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CA 72-4

cobas®

Cancer Antigen 72-4

REF	Σ	SYSTEM
		Elecsys 2010
		MODULAR ANALYTICS E170
11776258 122	100	**cobas e** 411
		cobas e 601
		cobas e 602

English

Please note

The measured CA 72-4 value of a patient's sample can vary depending on the testing procedure used. The laboratory finding must therefore always contain a statement on the CA 72-4 assay method used. CA 72-4 values determined on patient samples by different testing procedures cannot be directly compared with one another and could be the cause of erroneous medical interpretations. If there is a change in the CA 72-4 assay procedure used while monitoring therapy, then the CA 72-4 values obtained upon changing over to the new procedure must be confirmed by parallel measurements with both methods.

Intended use

Immunoassay for the in vitro quantitative determination of CA 72-4 in human serum and plasma. The assay in particular serves as an aid in the therapeutic monitoring of carcinomas of the stomach and ovaries.

The **e**lectro**c**hemi**l**uminescence **i**mmuno**a**ssay "ECLIA" is intended for use on Elecsys and **cobas e** immunoassay analyzers.

Summary

The Elecsys CA 72-4 assay utilizes the following two monoclonal antibodies [1,2] to detect the mucine-like, tumor-associated glycoprotein TAG 72 in serum:

- B72.3 monoclonal antibody, which has been raised against a membrane-enriched extract of mammary carcinoma metastases[3] and
- CC49 monoclonal antibody, specific to highly-purified TAG 72.

These antibodies react with the following tissues: mammary carcinoma, colon carcinoma, non-small cell pulmonary carcinoma, epithelial ovarial carcinoma, carcinomas of the endometrium, pancreas and stomach, other carcinomas, and fetal tissue from colon, stomach, and osophagus. In contrast, no reaction is found with normal adult tissue.[1,3]

Benign illnesses:

Elevated CA 72-4 serum values are found in patients suffering from various benign diseases:[1,4] pancreatitis, liver cirrhosis, pulmonary disease, rheumatic illness, gynaecological illness, benign ovarian disease, ovarian cysts, breast disease, and benign gastrointestinal tract disorders. The most important advantage of the CA 72-4 marker over others is its particularly high diagnostic specificity for benign illnesses.[1,4,5,6,7,8,9]

Stomach carcinoma:

Diagnostic sensitivities of 28-80 %, more usually 40-46 %, are reported for benign gastrointestinal diseases with a diagnostic specificity of > 95 %.[1,4,5,7,9,10]

There is a correlation between the stage of illness and the degree of CA 72-4 elevation.[11] After surgical intervention, CA 72-4 levels return to normal and remain within the normal range in cases where tumor tissue is no longer present. In 70 % of relapse cases, CA 72-4 increases prior or concurrently with clinical diagnosis of the relapse.[11]

There are indications that preoperative CA 72-4 levels can be of prognostic value.[12,13]

Ovarian carcinoma:

A diagnostic sensitivity of 47-80 % has been reported in ovarian carcinoma.[11,14] The diagnostic sensitivity of CA 72-4 is greater than that of CA 125 in mucinal ovarian carcinoma. Combined use of the two markers provides an additive diagnostic sensitivity of 73 % for primary diagnosis (CA 125 alone: 60 %) and 67 % for monitoring purposes (CA 125 alone: 60 %).[11]

Colorectal carcinoma:

Diagnostic sensitivity for colorectal carcinoma is 20-41 %;[11,15] there is a correlation with the clinical staging by Dukes. Diagnostic specificity of CA 72-4 to benign diseases of the colon is 98 %.[11,15] After complete resection a marked drop in CA 72-4 occurs. In long-term controls, the CA 72-4 concentration remains elevated when a residual tumor is present. Combined use of CA 72-4 and CEA increases diagnostic sensitivity from 78 % to 87 % in post-operative relaps controls.[11]

Test principle

Sandwich principle. Total duration of assay: 18 minutes.

- 1st incubation: 30 µL of sample, a biotinylated monoclonal CA 72-4-specific antibody (CC49), and a monoclonal CA 72-4-specific antibody (B72.3) labeled with a ruthenium complex[a)] react to form a sandwich complex.
- 2nd incubation: After addition of streptavidin-coated microparticles, the complex becomes bound to the solid phase via interaction of biotin and streptavidin.
- The reaction mixture is aspirated into the measuring cell where the microparticles are magnetically captured onto the surface of the electrode. Unbound substances are then removed with ProCell/ProCell M. Application of a voltage to the electrode then induces chemiluminescent emission which is measured by a photomultiplier.
- Results are determined via a calibration curve which is instrument-specifically generated by 2-point calibration and a master curve provided via the reagent barcode.

a) Tris(2,2'-bipyridyl)ruthenium(II)-complex ($Ru(bpy)_3^{2+}$)

Reagents - working solutions

The reagent rackpack is labeled as CA72-4.

M Streptavidin-coated microparticles (transparent cap), 1 bottle, 6.5 mL:
Streptavidin-coated microparticles 0.72 mg/mL; preservative.

R1 Anti-CA 72-4-Ab~biotin (gray cap), 1 bottle, 8 mL:
Biotinylated monoclonal anti-CA 72-4 antibody (CC49; mouse) 1 mg/L; phosphate buffer 100 mmol/L, pH 6.8; preservative.

R2 Anti-CA 72-4-Ab~$Ru(bpy)_3^{2+}$ (black cap), 1 bottle, 8 mL:
Monoclonal anti-CA 72-4 antibody (B72.3; mouse) labeled with ruthenium complex 6 mg/L; phosphate buffer 100 mmol/L, pH 6.8; preservative.

Precautions and warnings

For in vitro diagnostic use.
Exercise the normal precautions required for handling all laboratory reagents.
Disposal of all waste material should be in accordance with local guidelines.
Safety data sheet available for professional user on request.

Avoid foam formation in all reagents and sample types (specimens, calibrators and controls).

Reagent handling

The reagents in the kit have been assembled into a ready-for-use unit that cannot be separated.

All information required for correct operation is read in from the respective reagent barcodes.

Storage and stability

Store at 2-8 °C.

Do not freeze.

Store the Elecsys reagent kit **upright** in order to ensure complete availability of the microparticles during automatic mixing prior to use.

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Stability:	
unopened at 2-8 °C	up to the stated expiration date
after opening at 2-8 °C	12 weeks
on the analyzers	8 weeks

Specimen collection and preparation

Only the specimens listed below were tested and found acceptable.

Serum collected using standard sampling tubes or tubes containing separating gel.

Li-, Na-, NH_4^+-heparin and K_3-EDTA plasma.

Criterion: Recovery within 90-110 % of serum value or slope 0.9-1.1 + intercept within < ± 2x analytical sensitivity (LDL) + coefficient of correlation > 0.95.

Stable for 30 days at 2-8 °C, 3 months at -20 °C. Freeze only once.[16]

The sample types listed were tested with a selection of sample collection tubes that were commercially available at the time of testing, i.e. not all available tubes of all manufacturers were tested. Sample collection systems from various manufacturers may contain differing materials which could affect the test results in some cases. When processing samples in primary tubes (sample collection systems), follow the instructions of the tube manufacturer.

Centrifuge samples containing precipitates before performing the assay.

Do not use heat-inactivated samples.

Do not use samples and controls stabilized with azide.

Ensure the samples, calibrators and controls are at 20-25 °C prior to measurement.

Due to possible evaporation effects, samples, calibrators and controls on the analyzers should be analyzed/measured within 2 hours.

Materials provided

See "Reagents – working solutions" section for reagents.

Materials required (but not provided)

- REF 11776274122, CA 72-4 CalSet, for 4 x 1 mL
- REF 11776452122, PreciControl Tumor Marker, for 2 x 3 mL each of PreciControl Tumor Marker 1 and 2
- REF 11732277122, Diluent Universal, 2 x 16 mL sample diluent or
  REF 03183971122, Diluent Universal, 2 x 36 mL sample diluent
- General laboratory equipment
- Elecsys 2010, MODULAR ANALYTICS E170 or **cobas e** analyzer

Accessories for Elecsys 2010 and **cobas e** 411 analyzers:

- REF 11662988122, ProCell, 6 x 380 mL system buffer
- REF 11662970122, CleanCell, 6 x 380 mL measuring cell cleaning solution
- REF 11930346122, Elecsys SysWash, 1 x 500 mL washwater additive
- REF 11933159001, Adapter for SysClean
- REF 11706802001, Elecsys 2010 AssayCup, 60 x 60 reaction vessels
- REF 11706799001, Elecsys 2010 AssayTip, 30 x 120 pipette tips

Accessories for MODULAR ANALYTICS E170, **cobas e** 601 and **cobas e** 602 analyzers:

- REF 04880340190, ProCell M, 2 x 2 L system buffer
- REF 04880293190, CleanCell M, 2 x 2 L measuring cell cleaning solution
- REF 03023141001, PC/CC-Cups, 12 cups to prewarm ProCell M and CleanCell M before use
- REF 03005712190, ProbeWash M, 12 x 70 mL cleaning solution for run finalization and rinsing during reagent change
- REF 12102137001, AssayTip/AssayCup Combimagazine M, 48 magazines x 84 reaction vessels or pipette tips, waste bags
- REF 03023150001, WasteLiner, waste bags
- REF 03027651001, SysClean Adapter M

Accessories for all analyzers:

- REF 11298500316, Elecsys SysClean, 5 x 100 mL system cleaning solution

Assay

For optimum performance of the assay follow the directions given in this document for the analyzer concerned. Refer to the appropriate operator's manual for analyzer-specific assay instructions.

Resuspension of the microparticles takes place automatically prior to use. Read in the test-specific parameters via the reagent barcode. If in exceptional cases the barcode cannot be read, enter the 15-digit sequence of numbers.

Bring the cooled reagents to approximately 20 °C and place on the reagent disk (20 °C) of the analyzer. Avoid foam formation. The system automatically regulates the temperature of the reagents and the opening/closing of the bottles.

Calibration

Traceability: This method has been standardized against the Enzymun-Test CA 72-4 method.

Every Elecsys reagent set has a barcoded label containing specific information for calibration of the particular reagent lot. The predefined master curve is adapted to the analyzer using the relevant CalSet.

Calibration frequency: Calibration must be performed once per reagent lot using fresh reagent (i.e. not more than 24 hours since the reagent kit was registered on the analyzer). Renewed calibration is recommended as follows:

- after 12 weeks when using the same reagent lot
- after 7 days (when using the same reagent kit on the analyzer)
- as required: e.g. quality control findings outside the defined limits

Quality control

For quality control, use PreciControl Tumor Marker.

In addition, other suitable control material can be used.

Controls for the various concentration ranges should be run individually at least once every 24 hours when the test is in use, once per reagent kit, and following each calibration.

The control intervals and limits should be adapted to each laboratory's individual requirements. Values obtained should fall within the defined limits. Each laboratory should establish corrective measures to be taken if values fall outside the defined limits.

Follow the applicable government regulations and local guidelines for quality control.

Calculation

The analyzer automatically calculates the analyte concentration of each sample (either in U/mL or kU/L).

Limitations - interference

The assay is unaffected by icterus (bilirubin < 1129 µmol/L or < 66 mg/dL), hemolysis (Hb < 1.4 mmol/L or < 2.2 g/dL), lipemia (Intralipid < 1500 mg/dL) and biotin (< 246 nmol/L or < 60 ng/mL).

Criterion: Recovery within ± 10 % of initial value.

Samples should not be taken from patients receiving therapy with high biotin doses (i.e. > 5 mg/day) until at least 8 hours following the last biotin administration.

No interference was observed from rheumatoid factors up to a concentration of 1500 IU/mL.

There is no high-dose hook effect at CA 72-4 concentrations up to 15000 U/mL.

In vitro tests were performed on 27 commonly used pharmaceuticals. No interference with the assay was found.

In rare cases, interference due to extremely high titers of antibodies to analyte-specific antibodies, streptavidin or ruthenium can occur. These effects are minimized by suitable test design.

For diagnostic purposes, the results should always be assessed in conjunction with the patient's medical history, clinical examination and other findings.

Limits and ranges

Measuring range

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0.200-300 U/mL (defined by the lower detection limit and the maximum of the master curve). Values below the lower detection limit are reported as < 0.200 U/mL. Values above the measuring range are reported as > 300 U/mL (or up to 600 U/mL for 2-fold diluted samples).

Lower limits of measurement

Lower detection limit of the test

Lower detection limit: < 0.20 U/mL

The lower detection limit represents the lowest measurable analyte level that can be distinguished from zero. It is calculated as the value lying two standard deviations above that of the lowest standard (master calibrator, standard 1 + 2 SD, repeatability study, n = 21).

Dilution

Samples with CA 72-4 concentrations above the measuring range can be diluted with Diluent Universal. The recommended dilution is 1:2 (either automatically by the MODULAR ANALYTICS E170, Elecsys 2010 or **cobas e** analyzers or manually). The concentration of the diluted sample must be > 150 U/mL.

After manual dilution, multiply the result by the dilution factor.

After dilution by the analyzers, the MODULAR ANALYTICS E170, Elecsys 2010 and **cobas e** software automatically takes the dilution into account when calculating the sample concentration.

Please note: A sample dependent non-linearity of dilutions has been observed for samples which are outside the measuring range.

Expected values

Extended studies with the Elecsys CA 72-4 assay in clinical centers in Belgium, Germany, and Roche-internal studies gave the following results for a total of 635 healthy individuals:

6.9 U/mL (95 % percentile)

5.6-8.2 U/mL (95 % confidence range of the percentile)[17]

Status: Elecsys CA 72-4 multicenter evaluation; study No. B99P026, 7/2001

Each laboratory should investigate the transferability of the expected values to its own patient population and if necessary determine its own reference ranges.

Specific performance data

Representative performance data on the analyzers are given below. Results obtained in individual laboratories may differ.

Precision

Precision was determined using Elecsys reagents, pooled human sera and controls in accordance with a modified protocol (EP5-A) of the CLSI (Clinical and Laboratory Standards Institute): 6 times daily for 10 days (n = 60); repeatability on MODULAR ANALYTICS E170 analyzer, n = 21. The following results were obtained:

Elecsys 2010 and **cobas e** 411 analyzers						
	Repeatability			**Intermediate precision**		
Sample	Mean U/mL	SD U/mL	CV %	Mean U/mL	SD U/mL	CV %
Human serum 1	3.12	0.06	2.0	3.39	0.12	3.6
Human serum 2	19.2	0.34	1.8	20.1	0.85	4.2
Human serum 3	107	2.26	2.1	119	5.79	4.9
PreciControl TM[b)]1	2.85	0.06	2.1	2.87	0.08	2.9
PreciControl TM2	40.4	0.98	2.4	43.0	2.12	4.9

b) TM = Tumor Marker

MODULAR ANALYTICS E170, **cobas e** 601 and **cobas e** 602 analyzers						
	Repeatability			**Intermediate precision**		
Sample	Mean U/mL	SD U/mL	CV %	Mean U/mL	SD U/mL	CV %
Human serum 1	3.23	0.04	1.4	3.25	0.07	2.2
Human serum 2	18.8	0.50	2.8	137	4.90	3.6
Human serum 3	149	3.93	2.8	18.6	0.46	2.5

MODULAR ANALYTICS E170, **cobas e** 601 and **cobas e** 602 analyzers						
	Repeatability			**Intermediate precision**		
Sample	Mean U/mL	SD U/mL	CV %	Mean U/mL	SD U/mL	CV %
PreciControl TM1	3.90	0.05	1.0	3.78	0.12	3.1
PreciControl TM2	33.3	0.38	1.0	32.5	0.98	3.0

Method comparison

A comparison of the Elecsys CA 72-4 assay (y) with the Enzymun-Test CA 72-4 method (x) using clinical samples gave the following correlations:

Number of samples measured: 144

Passing/Bablok[18]	Linear regression
y = 0.93x - 1.59	y = 0.95x - 1.43
τ = 0.877	r = 0.954

The sample concentrations were between approximately 0.3 and approximately 87 U/mL.

Analytical specificity

The Elecsys CA 72-4 tumor marker assay is based on the monoclonal B72.3 and CC49 antibodies which are only available from Fujirebio Diagnostics, its licensees and its representatives. The performance characteristics of testing procedures using these antibodies cannot be assumed for test methods using other antibodies.

Functional sensitivity

1.0 U/mL

The functional sensitivity is the lowest analyte concentration that can be reproducibly measured with an intermediate precision CV of < 20 %.

References

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For further information, please refer to the appropriate operator's manual for the analyzer concerned, the respective application sheets, the product information and the Method Sheets of all necessary components (if available in your country).

A point (period/stop) is always used in this Method Sheet as the decimal separator to mark the border between the integral and the fractional parts of a decimal numeral. Separators for thousands are not used.

FUJIREBIO® Diagnostics, Inc.

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Symbols

Roche Diagnostics uses the following symbols and signs in addition to those listed in the ISO 15223-1 standard.

CONTENT	Contents of kit
SYSTEM	Analyzers/Instruments on which reagents can be used
REAGENT	Reagent
CALIBRATOR	Calibrator
→	Volume after reconstitution or mixing

CE

Roche Diagnostics GmbH, Sandhofer Strasse 116, D-68305 Mannheim
www.roche.com