

TRICHLOROACETIC ACID (TCA) in urine by GC/ECD or GC/MS head space
Code GC17010

BIOCHEMISTRY

Trichloroacetic acid (TCA) is the most significant urinary metabolite of trichlorethylene. It's a fumigant solvent used for dry cleaning and as a degreasing agent. It can be inhaled or absorbed through the skin and at high doses produces cutaneous irritation and a nephrotoxic effect.

It is present in the urine of individuals professionally exposed to trichlorethylene vapour and other chlorinated solvents or in the urine of drug users who regularly snort solvents or in cases of voluntary or accidental ingestion of trichlorethylene or its derivatives.

Analytical determination is based on the Fujiwara reaction that develops a red colour by reacting trichloroacetic acid with pyridine in an alkaline environment, however this methodology is aspecific.

The proposed method determines trichloroacetic acid, after decarboxylation, injecting a urinary test previously treated in an appropriate solvent into GC-MS or GC-ECD/head space.

The levels of TCA are determined on a starting and ending sample urine.

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CE

This product fulfills all the requirements of Directive 98/79/EC on in vitro diagnostic medical devices (IVD). The declaration of conformity is available upon request.

N° 010	Trichloroacetic Acid in urine by GC/ECD/MS-headspace	06/2024
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TECHNICAL FEATURES

Principle of the Method:

This method allows to determine the Trichloroacetic acid in urine in GC/ECD and/or in GC/MS head space. The TCA, after dilution, is treated with a stabilizing and derivatization reagent for 1 hour at 100 °C; this solution is directly injected into GC.

Recovery of Method :

98%

Sensitivity of Method (LLOD):

0,001 mg/l by ECD
0,01 mg/l by MS

Dynamic range :

0,001 – 120 mg/l by ECD
0,01 – 120 mg/l by MS

Reference values :

< 0,06 mg/l in urine of not exposed subjects

< 15 mg/l in urine after work shift
ACGIH 2020

Components of kit :

All reagents are ready to use and stable 3 years at room temperature (< 20 °C)

Reagent A – Diluting Solution, 1 x 100 ml

Reagent B – Stabilizing Solution, 1 x 80 ml

Reagent C – Derivatization Solution, 1 x 3 ml

Reagent L – Test Solution, 1 x 2 ml

Store at 2-8 °C

Urine Calibrator lyophil, 3 x 1 ml

Code Z17016 (packed separately – see data sheet)

Minimum Instrumental equipment required:

GC/ECD or GC/MS
Operational Computer

Optional Equipment:

Autosampler

Urine Collection Procedure:

After work shift, collect 10 ml of urine in a suitable test tube.
Stable about 60 days at –20 °C.

PREANALYTICAL PROCEDURE

Preparation of Test solution

Pipette in a vial of 10 ml:

- 1950 µl of **Reagent A** – Diluting Solution
- 50 µl of **Reagent L** – Test Solution

Close vials hermetically

IMPORTANT: Don't use this solution to calibrate!

Inject 200 µl of solution into gas chromatograph GC. Verify that the Test solution has retention time similar to fig. 1 and 9. If the Test is all right you can start with the analytical procedure; if not, check the functionality of the analytical system.

ANALYTICAL PROCEDURE

STEP 1 : Samples Preparation

Pipette in vials of 10 ml:

	Calibrator	Control	Sample
Calibrator	200 µl		
Control		200 µl	
Sample			200 µl
Reagent A – Diluting Solution	1000 µl	1000 µl	1000 µl
Reagent B – Stabilizing Sol.	800 µl	800 µl	800 µl
Reagent C – Derivatization Sol.	25 µl	25 µl	25 µl

Close vials hermetically

STEP 2 : Incubate vials at 100 °C for 1 h.

Cooling for 30 minutes at room temperature

Place them in the sampler

STEP 3 : Inject 200 µl in GC

Prepare work list and start the series according to the system's specifications

TRICHLOROACETIC ACID - Warnings

REAGENT L : TEST SOLUTION

Trichloroacetic acid	220.000 mg/l
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SET OF GAS-CROMATOGRAPH:

- VF-5ms Column 30m x 0,25mm, 0,25µm
- Temperature of injector 200 °C
- Temperature 40°C x 5 minutes
- Flow Gas Helium 1 ml/min
- Splitting ratio about 1:20
- Temperature of syringe: 40 °C
- Temperature of agitator: 40 °C (1 minute) – not agitation

SET OF MASSA DETECTOR (4000):

- Mass temperature 180 °C
- Temperatura Manifold: 80 °C
- Temperatura Transfer Line: 270 °C
- Operating mode in Electronic Impact (EI)
- Massa Range 45 – 200
- Filament on: 1 minuto

SET OF ECD DETECTOR:

- Temperature 260 °C isothermal
- High sensitivity (10)

CONDITIONING OF VF-5 MS COLUMN

Follow the manufacturer's specifications.
At the beginning of each analytical session carry out the calibration of the masses and RF.

COLUMN CLEANING

After each analytical session to bring gradient at the maximum temperature of the column (recommended by manufacturer) with a speed of 30 °C/minute.
See the manufacturer's instructions.

ACCESSORIES AND CONSUMABLES

CODE	DESCRIPTION	PACKAGING
Z17016	Urine Calibrator for Trichloroacetic Acid	1 x 2 ml
Z38019	Urine multiparametric Control lyophil. for toxic organic compounds, Levels 1,2	2 x 5 x 10 ml
ZRE13623	Rxi-Sil 5MS (30 m x 0,25 mm) ID, DF=0,25 Capillary column	1 Pc
SCP8944	VF-5ms (30 m x 0,25 mm) ID DF=0,25 column	1 Pc
S51834475	Glass vial of 10 ml for headspace	1 x 100 Pcs
S80100165	Magnetic caps with teflon and sylicon septa for headspace vials	1 x 100 Pcs
S50404669	New Easy Grip Manual Crimper for 20 mm	1 x 100 Pcs

TRICHLOROACETIC ACID IN URINE

(Reference chromatograms/spectra GC-MS / Head space)

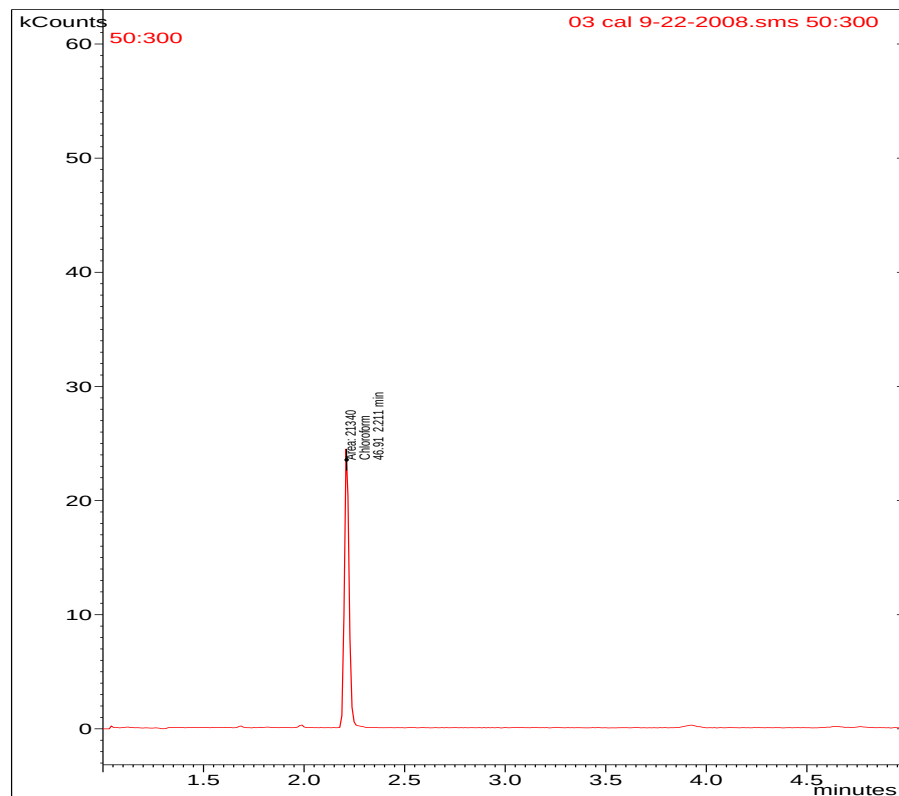


Fig. 1 :	Test solution
	R.T. 2.204 TCA

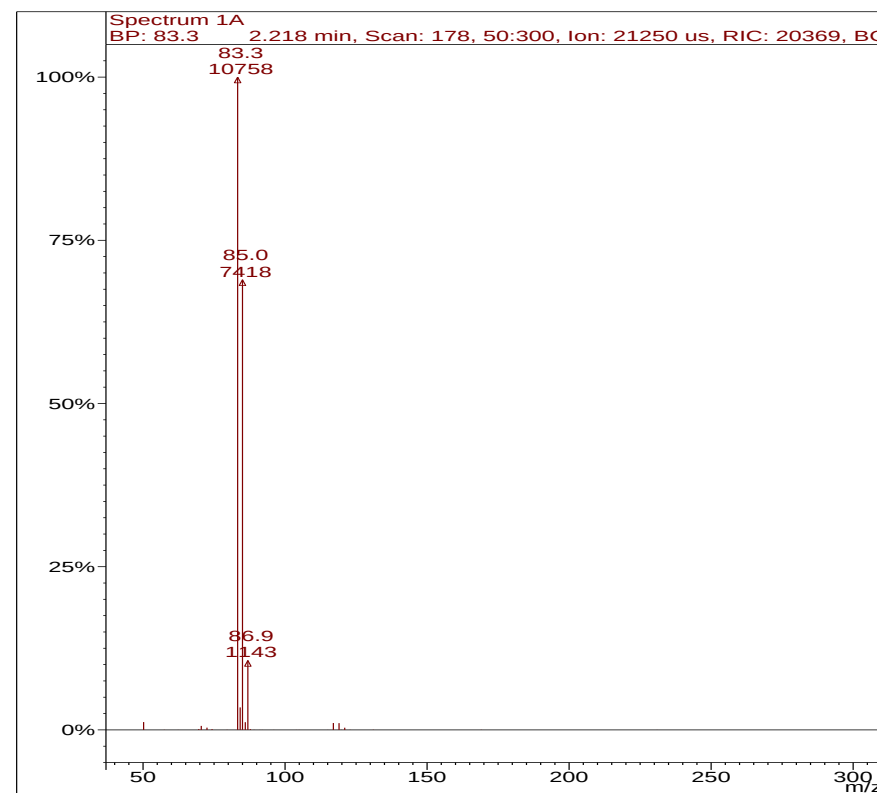


Fig. 2 :	Test spectrum
	MOLECULAR ION: 83

TRICHLOROACETIC ACID IN URINE

(Reference chromatograms/spectra GC-MS / Head space)

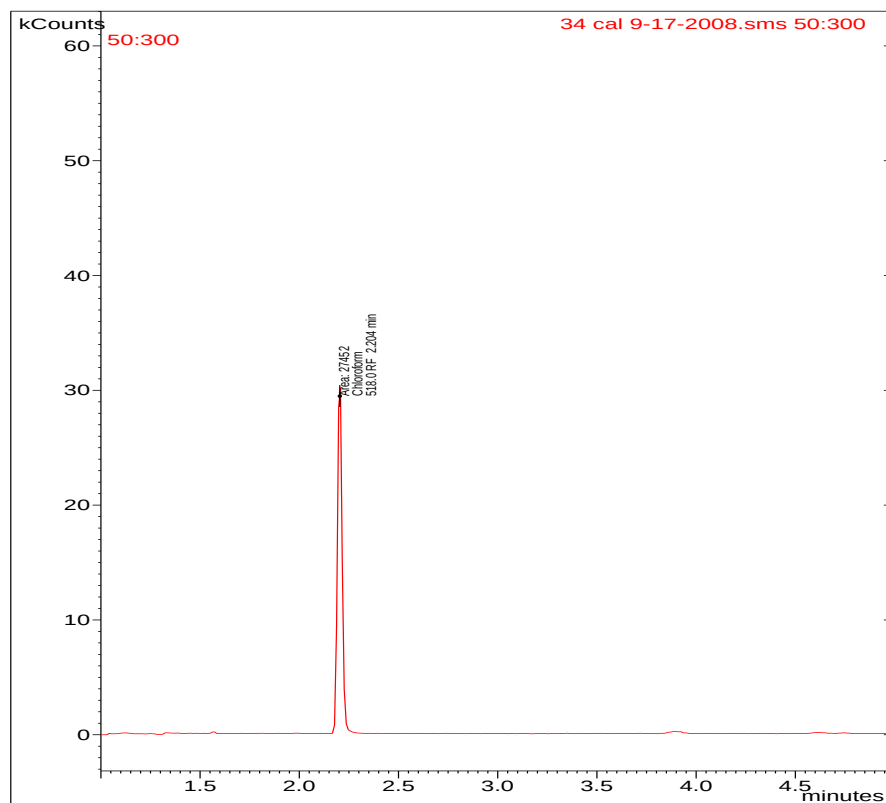


Fig. 3 :	Urine calibrator
	R.T. 2.204 TCA 53 mg/l

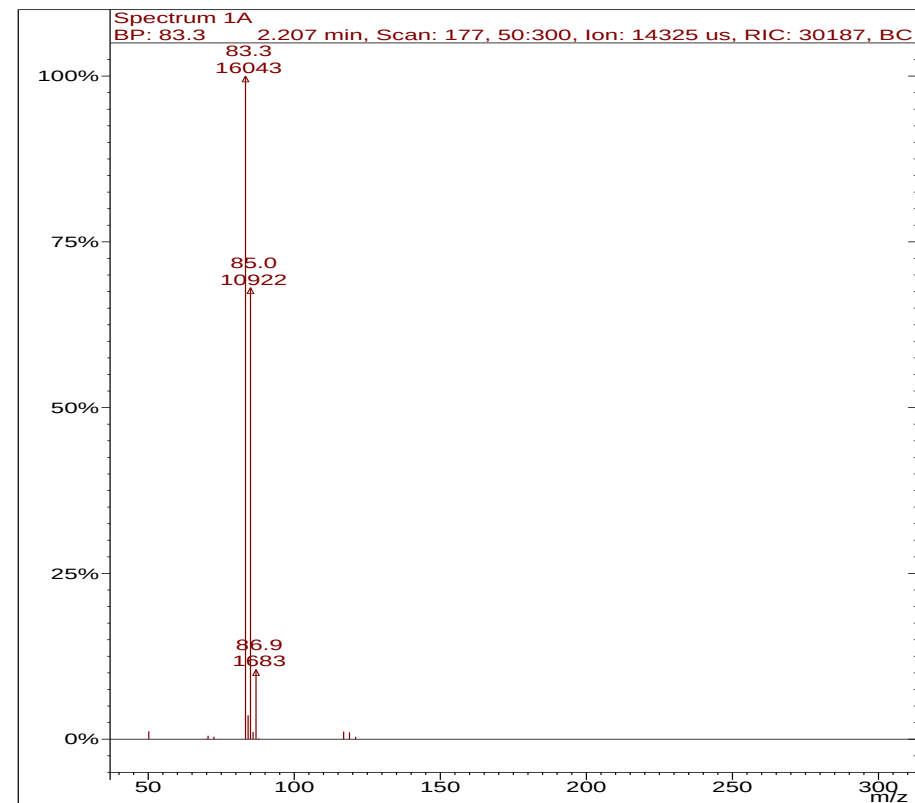


Fig. 4 :	Calibrator spectrum
	MOLECULAR ION: 83

TRICHLOROACETIC ACID IN URINE

(Reference chromatograms/spectra GC-MS / Head space)

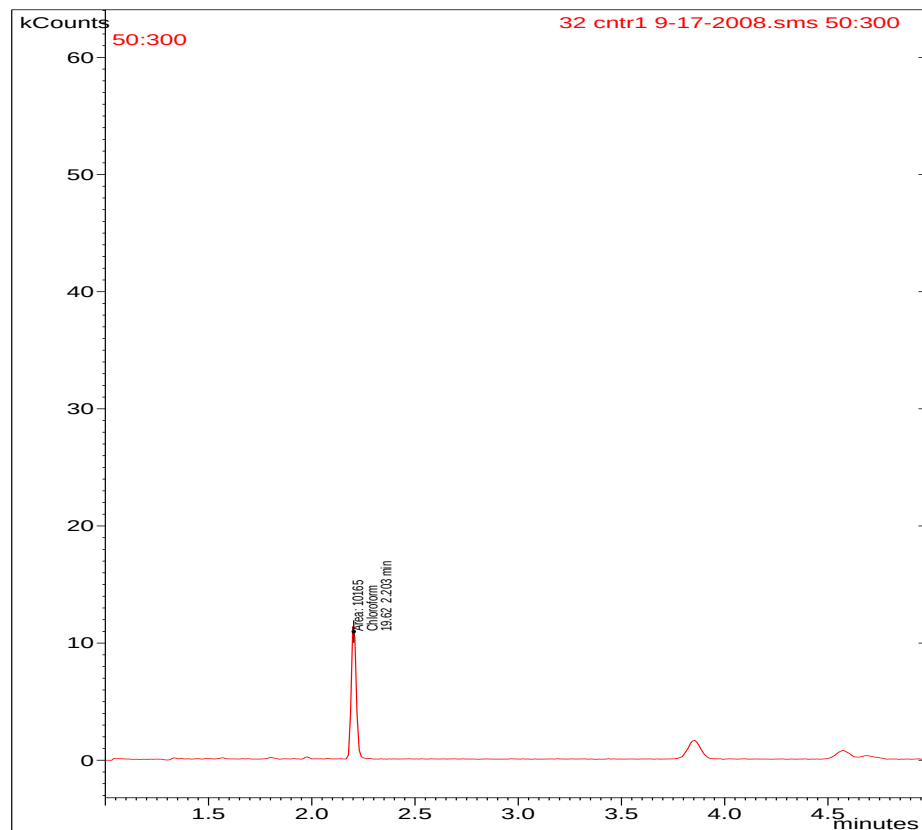


Fig. 5 :	Urine control level 1
	R.T. 2.203 TCA 19,62 mg/l

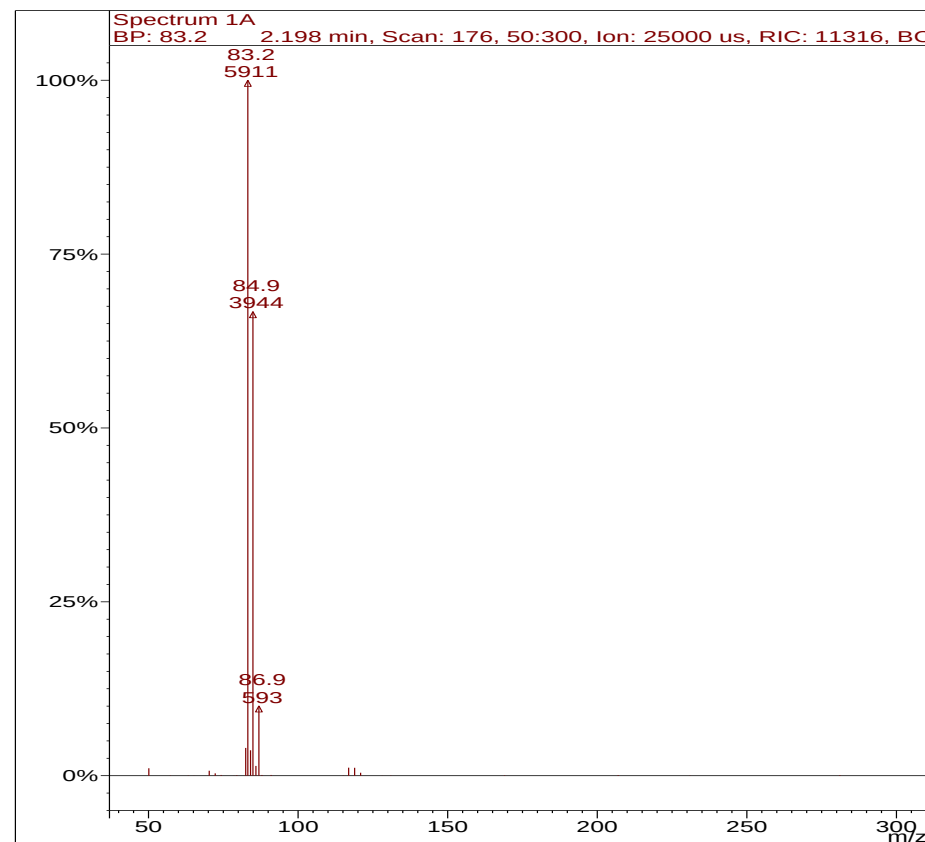


Fig. 6 :	Control level 1 spectrum
	MOLECULAR ION: 83

TRICHLOROACETIC ACID IN URINE

(Reference chromatograms/spectra GC-MS / Head space)

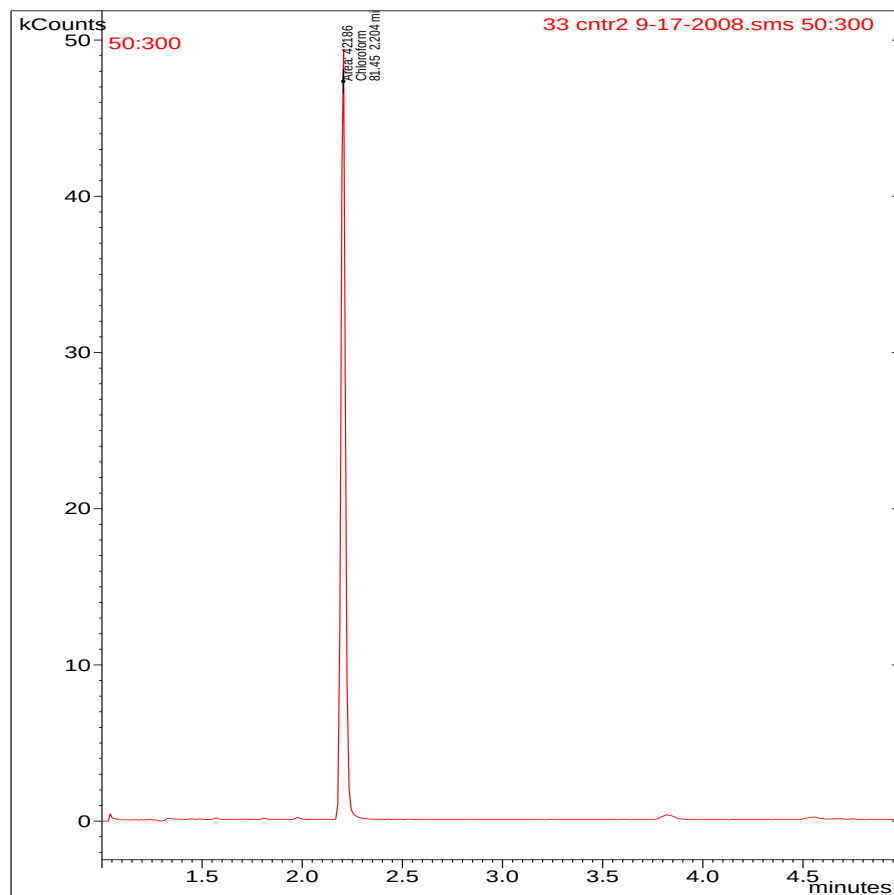


Fig. 7 :	Urine Control level 2
	R.T. 2.204 TCA 81,45 mg/l

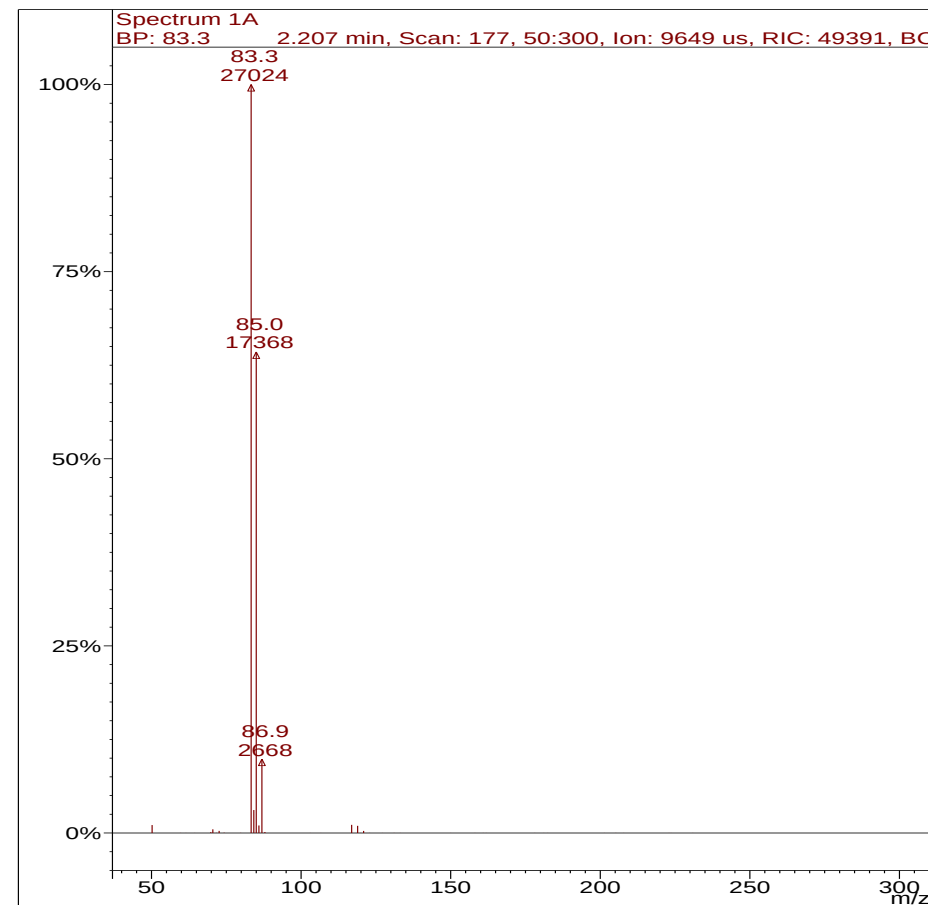


Fig. 8 :	Control level 2 spectrum
	MOLECULAR ION: 83

TRICHLOROACETIC ACID IN URINE

(Reference chromatograms/spectra GC-ECD / Head space)

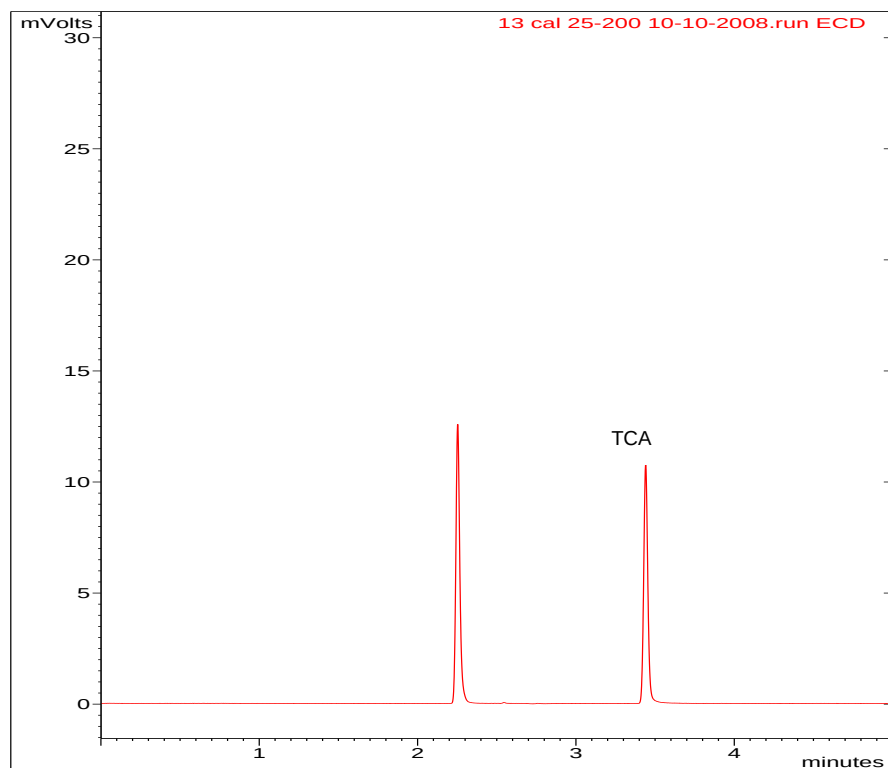


Fig. 9 :	Test solution
	R.T. 3.45 TCA

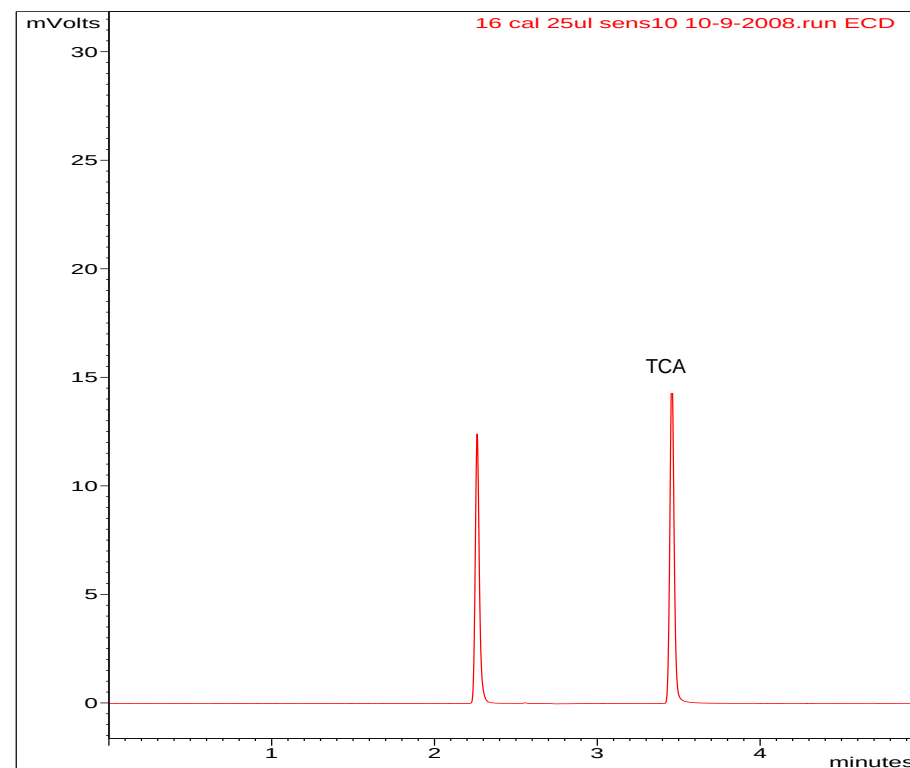


Fig. 10 :	Urine calibrator
	R.T. 3.45 TCA 53 mg/l

TRICHLOROACETIC ACID IN URINE

(Reference chromatograms/spectra GC-ECD / Head space)

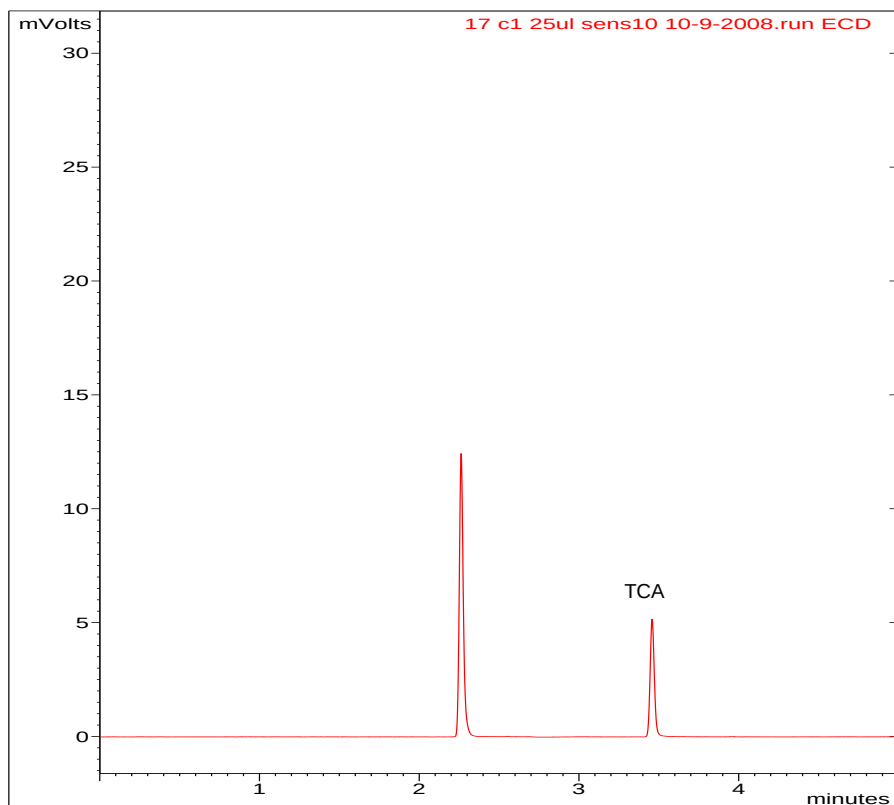


Fig. 11 :	Urine control level 1
	R.T. 3.45 TCA 18,08 mg/l

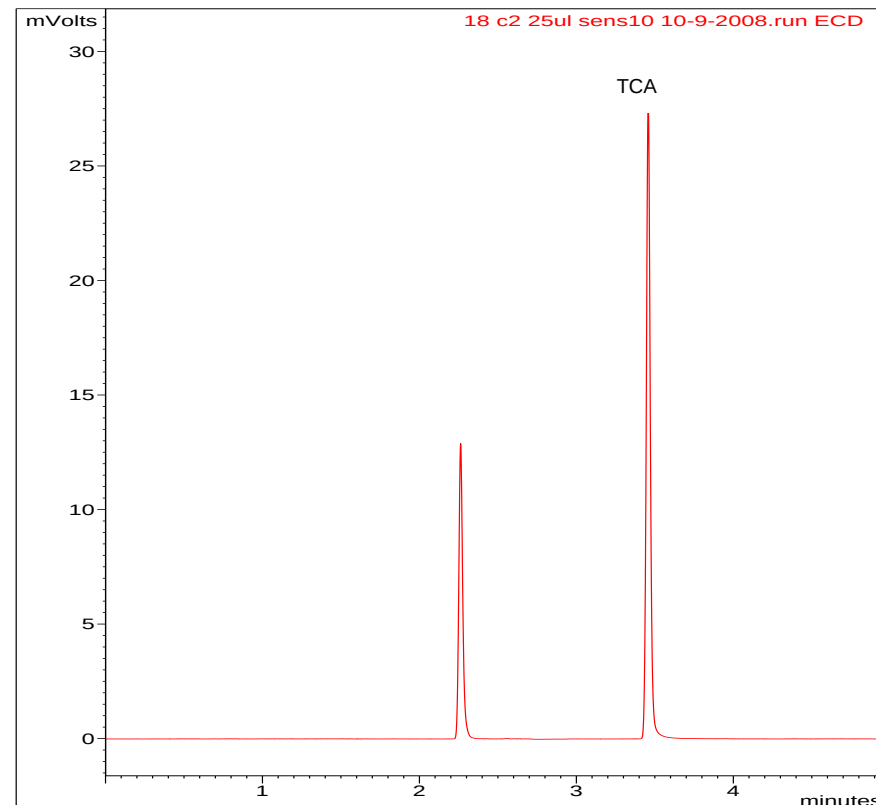


Fig. 12 :	Urine control level 2
	R.T. 3.45 TCA 93,95 mg/l