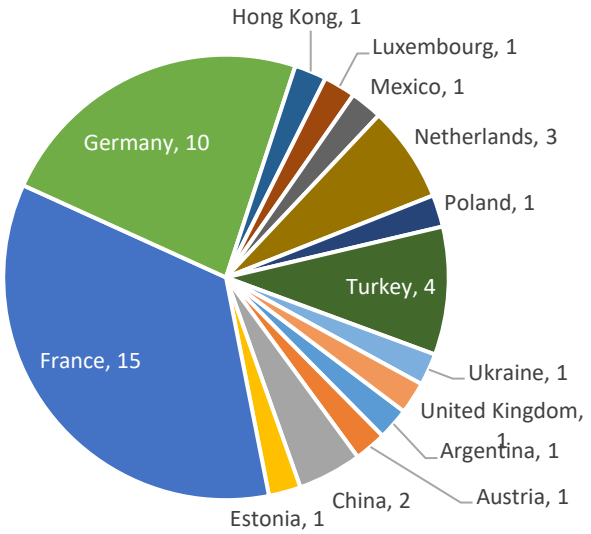
The ERNDIM ACDB scheme offers dried blood spots (DBS) obtained from patients with confirmed diagnoses to enable laboratories to gain or maintain experience to identify organoacidopathies and fatty acid β-oxidation defects. The scheme is organised by Dr Joachim Janda (Metabolic Center Heidelberg) in conjunction with CSCQ, the Swiss organisation for quality assurance in medical laboratories.

As in previous years, samples were sent out to cover the spectrum of what is typically observed in the metabolic laboratory. A mix of clearly diagnostic profiles and some more challenging profiles were provided. As in previous years normal profiles were also sent out. The requirement to interpret a normal profile, as such, is as important as correctly identifying abnormal profiles. Correctly identifying a profile as normal can avoid unnecessary further investigation and distress to the patient and family.

2. Geographical distribution of participants

In 2024, 43 laboratories from many different countries participated in the ACDB Heidelberg scheme including one educational participant. Educational participants can take part in all aspects of the scheme and receive interim reports with scores, but performance is not indicated on the ERNDIM certificate of performance.
Participants and new applicants will be distributed between the Heidelberg, London and Rome "acylcarnitine in DBS schemes" which are run separately. The three organising laboratories each participate in the other's scheme by rotation.

[1] If this report is not Version 1 for this scheme year, go to APPENDIX 1 for details of the changes made since the last version of this document.



Country	Number of participants
Argentina	1
Austria	1
China	2
Estonia	1
France	15
Germany	10
Hong Kong	1

Country	Number of participants
Luxembourg	1
Mexico	1
Netherlands	3
Poland	1
Turkey	4
Ukraine	1
United Kingdom	1

3. Design and logistics of the scheme including sample information

As in earlier ACDB schemes, the samples used in 2024 were authentic human DBS samples, five from affected patients and one from a healthy individual.
All samples selected by the Scientific Advisor are typically prepared from 30-50 µL of lithium heparin (or EDTA) anticoagulated whole blood on Whatman (Schleicher & Schuell) 903™ paper. All samples are obtained following local ethical and consent guidelines.
In 2024 CSCQ dispatched the ACDB EQA samples to the scheme participants and provides a website for on-line submission of results and access to scheme reports. Existing QLOU, ACDB, DPT and Urine MPS scheme participants can log on to the CSCQ results submission website at:

https://cscq.hcuge.ch/cscq/ERNDIM/Initial/Initial.php

Participants are also encouraged to make use of the option to upload labelled copies of scans and/or chromatograms on the CSCQ website together with their analytical and interpretative results.

4. Schedule of the scheme

Time schedule in the 2024 ERNDIM ACDB Heidelberg scheme.

	1st Submission Round	2nd Submission Round
Sample IDs	ACDB-DH-2024-**A** ACDB-DH-2024-**B** ACDB-DH-2024-**C**	ACDB-DH-2024-**D** ACDB-DH-2024-**E** ACDB-DH-2024-**F**
Shipment of samples	February 7, 2024	
Start of analysis (clinical data available)	12 March 2024	03 June 2024
Reminder for result submission	26 March 2024	17 June 2024
Results submission deadline	02 April 2024	24 June 2024
Interim reports available on CSCQ website	28 May 2024	14 August 2024

To be able to continue this scheme we need a steady supply of new patient samples. Several laboratories have donated samples to the ACDB scheme in the past, for which they are gratefully acknowledged. If you have one or more samples available and are willing to donate these to the scheme, please contact us at admin@erndim.org.
Laboratories which donate samples that are used in the scheme are eligible for a 20% discount on their participation in the ACDB scheme in the following year.

Samples included in the 2024 ERNDIM ACDB Heidelberg scheme.

Survey	Sample no.	Diagnosis
24-03-ACH	ACDB-DH-2024-A	Carnitine palmitoyltransferase I deficiency
	ACDB-DH-2024-B	Isovaleryl-CoA dehydrogenase deficiency
	ACDB-DH-2024-C	Propionyl-CoA carboxylase deficiency
24-06-ACH	ACDB-DH-2024-D	Hydroxymethylglutaryl-CoA lyase deficiency
	ACDB-DH-2024-E	Normal control sample
	ACDB-DH-2024-F	3-Methylglutaconic aciduria, type I

The scheme format was kept identical to those of previous years. Samples were shipped by regular mail. Details regarding stability of samples are provided in the sample package.
Interim reports were generated by the evaluation program developed by CSCQ.

Origin of patient samples: DBS samples were provided by; Metabolic Center Heidelberg, General University Hospital in Prague and Bambino Gesù Children's Hospital in Rome.

Prior to the distribution of the first round, a validation set of samples was returned from the CSCQ to the organising laboratory and re-analysed.

5. Results

Returned results in the 2024 ERNDIM ACDB Heidelberg scheme.

	Survey 1	Survey 2
Receipt of results	40	41
No answer	3	2

6. Web site reporting

The website reporting system is compulsory for all centres. The participants are reminded to carefully read and consider the following advice:

- **Results**
  - Give as much quantitative data as possible.
  - Enter the key metabolites with the evaluation **in the tables** even if you do not give quantitative data.
  - If the profile is normal: enter “Normal profile” in “Key metabolites”.
  - **Do not enter results in the “comments” field**, **otherwise your results will not be included in the evaluation program.**
- **Diagnosis**
  - **Do not enter the diagnosis in the “comments” window**, **otherwise your results will not be included in the evaluation program.**
- **Recommendations (= advice for further investigation)**
  - Scored together with the interpretative score.
  - Advice on treatment will not be scored.
  - **Do not give recommendations in “Comments on diagnosis” field**: It will not be included in the evaluation program.

7. Scoring and evaluation of results

A scoring system was developed in 2012 and approved by the ERNDIM Scientific Advisory Board (SAB). Similar to other qualitative (proficiency testing) ERNDIM schemes, the maximum score for a sample is 4 points.
Qualitative results and diagnostic proficiency of the 2024 samples were scored using the criteria given below. These criteria have been set by the Scientific Advisor and approved by the SAB of ERNDIM. A second evaluation of this year's results was carried out by Dr. Cristiano Rizzo, scientific advisor of the ACDB Rome scheme. The final decision on scoring of the scheme has been made by the SAB during its autumn meeting (28 November 2024).

General criteria used to score results

Item	Description of scoring criteria	Score
Quantitative results	Correct classification of quantitative results (i.e., normal or increased) according to reference values	1
	Incorrect classification of quantitative results	0
Qualitative results	Correct results according to criteria set for the sample	1
	Incorrect: minimally required results not reported	0
Diagnostic proficiency	Correct according to criteria set for the sample	2
	Partially correct	1
	Unsatisfactory or misleading	0
	Maximum total score	**4**

Starting with the 2014 schemes the concept of ‘critical error’ has been introduced to the assessment of the qualitative schemes. Labs failing to make a correct diagnosis of a sample considered eligible for this category will be deemed not to have reached a satisfactory performance even if their total points for the

year is sufficient according to the requirement set by the SAB. The classification of samples to be judged for critical error was undertaken at the SAB meeting held on 18 November 2024.

Score for satisfactory performance
A minimum of 17 points out of a maximum of 24 (71%) is necessary for a satisfactory performance.

The ERNDIM Annual Certificate covers all ERNDIM schemes in which a laboratory has participated during the scheme year. For the ACDB scheme, "participation" is defined as requiring two returns during the year. Failure to meet this requirement will result in the certificate of participation showing 'non-submitter' rather than 'satisfactory' or 'unsatisfactory'.

8. Results of samples and evaluation of reporting

8.1. Patient A

Carnitine palmitoyltransferase I deficiency

Patient details provided to participants
Patient with hypoglycemic crises at 6 months of age. He currently has language and learning difficulties at school

Further patient details
This was a common sample provided by the ACDB centre Rome.

Analytical performance
Forty of 43 participants reported results for this sample. Frequently mentioned key metabolites were palmitoylcarnitine (C16) with reduced (n=28, 70%) or normal (n=2, 5%) concentrations and stearoylcarnitine (C18) with reduced (n=29, 72.5%) or normal (n=3, 7.5%) concentrations. The concentration of free carnitine (C0) was reported to be elevated by 5 (12.5%) and as grossly elevated by 33 (82.5%) participants. Half of the labs reported on the so-called "CPT1 ratio", C0/(C16+C18), with all of them assessing its values as grossly elevated.

Further metabolites which were frequently referred to were C18:1 (n=16), C16:1 (n=16), and C18:2 carnitine with concentrations mostly categorized as decreased.

Evaluation criteria: One point is given for reporting long-chain acylcarnitines as decreased and one point is given for reporting free carnitine at least as elevated – both either as metabolite species or as ratio.

Diagnosis / Interpretative proficiency
CPT 1 was reported as principal diagnosis by 32 (80%) participants and as alternative diagnosis by two (5%) participants.
There were six participants not considering CPT1 for this sample, one of whom reported a carnitine deficiency under supplementation and reported correct analytical results. However, five other laboratories reported either no abnormal results or elevated free carnitine in combination with other AC homologues not relevant to this sample. They concluded 'no abnormalities' (n=3), MCAD or fructose-biphosphatase deficiency. These five laboratories were assigned a critical error for their performance.

Evaluation criteria: Stating CPT1 as the most likely diagnosis is awarded two points. One point is given if it is mentioned as an alternative and a further point is given if the recommendations allow the correct diagnosis to be made (e. g., by genetic analysis, reduced carnitine palmitoyltransferase I activity, and/or decreased long-chain fatty acid oxidation).

Recommendations
In their recommendations for further testing, the participants most frequently mentioned molecular genetic analyses (n=30), organic acids in urine (n=20), to measure enzymatic acitivity (n=14), and/or testing liver enzymes / function (n=9).

Overall impression
For most participants, this sample was clearly diagnosable. The reported results yielded an analytical proficiency of 87.5% and an interpretive proficiency of 82.5% for this common CPT1 sample.

8.2. Patient B

Isovaleryl-CoA dehydrogenase deficiency

Patient details provided to participants

Young woman with mild intellectual impairment and migraine

Further patient details

She had presented with neurological abnormalities, abnormal body odor and moderate hyperammonemia at day 8. IVA was diagnosed by organic acid analysis. Newborn screening showed clearly elevated C5 but results were received when the patient was already diagnosed. Molecular analysis revealed homozygosity for a pathogenic variant in *IVD*.

Analytical performance

Isovalerylcarnitine (C5) can be detected in substantially elevated concentrations. Correspondingly, diagnostic ratios such as C5/C2 are also elevated.

All participants who submitted results reported the C5 concentration to be increased (elevated: n=11 or 27.5%, grossly elevated: n=29 or 72.5%). Twenty-one labs reported on free carnitine and stated low (n=9, 22.5%) or normal (n=12, 30%) concentrations. The ratios C5/C0, C5/C2, and C5/C3 were reported by six, 14, and eight participants at least to be elevated.

Two laboratories stated that the C5 signals could be clearly assigned to isovalerylcarnitine by second-tier analyses.

Evaluation criteria: Two points are awarded for reporting C5 and/or related ratios as at least elevated.

Diagnosis / Interpretative proficiency

All participants considered IVA as diagnosis – 38 as principal diagnosis (95%) and two as alternative (5%). The indications on other alterative diagnoses overall in this sample reflect the ambiguity of C5 signals: Here, 2-methylbutyryl-CoA dehydrogenase deficiency was mentioned by 23 laboratories (by two labs as principal diagnosis) and 17 laboratories also reported on pivaloylcarnitine.

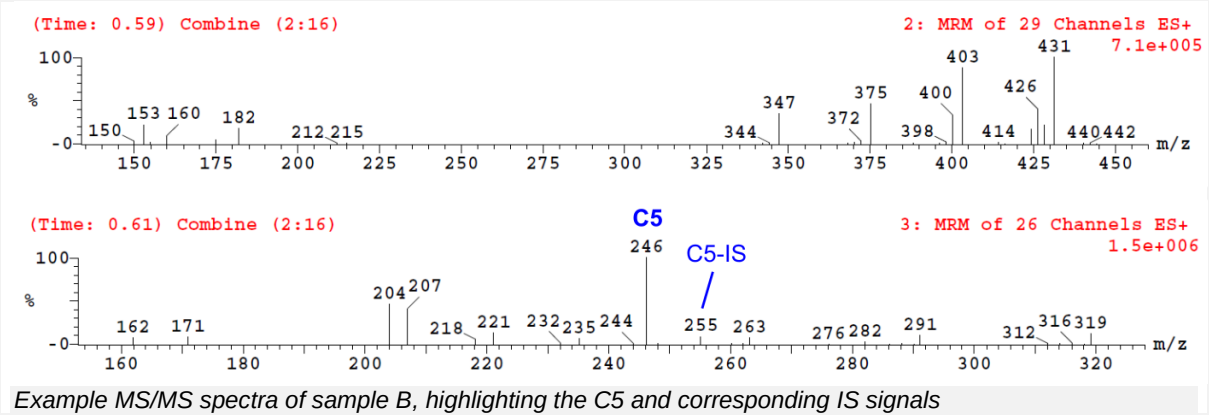
Evaluation criteria: Two points are awarded for stating IVA as the most likely diagnosis. If it is given as an alternative, a recommendation must be made that enables the correct diagnosis to be found.

Recommendations

The most frequent recommendations for this sample were to analyse organic acids in urine (n=36), molecular genetic testing (n=34), and determination of enzymatic activity (n=11). 11 participants also gave recommendations on further treatment.

Overall impression

This sample was not challenging for the participants. For analytical and interpretive performance, 100% proficiency was achieved.



Example MS/MS spectra of sample B, highlighting the C5 and corresponding IS signals

8.3. Patient C

Propionyl-CoA carboxylase deficiency

Patient details provided to participants

Six-year-old girl with developmental delay. On treatment.

Further patient details

First child of consanguineous parents. Symptomatic at day 2 with feeding difficulties, metabolic acidosis and ketonuria, which stabilized on i.v. glucose. Results of newborn screening with elevated C3 and ratios was available at day 4, organic acid analysis confirmed propionic aciduria. Molecular analysis revealed homozygosity for a pathogenic variant in *PCCA*.

Analytical performance

In this sample, elevated propionyl (C3) carnitine concentrations can be detected along with increased values for corresponding diagnostic ratios, such as C3/C2 or C3/C0. The O-palmitoleoylcarnitine (C16:1) concentration is slightly elevated. In addition, labs that perform second tier tests can measure elevated 3-OH-propionic and methylcitric acids, while methylmalonic acid and homocysteine should be within the normal range.

Almost all labs reported on high C3 concentrations (elevated: n=3, 7.5%; grossly elevated: n=36, 90%). Some participants additionally reported supportive ratios at least as increased: C3/C2: 45%, C3/C16: 27.5%, and C3/C0: 10% of participants. Seventeen labs also reported that C4DC(/C5OH) carnitine was within the normal range or even decreased. One participant did not report analytical results at all although mentioning the correct diagnosis.

Evaluation criteria: Reporting C3 carnitine at least as elevated and/or elevated C3-based ratios is awarded two points.

Diagnosis / Interpretative proficiency

PA was reported as principal diagnosis by the majority of participants (n=35, 87.5%). Five labs reported PA as alternative diagnosis and opted for methylmalonic acidaemia (MMA) as their choice for the most likely diagnosis. MMA was also the most frequently mentioned alternative diagnosis (70% of reports) followed by cobalamin metabolism defects (35% of reports).

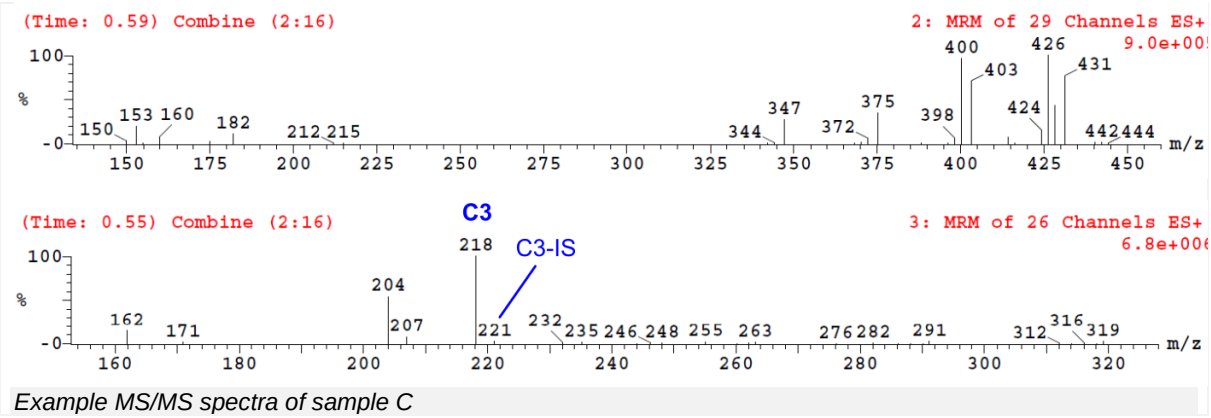
Evaluation criteria: Two points are given for PA as most likely diagnosis. If reported as alternative, one point is awarded and one more point in case a method suitable for differentiation is recommended.

Recommendations

To differentiate their proposed diagnoses, most participants recommended to analyse organic acids in urine (n=39) and/or quantify relevant metabolites in plasma or dried blood spots, such as homocysteine, methylcitric acid or methylmalonic acid. Thirteen labs recommended to test amino acids in plasma. For confirmation, 34 participants recommended to perform molecular genetic analyses, while determination of enzymatic acidity was mentioned 12 times.

Overall impression

The participants performed excellent with this sample and achieved 98% analytical and 100% interpretive proficiency.



Example MS/MS spectra of sample C

8.4. Patient D

Hydroxymethylglutaryl-CoA lyase deficiency

Patient details provided to participants

Boy of eight years who presented first 3 years ago with hepatomegaly and seizures.

Further patient details

The sample was a generous donation by Petr Chrastina, Department of Pediatrics and Inherited Metabolic Disorders, General University Hospital in Prague.

Analysis of acylcarnitines (kit without derivatisation) reveals clearly elevated C5OH (or C4DC) including corresponding ratios (e. g. C5OH/C2 ratio) and slightly elevated C6DC (as methylglutaryl carnitine). Metabolites useful for differential diagnostic, i. e. C3 and C5:1 carnitine, are within normal range.

Analytical performance

Results were reported by 41/43 participants in this ACDB survey. Diagnostic markers for HMG CLD are C6DC and C5OH carnitines, which can have isobaric analytes depending on the method applied (e. g. underivatized / butylated).

C5OH was reported to be in elevated concentration by 23 (56%) labs and as grossly elevated by 17 (42%) participants, while C6DC was reported by 25 (61%) labs as elevated and three (7%) as grossly elevated. One participant characterised the C6DC concentration as normal. C5OH-based ratios were also elevated and mentioned by four participants. Concentrations of C3 and C5:1 carnitine were referred to by 20 (49%) participants and mostly described as normal.

Evaluation criteria: In the 2022 ACDB scheme, it was announced that the C6DC marker will play a greater role in the evaluation of HMG-CLD samples than before. Therefore, C5OH and/or C6DC will be scored with one point each if they are reported as at least elevated.

Diagnosis / Interpretative proficiency

HMG CLD was chosen as primary diagnosis by 37 participants (90%) – as alternative diagnosis by two of them. As C5OH can be indicative for several other metabolic disorders, the majority of other primary or alternative diagnoses mentioned were of this group, e. g. 3-MCC (n=18), 3-MGA (n=19), biotinidase or holocarboxylase synthetase deficiency (n=19), BKT (n=17), or MHBD (n=13).
Some labs reported MMA or vitamin B_{12} related disorders as primary or alternative diagnosis (n=4), which may be due to the ambiguity of 262 *m/z* in acylcarnitine assays without derivatisation.
Participants who considered C3 and/or C5:1 in their reports typically added a prioritisation of potential alternative diagnoses based on their analytical findings. MADD and IVA were reported by one lab each as first diagnosis.

The reporting of isovaleric acidemia without any further recommendations here was considered a critical error by the SAB.

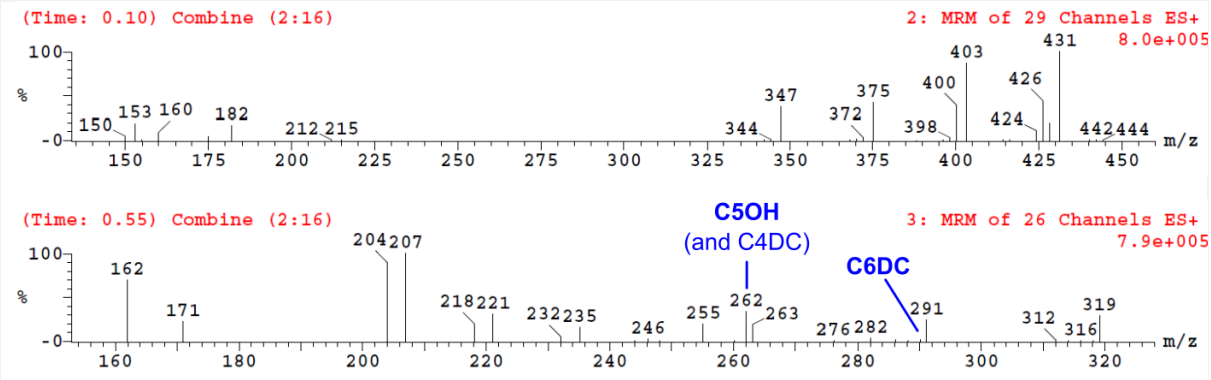
Evaluation criteria: Stating HMG CLD as the most likely diagnosis is awarded two points. One point is given if it is mentioned as an alternative and a further point is given if the recommendations allow the correct diagnosis to be made.

Recommendations

The vast majority of participants recommended analysis of urinary organic acids (n=39) for differentiation and molecular genetics (n=34) or enzymatic analyses (n=11) for confirmation.

Overall impression

Even with somewhat stricter evaluation criteria for the analytical part, the performance achieved is very good (analytical: 83% and interpretative 90%) and in the range of the ACDB-DH-2022-D sample.



Example MS/MS spectra of sample D

8.5. Patient E

Normal control sample

Patient details provided to participants

27-year-old woman experiencing episodic myalgia.

Further patient details

This sample was taken from a healthy colleague not known to suffer from an inborn error of metabolism (IEM) and represents a normal acylcarnitine profile.

Analytical performance

The majority of participants (36/41) clearly described the acylcarnitine profile as normal. Five labs reported single analytes as elevated, such as C3 (n=1), C4DC (n=2), or C5:1 (n=2), or decreased, such as C3 (n=1), C16 (n=2).

Evaluation criteria: Two points are awarded for reporting a normal acylcarnitine profile. If analytes are reported as elevated or decreased, it has to be stated that these alterations are not suspicious for an IEM.

Diagnosis / Interpretative proficiency

Thirty-nine laboratories concluded that this sample did not represent a metabolic disorder, including three participants that had reported elevated metabolites. In contrast, one lab diagnosed a primary carnitine deficiency and one lab opted for VLCAD.

Evaluation criteria: Stating no evidence for an IEM in this sample leads to 2 points.

Recommendations

The most frequent recommendations for this sample were to analyse organic acids in urine (n=14) or to repeat the acylcarnitine analysis (n=16) with either dried blood spots or plasma.

Overall impression

Analytical and interpretive performances were both 95% in recognising this sample as normal.

8.6. Patient F

3-Methylglutaconic aciduria, type I

Patient details provided to participants

Teenager with recurrent headaches.

Further patient details

This patient presented as a child, and urine analysis for organic acids revealed elevated concentrations of 3-OH isovaleric acid and 3-methylglutaconate. In subsequent tests, activity of 3-methylglutaconyl-CoA hydratase in lymphocytes was clearly reduced, and a homozygous deletion of exons 5-6 in the AUH gene confirmed the diagnosis.

This sample was a direct repetition of last year (ACDB-DH-2023-B). The acylcarnitine profile contains an elevated signal for hydroxyisovalerylcarnitine (C5OH) which can be supported by corresponding ratios, e. g. C5OH/C2.

Analytical performance
95% of participants who submitted results reported C5OH to be in elevated (n=21) or even grossly elevated concentration (n=18). One participant characterised the concentration as decreased/low. Five participants additionally reported elevated C5OH-based ratios, e. g. C5OH/C0 and/or C5OH/C8. Analytes allowing for a differentiation between disorders marked by C5OH carnitine were also reported frequently and, in most cases, described as in normal levels: C3 (n=10), C5:1 (n=14), and C6DC (n=16).

Evaluation criteria: Reporting C5OH carnitine at least as elevated and/or elevated C5OH-based ratios is awarded two points.

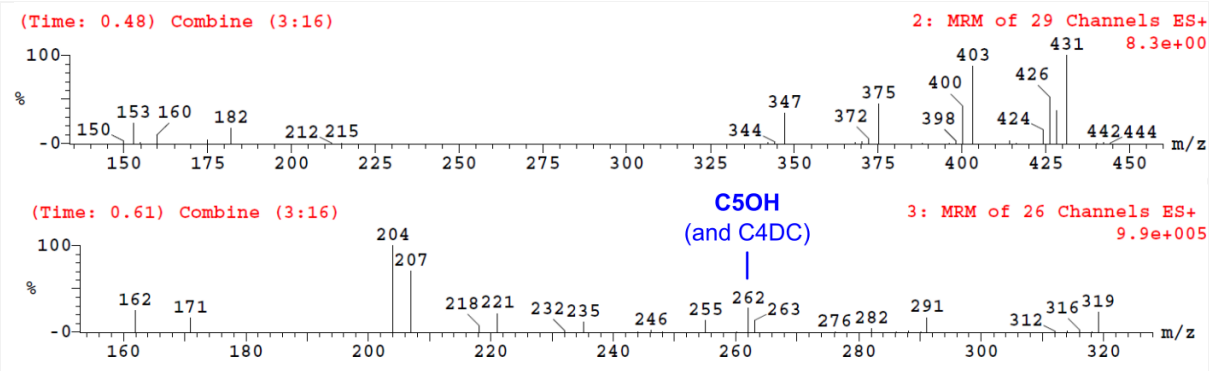
Diagnosis / Interpretative proficiency
3-MGA was reported as primary diagnosis by ten participants and as an alternative diagnosis (including a recommendation to analyse urinary organic acids) by 17 participants (66% together). The most frequently reported primary diagnosis was 3-MCC deficiency (n=18 or 44%), however. Other disorders characterised by elevated C5OH were rarely chosen as primary diagnosis but often mentioned as alternative: HMG CLD (n=19), BKT (n=18), MHBD (n=15), HLCS (n=15) or biotinidase deficiency (n=13). MMA was reported as an alternative by three laboratories. As in sample D, most participants who considered metabolites like C3, C5:1 or C6DC, used them to exclude certain diagnoses.

Other IEM reported as primary diagnoses by single laboratories were vitamin B_{12} deficiency, 3OH-isobutyric acidemia, isovaleric acidemia, MCAD or an inconclusive acylcarnitine profile. A critical error was assigned to one lab which did not report the indicative AC species for MGA1 and diagnosed a mild CPT2 deficiency.

Evaluation criteria: Two points are given either for reporting 3-MGA as the most likely diagnosis or for reporting as alternative diagnosis with additional recommendation to analyse urinary organic acids.

Recommendations
In this sample 39/41 participants recommended to analyse organic acids in order to differentiate their proposed diagnoses. For confirmation, many laboratories recommended molecular genetic analyses (n=33) or enzymatic assays (n=10). Biotinidase activity in DBS (or plasma) was also recommended several times, but rather as a further differentiation method.

Overall impression
The analytical performance was excellent and yielded 95%. The diagnostic proficiency resulted in 66%, however, given that the same sample was circulated in 2023 (sample B) with only 48% interpretative performance, this is a substantial improvement.



Example MS/MS spectra of sample F

9. Scores of participants

All data transfer, the submission of data as well as the request and viewing of reports proceed via the ACDB-CSCQ results website. The results of your laboratory are confidential and only accessible to you (with your username and password). The anonymous scores of all laboratories are accessible to all participants and only in your version is your laboratory highlighted in the leftmost column.

Detailed scores – **Round 1**

Lab n°	Patient A CPT1			Patient B IVA			Patient C PA			
	A	I	Total	A	I	Total	A	I	Total	Total
1	2	2	4	2	2	4	2	2	4	12
2	2	2	4	2	2	4	2	2	4	12
3	2	2	4	2	2	4	2	2	4	12
4	2	2	4	2	2	4	2	2	4	12
5	0	0	0	0	0	0	0	0	0	0
6	2	2	4	2	2	4	2	2	4	12
7	2	2	4	2	2	4	2	2	4	12
8	2	2	4	2	2	4	2	2	4	12
9	2	0	2	2	2	4	2	2	4	10
10	2	2	4	2	2	4	2	2	4	12
11	2	2	4	2	2	4	2	2	4	12
12	2	2	4	2	2	4	2	2	4	12
13	2	2	4	2	2	4	2	2	4	12
14	2	2	4	2	2	4	2	2	4	12
15	2	2	4	2	2	4	2	2	4	12
16	0	0	0	0	0	0	0	0	0	0
17	2	2	4	2	2	4	2	2	4	12
18	0	0	0	2	2	4	2	2	4	8
19	2	2	4	2	2	4	2	2	4	12
20	2	2	4	2	2	4	2	2	4	12
21	2	2	4	2	2	4	2	2	4	12
22	1	2	3	2	2	4	2	2	4	11
23	2	2	4	2	2	4	2	2	4	12
24	2	2	4	2	2	4	2	2	4	12
25	2	2	4	2	2	4	2	2	4	12
26	2	1	3	2	2	4	2	2	4	11
27	2	2	4	2	2	4	2	2	4	12
28	0	0	0	2	2	4	2	2	4	8

Lab n°	Patient A CPT1			Patient B IVA			Patient C PA			
	A	I	Total	A	I	Total	A	I	Total	Total
29	1	0	1	2	2	4	2	2	4	9
30	1	0	1	2	2	4	2	2	4	9
31	2	2	4	2	2	4	2	2	4	12
32	2	2	4	2	2	4	0	2	2	10
33	2	2	4	2	2	4	2	2	4	12
34	2	2	4	2	2	4	2	2	4	12
35	2	2	4	2	2	4	2	2	4	12
36	2	2	4	2	2	4	2	2	4	12
37	2	2	4	2	2	4	2	2	4	12
38	1	2	3	2	2	4	2	2	4	11
39	0	0	0	0	0	0	0	0	0	0
40	2	2	4	2	2	4	2	2	4	12
41	2	2	4	2	2	4	2	2	4	12
42	1	0	1	2	2	4	2	2	4	9
43	1	1	2	2	2	4	2	2	4	10

Detailed scores – Round 2

Lab n°	Patient D HMG CLD			Patient E normal			Patient F 3-MGA			
	A	I	Total	A	I	Total	A	I	Total	Total
1	1	2	3	2	2	4	2	2	4	11
2	1	2	3	2	2	4	0	0	0	7
3	2	2	4	2	2	4	2	2	4	12
4	2	2	4	2	2	4	2	2	4	12
5	0	0	0	0	0	0	0	0	0	0
6	2	2	4	2	2	4	2	2	4	12
7	2	2	4	2	2	4	2	2	4	12
8	2	2	4	2	2	4	2	0	2	10
9	1	0	1	2	2	4	2	0	2	7
10	2	2	4	2	2	4	2	2	4	12
11	1	2	3	2	2	4	2	2	4	11
12	2	2	4	2	2	4	2	0	2	10
13	2	2	4	2	2	4	2	0	2	10
14	1	0	1	2	2	4	2	0	2	7

Lab n°	Patient D HMG CLD			Patient E normal			Patient F 3-MGA			
	A	I	Total	A	I	Total	A	I	Total	Total
15	2	2	4	2	2	4	2	2	4	12
16	0	0	0	0	0	0	0	0	0	0
17	2	2	4	2	2	4	2	0	2	10
18	2	2	4	2	2	4	2	2	4	12
19	2	2	4	2	2	4	2	2	4	12
20	2	2	4	2	2	4	2	2	4	12
21	2	2	4	2	2	4	2	2	4	12
22	1	2	3	2	2	4	2	0	2	9
23	2	2	4	2	2	4	2	2	4	12
24	2	2	4	2	2	4	2	2	4	12
25	1	2	3	2	2	4	2	2	4	11
26	1	2	3	2	2	4	2	2	4	11
27	2	2	4	2	2	4	2	2	4	12
28	1	2	3	2	2	4	2	2	4	11
29	2	2	4	2	2	4	2	2	4	12
30	2	2	4	2	2	4	2	0	2	10
31	2	2	4	2	2	4	2	2	4	12
32	1	2	3	2	2	4	2	0	2	9
33	2	2	4	2	2	4	2	2	4	12
34	2	2	4	2	2	4	2	2	4	12
35	2	2	4	2	2	4	2	2	4	12
36	2	2	4	2	2	4	2	0	2	10
37	1	2	3	0	0	0	0	0	0	3
38	2	2	4	2	2	4	2	2	4	12
39	2	2	4	2	2	4	2	2	4	12
40	1	2	3	2	2	4	2	2	4	11
41	2	2	4	2	2	4	2	2	4	12
42	1	0	1	2	2	4	2	0	2	7
43	1	0	1	0	0	0	2	0	2	3

Total scores

Lab n°	A	B	C	D	E	F	Cumulative score	Cumulative score (%)	Critical error
1	4	4	4	3	4	4	23	96	
2	4	4	4	3	4	0	19	79	CE

Lab n°	A	B	C	D	E	F	Cumulative score	Cumulative score (%)	Critical error
3	4	4	4	4	4	4	24	100	
4	4	4	4	4	4	4	24	100	
5	0	0	0	0	0	0	0	0	
6	4	4	4	4	4	4	24	100	
7	4	4	4	4	4	4	24	100	
8	4	4	4	4	4	2	22	92	
9	2	4	4	1	4	2	17	71	
10	4	4	4	4	4	4	24	100	
11	4	4	4	3	4	4	23	96	
12	4	4	4	4	4	2	22	92	
13	4	4	4	4	4	2	22	92	
14	4	4	4	1	4	2	19	79	
15	4	4	4	4	4	4	24	100	
16	0	0	0	0	0	0	0	0	
17	4	4	4	4	4	2	22	92	
18	0	4	4	4	4	4	20	83	CE
19	4	4	4	4	4	4	24	100	
20	4	4	4	4	4	4	24	100	
21	4	4	4	4	4	4	24	100	
22	3	4	4	3	4	2	20	83	
23	4	4	4	4	4	4	24	100	
24	4	4	4	4	4	4	24	100	
25	4	4	4	3	4	4	23	96	
26	3	4	4	3	4	4	22	92	
27	4	4	4	4	4	4	24	100	
28	0	4	4	3	4	4	19	79	CE
29	1	4	4	4	4	4	21	88	CE
30	1	4	4	4	4	2	19	79	CE
31	4	4	4	4	4	4	24	100	
32	4	4	2	3	4	2	19	79	
33	4	4	4	4	4	4	24	100	
34	4	4	4	4	4	4	24	100	
35	4	4	4	4	4	4	24	100	
36	4	4	4	4	4	2	22	92	
37	4	4	4	3	0	0	15	62	
38	3	4	4	4	4	4	23	96	
39	0	0	0	4	4	4	12	50	

Lab n°	A	B	C	D	E	F	Cumulative score	Cumulative score (%)	Critical error
40	4	4	4	3	4	4	23	96	
41	4	4	4	4	4	4	24	100	
42	1	4	4	1	4	2	16	67	CE
43	2	4	4	1	0	2	13	54	

Performance

	Number of labs	% total labs
Satisfactory performers (≥ 71 % of adequate responses)	32	74
Unsatisfactory performers (< 71 % adequate responses and/or critical error)	8	19
Partial and non-submitters	3	1

Overall Proficiency

Sample	Diagnosis	Analytical (%)	Interpretation (%)	Total (%)
ACDB-DH-2024-A	CPT1	88	83	85
ACDB-DH-2024-B	IVA	100	100	100
ACDB-DH-2024-C	PA	98	100	99
ACDB-DH-2024-D	HMG CLD	83	90	87
ACDB-DH-2024-E	normal	95	95	95
ACDB-DH-2024-F	3-MGA	95	66	80

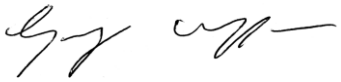
10. ERNDIM certificate of participation

A combined certificate of participation covering all EQA schemes will be provided to all participants who take part in any ERNDIM scheme. For the ACDB scheme, this certificate will indicate if results were submitted and whether satisfactory performance was achieved in the scheme.

11. Questions, Comments and Suggestions

If you have any questions, comments or suggestions please address to the Scientific Advisor of the scheme, Dr. Joachim Janda (Joachim.Janda@med.uni-heidelberg.de) and/or to the ERNDIM Administration Office (admin@erndim.org).

Date of report, 2025-03-03
Name and signature of Scientific Advisor



Dr J. Janda
Scientific Advisor
Laboratory of Metabolic Diseases

Prof. Dr. G. F. Hoffmann
Director
Department of General Paediatrics

Please note:
This annual report is intended for participants of the ERNDIM ACDB scheme. The contents should not be used for any publication without permission of the scheme advisor

APPENDIX 1. **Change log (changes since the last version)**

Version Number	Published	Amendments
1	30 April 2025	2024 annual report published

END