Access
Immunoassay Systems

CEA

REF 33200

FOR USE WITH TEST NAME: CEA2

The concentration of CEA in a given specimen determined with different manufacturers can vary due to differences in assay methods and reagent specificity. The results reported by the laboratory to the physician must include the identity of the CEA assay used. Values obtained with different assay methods cannot be used interchangeably. If, in the course of monitoring a patient, the assay method used for determining CEA values is changed, additional sequential testing should be carried out to confirm baseline values.

Caution: For U.S.A. only, Federal law restricts this device to sale and distribution by or on the order of a physician, or to a clinical laboratory; and use is restricted to by or on the order of a physician.

Intended Use

The Access CEA assay is a paramagnetic particle, chemiluminescent immunoassay for the quantitative determination of Carcinoembryonic Antigen (CEA) levels in human serum, using the Access Immunoassay Systems. CEA measured by the Access Immunoassay Systems is used as an aid in the management of cancer patients in whom changing CEA concentrations have been observed.

Summary and Explanation

Carcinoembryonic antigen (CEA), first described by Gold and Freedman in 1965, was isolated from extracts of liver metastases of colon adenocarcinomas and normal fetal digestive tract.[1,2] It is considered one of the most extensively investigated human tumor associated antigens. An immunologically heterogenous group of glycoproteins, CEA is approximately 200,000 daltons with 50–85% carbohydrates by weight.[3] CEA is a member of the immunoglobulin superfamily and appears to have functions of an intercellular adhesion molecule.[4] In addition, molecules structurally related to CEA (i.e. NCA, NCA-2, NFA) have been reported in normal adult tissues.[5,6,7]

The measurement of serum CEA has shown substantial benefit in the prognosis and management of patients with malignant diseases, especially colorectal cancer.[8,9,10,11,12,13] Serial measurements can be used to monitor patients for progression, regression or recurrence of cancer following treatment. A persistent elevation of CEA following therapeutic or surgical intervention signals residual disease or recurrence, whereas decreasing levels to within the normal range is indicative of successful intervention.[14]

CEA is also elevated in the serum of patients with non-malignant diseases and in heavy smokers, therefore CEA should not be used in the diagnosis of cancer or for screening asymptomatic patients.

Principles of the Procedure

The Access CEA assay is a two-site immunoenzymatic "sandwich" assay using two mouse monoclonal anti-CEA antibodies (MAb) which react with different epitopes of CEA. A sample is added to a reaction vessel, along with the first anti-CEA MAb-alkaline phosphatase conjugate and the second anti-CEA MAb bound to paramagnetic particles. The incubation is followed by a magnetic separation and washing. Then, the chemiluminescent substrate Lumi-Phos* 530 is added to the vessel and light generated by the reaction is measured with a luminometer. The light production is proportional to the concentration of CEA in the sample. The amount of analyte in the sample is determined by means of a stored, multi-point calibrator curve.

Product Information

Access CEA Reagent Pack

Cat. No. 33200: 100 determinations, 2 packs, 50 tests/pack

- Provided ready to use.
- Store upright and refrigerate packs at 2 to 10°C.
- Refrigerate at 2 to 10°C for a minimum of two hours before use on the instrument.
- Stable until the expiration date stated on the label when stored at 2 to 10°C.
- After initial use, the pack is stable at 2 to 10°C up to 28 days.
- Signs of possible deterioration are a broken elastomeric layer on the pack or control values out of range.
- If the reagent pack is damaged (i.e., broken elastomer), discard the pack.

R1a:	Solid phase: Paramagnetic particles coated with mouse anti-CEA MAb, suspended in TRIS buffered bovine serum albumin (BSA), with < 0.1% sodium azide and 0.1% ProClin** 300.
R1b:	Diluent: Phosphate buffer, protein (bovine, murine) with < 0.1% sodium azide and 0.1% ProClin 300.
R1c:	Conjugate: Mouse anti-CEA MAb Bound to alkaline phosphatase (bovine), diluted in phosphate buffer, protein (bovine), < 0.1% sodium azide and 0.1% ProClin 300.

Warnings and Precautions

- For *in vitro* diagnostic use.
- Patient samples and blood-derived products may be routinely processed with minimum risk using the procedure described. However, handle these products as potentially infectious according to universal precautions and good clinical laboratory practices, regardless of their origin, treatment, or prior certification. Use an appropriate disinfectant for decontamination. Store and dispose of these materials and their containers in accordance with local regulations and guidelines.
- Sodium azide may react with lead and copper plumbing to form highly explosive metal azides. On disposal, flush with a large volume of water to prevent azide build-up.[15]
- Xi. Irritant: 0.1% ProClin 300.

R 43: May cause sensitization by skin contact.

S 28-37: After contact with skin, wash immediately with plenty of soap and water. Wear suitable gloves.

- The Material Safety Data Sheet (MSDS) is available upon request.

Specimen Collection and Preparation

1. Serum is the recommended sample.
2. Observe the following recommendations for handling, processing, and storing blood samples:[16]
   - Collect all blood samples observing routine precautions for venipuncture.
   - For serum, allow samples to clot adequately before centrifugation.
   - Keep tubes stoppered at all times.
   - Within two hours after centrifugation, transfer at least 500 µL of cell-free sample to a storage tube. Tightly stopper the tube immediately.
   - Store samples, tightly stoppered, at room temperature (15 to 30°C) for no longer than eight hours.
   - If the assay will not be completed within eight hours, refrigerate the samples at 2 to 8°C.
   - If the assay will not be completed within 48 hours, or for shipment of samples, freeze at -20°C or colder.
3. Use the following guidelines when preparing specimens:
   - Ensure residual fibrin and cellular matter has been removed prior to analysis.

- Follow blood collection tube manufacturer's recommendations for centrifugation.

4. Each laboratory should determine the acceptability of its own blood collection tubes and serum separation products. Variations in these products may exist between manufacturers and, at times, from lot-to-lot.

Materials Provided

R1 Access CEA Reagent Packs

Materials Required But Not Provided

1. Access CEA Calibrators
   Provided at zero and approximately 1, 10, 100, 500 and 1000 ng/mL.
   Cat. No. 33205
2. Access CEA QC or other commercially available control material.
   Cat. No. 33209
3. Access CEA Diluent
   Cat. No. 33206
4. Access Substrate
   Cat. No. 81906
5. **Access, Access 2, SYNCHRON LXi:**
   Access Wash Buffer II, Cat. No. A16792
   UniCel DxI:
   UniCel DxI Wash Buffer II, Cat. No. A16793

Procedural Comments

1. Refer to the appropriate system manuals and/or Help system for a description of installation, theory of operation, performance characteristics, system processing (i.e., operating instructions), calibration information and procedures, maintenance, and troubleshooting. The operational limitations and precautions and hazards are included where appropriate throughout the manuals.
2. Mix contents by gently inverting pack several times before loading on the instrument. Do not invert open (punctured) packs–mix reagents by swirling gently.
3. Use thirty-five (35) µL of sample for each determination in addition to the sample container and system dead volume. Refer to the appropriate system manuals and/or Help system for the minimum sample volume required.
4. The system default unit of measure for sample results is ng/mL.

Procedure

Refer to the appropriate system manuals and/or Help system for information on managing samples, configuring tests, requesting tests, and reviewing test results.

Calibration Details

An active calibration curve is required for all tests. For the Access CEA assay, calibration is required every 28 days. Refer to the appropriate system manuals and/or Help system for information on calibration theory, configuring calibrators, calibrator test request entry, and reviewing calibration data.

Quality Control

Quality control materials simulate the characteristics of patient samples and are essential for monitoring the system performance of immunochemical assays. Because samples can be processed at any time in a "random access" format rather than a "batch" format, quality control materials should be included in each 24-hour period.[17] Include commercially available quality control materials that cover at least two levels of analyte. More frequent use of controls or the use of additional controls is left to the discretion of the user based on good laboratory practices or laboratory accreditation requirements and applicable laws. Follow manufacturer's instructions for reconstitution and storage. Each laboratory should establish mean values and acceptable ranges to assure proper performance. Quality control results that do not fall within acceptable ranges may indicate invalid test results. Examine all test results generated since the

last acceptable quality control test point for this analyte. Refer to the appropriate system manuals and/or Help system for information about reviewing control results.

Results

Patient test results are determined automatically by the system software using a weighted four-parameter logistic (4PLC) math model. The amount of analyte in the sample is determined from the measured light production by means of the stored calibration data. Patient test results can be reviewed using the appropriate screen. Refer to the appropriate system manuals and/or Help system for complete instructions on reviewing sample results.

Limitations of the Procedure

1. Samples can be accurately measured within the reportable range of the lower limit of detection and the highest calibrator value (approximately 0.1–1000 ng/mL). If a sample contains more than the stated value of the highest Access CEA Calibrator (S5), report the result as greater than that value (i.e. > 1000 ng/mL). Alternatively, dilute one volume of the sample with nine volumes of Access CEA Calibrator S0 (zero) or Access CEA Diluent. After assaying the diluted sample, multiply the obtained value by the dilution factor, ten (10). If a sample contains less than the lower limit of detection for the assay, report the result as less than the lower limit of detection (< 0.1 ng/mL). Refer to the appropriate system manuals and/or Help system for instructions on how to enter a sample dilution in a test request.
2. For assays employing antibodies, the possibility exists for interference by heterophile antibodies in the patient sample. Patients who have been regularly exposed to animals or have received immunotherapy or diagnostic procedures utilizing immunoglobulins or immunoglobulin fragments may produce antibodies, e.g. HAMA, that interfere with immunoassays. Additionally, other heterophile antibodies such as human anti-goat antibodies may be present in patient samples.[18,19]

   Such interfering antibodies may cause erroneous results. Carefully evaluate the results of patients suspected of having these antibodies.
3. The Access CEA results should be interpreted in light of the total clinical presentation of the patient, including: symptoms, clinical history, data from additional tests and other appropriate information. Elevated levels of CEA may occur in non-neoplastic conditions, therefore, the Access CEA assay is not intended for the diagnosis of, or for screening of cancer.
4. Access CEA assay does not demonstrate any hook effect up to 100,000 ng/mL.

Expected Values

1. Each laboratory should establish its own reference ranges to assure proper representation of specific populations.
2. CEA concentrations were measured in human serum samples from 301 apparently healthy blood donors (including smokers and non-smokers), using the Access CEA assay:

	n	0.0–3.0 (ng/mL)	3.1–5.0 (ng/mL)	5.1–10.0 (ng/mL)	> 10.0 (ng/mL)
Non-smokers	151	95.4%	3.9%	0.7%	0.0%
Smokers	150	82.0%	8.7%	8.0%	1.3%
Total	301	88.7%	6.3%	4.3%	0.7%

Specific Performance Characteristics

Accuracy

Correlation

Comparison of serum CEA values using the Access CEA assay on the Access Immunoassay Analyzer and a commercially available automated immunoassay kit gives the following statistical data using Deming calculations:

n	Range of Observations (ng/mL)	Intercept	Slope	r
288	0.26–920.36	0.52	0.97	0.96

Spiking Recovery

Known amounts of CEA were added to three patient samples. The concentration of CEA was determined before and after the addition of exogenous CEA and the percent recovery was calculated:

Sample 1 CEA Added (ng/mL)	Expected Concentration (ng/mL)	Determined Concentration (ng/mL)	Recovery (%)
0.0	–	8.51	–
2.5	11.01	11.03	100.2
5.0	13.51	14.04	103.9
7.5	16.01	16.98	106.1
10.0	18.51	20.35	109.9
		Mean % Recovery	**105.0**

Sample 2 CEA Added (ng/mL)	Expected Concentration (ng/mL)	Determined Concentration (ng/mL)	Recovery (%)
0.0	–	30.98	–
2.5	33.48	32.98	98.5
5.0	35.98	35.95	99.9
7.5	38.48	37.59	97.7
10.0	40.98	42.38	103.4
		Mean % Recovery	**99.9**

Sample 3 CEA Added (ng/mL)	Expected Concentration (ng/mL)	Determined Concentration (ng/mL)	Recovery (%)
0.0	–	722.22	–
25.0	747.22	736.26	98.5
50.0	772.22	785.54	101.7
75.0	797.22	836.11	105.5
100.0	822.22	879.31	106.9
		Mean % Recovery	**103.2**

Dilution Recovery (Linearity)

Dilution (non-serial) of three patient samples containing CEA with the Access CEA Calibrator S0 (zero) resulted in the following data:

Sample 1	Expected Concentration (ng/mL)	Determined Concentration (ng/mL)	Recovery (%)
Neat	–	89.21	–
1/1.5	59.47	60.40	101.6
1/2.5	35.68	36.04	101.0
1/6.0	14.87	14.68	98.7
1/15.0	5.95	6.08	102.2
1/48.0	1.86	1.85	99.5
		Mean % Recovery	**100.6**

Sample 2	Expected Concentration (ng/mL)	Determined Concentration (ng/mL)	Recovery (%)
Neat	–	37.93	–
3/4	28.45	28.98	101.9
1/2.0	18.97	19.72	104.0
1/4.0	9.48	9.97	105.2
1/8.0	4.74	5.07	107.0
1/24.0	1.58	1.65	104.4
		Mean % Recovery	**104.5**

Sample 3	Expected Concentration (ng/mL)	Determined Concentration (ng/mL)	Recovery (%)
Neat	–	662.67	–
1/5.0	132.53	125.17	94.4
1/10.0	66.27	63.15	95.3
1/50.0	13.25	12.71	95.9
1/100	6.63	6.23	94.0
1/300	2.21	2.09	94.6
		Mean % Recovery	**94.8**

Imprecision

This assay exhibits total imprecision of less than or equal to 9% at concentrations greater than 2.1 ng/mL, and total SD of less than or equal to 0.19 ng/mL at concentrations less than or equal to 2.1 ng/mL. The assay imprecision was evaluated by testing 3 levels of controls in triplicate for a maximum of 2 runs per day for a total of 20 runs. The mean, SD and percent CV were calculated by analysis of variation (ANOVA):[20]

Sample	n	Mean Concentration (ng/mL)	Within Run		Total	
			SD	%CV	SD	%CV
Low Level	60	5.37	0.20	3.69	0.22	4.04
Medium Level	60	51.59	1.55	3.01	1.96	3.80
High Level	60	523.17	20.78	3.97	23.61	4.51

Analytical Sensitivity

The lowest detectable level of CEA distinguishable from zero (Access CEA Calibrator S0) with 95% confidence is 0.1 ng/mL. This value is determined from a total of ten assays across five

Access Analyzers. Each assay consisted of a complete six point calibration curve, tri-level controls and ten replicates of the zero calibrator. The analytical sensitivity value is interpolated from the curve at the point that is two standard deviations from the fitted zero calibrator signal.

Specificity

Antigens related to CEA were added to the zero (S0) calibrator at concentrations up to 1000 ng/mL. Results of these samples evaluated with the Access CEA assay are expressed as CEA concentrations.

Level of added antigen (ng/mL)	NCA-50 apparent CEA level (ng/mL)	NCA-2 apparent CEA level (ng/mL)	NCA apparent CEA level (ng/mL)	NFA-1 apparent CEA level (ng/mL)
0	0.0	0.0	0.0	0.0
10	0.0	0.0	0.0	0.0
100	0.1	0.0	0.0	0.0
500	0.5	0.0	0.0	0.0
1000	0.9	0.0	0.0	0.0

Interferences

Hemoglobin, triglycerides, bilirubin, human serum albumin and rheumatoid factor, tested up to the following concentrations, respectively, 500 mg/dL, 1800 mg/dL, 30 mg/dL, 5 g/dL and 500 IU/mL, do not interfere with the Access CEA assay.

The following therapeutic agents were tested at the concentrations listed and the percent recovery determined. There was no significant interference from these therapeutic agents.

Substance	Concentrations Added	Mean Recovery (%)
Bleomycin	0.1 IU/mL	102.92
Cisplatin	1.5 µg/mL	100.16
Cyclophosphamide	3000 µg/mL	102.62
Doxorubicin	100 µg/mL	99.65
Fluorouracil	360 µg/mL	102.59
Leucovorin	60 µg/mL	102.44
Methotrexate	4500 µg/mL	101.40
Mitomycin	60 µg/mL	98.88
Tamoxifen	133 µg/mL	102.68
Vinblastine	1.2 µg/mL	98.41
Vincristine	0.7 µg/mL	99.93

Access
Immunoassay Systems

CEA CALIBRATORS

REF 33205

Intended Use

The Access CEA Calibrators (BSA matrix) are intended to calibrate the Access CEA assay for the quantitative determination of Carcinoembryonic Antigen (CEA) levels in human serum, using the Access Immunoassay Systems.

Summary and Explanation

Quantitative assay calibration is the process by which samples with known analyte concentrations (i.e. assay calibrators) are tested like patient samples to measure the response. The mathematical relationship between the measured responses and the known analyte concentrations establishes the calibration curve. The mathematical relationship or calibration curve is used to convert RLU (relative light units) measurements of patient samples to specific quantitative analyte concentrations.

Traceability

The measurand (analyte) in the Access CEA Calibrators is traceable to the manufacturer's working calibrators. Traceability process is based on EN ISO 17511.

The assigned values were established using representative samples from this lot of calibrator and are specific to the assay methodologies of the Access reagents. Values assigned by other methodologies may be different. Such differences, if present, may be caused by inter-method bias.

Product Information

Access CEA Calibrators

Cat. No. 33205: 2.5 mL/vial

- Provided ready to use.
- Store upright and refrigerate at 2 to 10°C.
- Let stand for 10 minutes at room temperature and mix contents by gently inverting before use. Avoid bubble formation.
- Stable until the expiration date stated on the label when stored at 2 to 10°C.
- Signs of possible deterioration are control values out of range.
- Refer to calibration card for exact concentrations.

S0:	Phosphate buffer, protein (bovine), < 0.1% sodium azide and 0.1% ProClin** 300.
S1, S2, S3, S4, S5:	Human Carcinoembryonic Antigen at levels of approximately 1, 10, 100, 500, 1000 ng/mL, respectively, in phosphate buffer, protein (bovine), < 0.1% sodium azide and 0.1% ProClin 300.
Calibration Card:	1

Warnings and Precautions

- For *in vitro* diagnostic use.
- Human source material. The antigen used in the preparation of the calibrators is derived from human tissue culture. Handle these products as potentially infectious according to universal precautions and good clinical laboratory practices, regardless of their origin, treatment, or prior certification. Use an appropriate disinfectant for decontamination. Store and dispose of these materials and their containers in accordance with local regulations and guidelines.[21]

- Sodium azide may react with lead and copper plumbing to form highly explosive metal azides. On disposal of liquids, flush with a large volume of water to prevent azide build-up.[15]
- Xi. Irritant: 0.1% ProClin 300.

R 43: May cause sensitization by skin contact.
S 28-37: After contact with skin, wash immediately with plenty of soap and water. Wear suitable gloves.

- The Material Safety Data Sheet (MSDS) is available upon request.

Procedure

Refer to the appropriate system manuals and/or Help system for information on calibration theory, configuring calibrators, calibrator test request entry, and reviewing calibration data.

Calibration Details

The Access CEA Calibrators are provided at six levels: zero and approximately 1, 10, 100, 500 and 1000 ng/mL (exact concentrations stated on calibration card) prepared by diluting human CEA in buffered BSA-based matrix. Assay calibration data is valid for up to 28 days.

Limitations of the Procedure

If there is evidence of microbial contamination or excessive turbidity in a reagent, discard the vial.

Access
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CEA QC

REF 33209

Intended Use

The Access CEA QC (BSA matrix) controls are intended for monitoring the system performance of immunoenzymatic procedures for the quantitative measurement of Carcinoembryonic Antigen (CEA) using Access CEA reagents.

Summary and Explanation

Quality control materials simulate the characteristics of patient samples and are essential for monitoring the system performance of the Access CEA immunoassay. In addition, they are an integral part of good laboratory practices.[22,23,24,25,26] When performing assays with Access reagents for CEA, include quality control materials to validate the integrity of the assays. The assayed values should fall within the acceptable range if the test system is working properly.

Traceability

The measurand (analyte) in the Access CEA QC is traceable to the manufacturer's working calibrators. Traceability process is based on EN ISO 17511.

The assigned values were established using representative samples from this lot of QC and are specific to the assay methodologies of the Access reagents. Values assigned by other methodologies may be different. Such differences, if present, may be caused by inter-method bias.

Product Information

Access CEA QC

Cat. No. 33209: 2.5 mL/vial (3 vials each of QC1 and QC2)

- Provided ready to use.
- Store upright and refrigerate at 2 to 10°C.
- Let stand for 10 minutes at room temperature and mix contents by gently inverting before use. Avoid bubble formation.
- Stable until the expiration date stated on the label when stored at 2 to 10°C.
- Signs of possible deterioration are control values out of range.
- Refer to value card for concentration and acceptable range.

QC 1:	Human Carcinoembryonic Antigen (CEA) at a level of approximately 3 ng/mL in phosphate buffer, protein (bovine) with < 0.1% sodium azide and 0.1% ProClin** 300.
QC 2:	Human Carcinoembryonic Antigen (CEA) at a level of approximately 300 ng/mL in phosphate buffer, protein (bovine) with < 0.1% sodium azide and 0.1% ProClin 300.
QC Value Card:	1

Warnings and Precautions

- For *in vitro* diagnostic use.
- Human source material. The antigen used in the preparation of the quality control material is derived from human tissue culture. Handle these products as potentially infectious according to universal precautions and good clinical laboratory practices, regardless of their origin, treatment, or prior certification. Use an appropriate disinfectant for decontamination.

Store and dispose of these materials and their containers in accordance with local regulations and guidelines.[21]

- Sodium azide may react with lead and copper plumbing to form highly explosive metal azides. On disposal of liquids, flush with a large volume of water to prevent azide build-up.[15]
- Xi. Irritant: 0.1% ProClin 300.

R 43: May cause sensitization by skin contact.

S 28-37: After contact with skin, wash immediately with plenty of soap and water. Wear suitable gloves.

- The Material Safety Data Sheet (MSDS) is available upon request.

Procedure

Determine the concentration of human CEA in the Access CEA QC materials using the Access Immunoassay Systems in the same manner as a patient sample. Because samples can be processed at any time in a "random access" format rather than a "batch" format, quality control materials should be included in each 24-hour time period.[17] More frequent use of controls or the use of additional controls is left to the discretion of the user based on good laboratory practices or laboratory accreditation requirements and applicable laws. Refer to the appropriate system manuals and/or Help system for information on quality control theory, configuring controls, quality control sample test request entry and reviewing quality control data.

Expected Values

For the value assignment of the Access CEA QC material, a number of samples, representative of the entire lot, are selected and assayed to provide a reliable estimate of the mean value. The mean values and standard deviations are listed on the QC value card. Variations such as in technique, equipment, or reagents may result in values different from those listed. Therefore, each laboratory should establish its own mean values and standard deviations (SD).

Access
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CEA DILUENT

REF 33206

Intended Use

The Access CEA Diluent (BSA matrix) is intended for use with the Access CEA assay to dilute patient samples containing CEA concentrations greater than the Access CEA Calibrator S5.

Summary and Explanation

The CEA level in patient samples may exceed the levels of the Access CEA Calibrator S5. If a quantitative value is required, it will be necessary to dilute the sample in order to determine the CEA concentration.

Product Information

Access CEA Diluent

Cat. No. 33206: 4 mL/vial. Liquid.

- Provided ready for use.
- Allow the contents to stand for 10 minutes at room temperature and mix gently by inverting prior to use. Avoid bubble formation.
- Stable to the expiration date stated on the vial label when stored at 2 to 10°C.

Diluent	Buffered bovine serum albumin (BSA) matrix with < 0.1% sodium azide and 0.1% ProClin** 300. Contains 0.0 ng/mL of Human Carcinoembryonic Antigen (CEA).

Warnings and Precautions

- For *in vitro* diagnostic use.
- Patient samples and blood-derived products may be routinely processed with minimum risk using the procedure described. However, handle these products as potentially infectious according to universal precautions and good clinical laboratory practices, regardless of their origin, treatment, or prior certification. Use an appropriate disinfectant for decontamination. Store and dispose of these materials and their containers in accordance with local regulations and guidelines.
- Sodium azide may react with lead and copper plumbing to form highly explosive metal azides. On disposal of liquids, flush with a large volume of water to prevent azide build-up.[15]
- Xi. Irritant: 0.1% ProClin 300.

R 43: May cause sensitization by skin contact.
S 28-37: After contact with skin, wash immediately with plenty of soap and water. Wear suitable gloves.

- The Material Safety Data Sheet (MSDS) is available upon request.

Procedure

Samples can be accurately measured within the reportable range of the lower limit of detection and the highest calibrator value [approximately 0.1–1000 ng/mL (µg/L)]. If a sample contains more CEA than the stated value of the S5 calibrator, dilute one volume of sample with nine volumes of Access CEA Diluent. After assaying the diluted sample, multiply the calculated value by the dilution factor of ten (10). Refer to the appropriate system manuals and/or Help system for instructions on how to enter a sample dilution in a test request.

References

1 Gold P, Freedman SO. Demonstration of tumor-specific antigens in human colonic carcinomata by immunological tolerance and absorption techniques. J Exp Med 1965;121:439-462.

2 Gold P, Freedman SO. Specific carcinoembryonic antigens of the human digestive system. J Exp Med 1965; 122:467-481.

3 Thomas P, Toth CA, Saini KS, Jeesup M, Steele Jr. G. The structure, metabolism and function of the carcinoembryonic antigen gene family. Biochim Biophys Acta 1990;1032:177-189.

4 Benchimol S, Fuks A, Jothy S, Beauchemin N, Shirota K, Stanners CP. Carcinoembryonic antigen, a human tumor marker, functions as an intercellular adhesion molecule. Cell 1989;57:327-334.

5 von Kleist S, Chavanel G, Burtin P. Identification of an antigen from normal human tissue that cross-reacts with the carcinoembryonic antigen. Proc Natl Acad Sci USA 1972;69:2492-2494.

6 Burtin P, Chavanel G, Hirsch-Marie H. Characterization of a second normal antigen that cross-reacts with CEA. J Immunol 1973;111:1926-1928.

7 Matsuoka Y, Hara M, Takatsu K, Kitagawa M. Presence of antigen related to the carcinoembryonic antigen in feces of normal adults. GANN 1973;64:203-206.

8 Wolmark N, Fisher B, Wieand HS, Henry RS, et al. The prognostic significance of preoperative carcinoembryonic antigen levels in colorectal cancer. Results from NSABP (National Surgical Adjuvant Breast and Bowel Project) clinical trials. Ann Surg 1984;199:375-381.

9 American Society for Clinical Oncology Tumor Marker Expert Panel. Clinical practice guidelines for the use of tumor markers in breast and colorectal cancer. J Clin Oncol 1996;14:2843-2877.

10 Go VLW, Zamcheck N. The role of tumor markers in the management of colorectal cancer. Cancer 1982;50:2618-2623.

11 Sikorska H, Schuster J, Gold P. Clinical applications of carcinoembryonic antigen. Cancer Detection and Prevention 1988;12:321-55.

12 Lahoussen M, Stettner H, Pickel H, Urdl Q, Purstner P. The predictive value of a combination of tumor markers in monitoring patients with ovarian cancer. Cancer 1987;60:2228-32.

13 McNeely MDD. Gastrointestinal function and digestive disease. Kaplan LA, Pesce AJ, editors: Clinical chemistry: Theory, analysis and correlation; 3rd edition. St. Louis, MO 1989, CV Mosby.

14 Fletcher RH. Carcinoembryonic antigen. Ann Intern Med 1986;104:66-73.

15 DHHS (NIOSH) Publication No. 78-127, August 1976. Current Intelligence Bulletin 13 - Explosive Azide Hazard. Available http://www.cdc.gov/niosh.

16 Approved Guideline - Procedures for the Handling and Processing of Blood Specimens, H18-A3. 2004. Clinical and Laboratory Standards Institute.

17 Cembrowski GS, Carey RN. Laboratory quality management: QC⇌QA. ASCP Press, Chicago, IL, 1989.

18 Kricka L. Interferences in immunoassays – still a threat. Clin Chem 2000; 46: 1037–1038.

19 Bjerner J, et al. Immunometric assay interference: incidence and prevention. Clin Chem 2002; 48: 613–621.

20 Approved Guideline - Evaluation of Precision Performance of Quantitative Measurement Methods, EP5-A2. 2004. Clinical and Laboratory Standards Institute.

21 HHS Publication, 4th ed., April 1999. Biosafety in Microbiological and Biomedical Laboratories. Available http://www.cdc.gov/od/ohs/biosfty/bmbl4/bmbl4toc.htm

22 Broome HE, Cembrowski GS, Kahn SN, Martin PL, Patrick CA. Implementation and use of a manual multi-rule quality control procedure. Lab Med 1985; 16: 533-7.

23 Westgard JO, Barry PL, Hunt MR, Groth T. A multi-rule Shewhart chart for quality control in clinical chemistry. Clin Chem 1981; 27: 493-501.

24 Koch DD, Oryall JJ, Quam EF, Feldbruegge DH, et al. 1960. Selection of medically useful quality control procedures for individual tests done in a multitest analytical system. Clin. Chem 1990; 36, 230-3.

25 Mugan K, Carlson IH, Westgard JO. Planning QC procedures for immunoassays. J Clin Immunoassay 1994; 17:216-22.

26 Approved Guideline – Statistical Quality Control for Quantitative Measurement Procedures: Principles and Definitions, C24-A3. June 2006. Clinical and Laboratory Standards Institute.

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