

# CARCINOEMBRYONIC ANTIGEN (CEA)

## **INTRODUCTION**

CEA is a glycoprotein normally produced only during early fetal life. Rapid multiplication of digestive system epithelial cells raises the CEA level in the blood. It also appears in the blood of chronic smokers. <25% patients with disease confined to the colon have elevated CEA. However the sensitivity increases with advancing tumor stage. It is recommended to measure CEA levels only after malignancy is confirmed. These levels return to normal within 4-6 weeks after surgical resection. The American Society of Clinical Oncology recommends monitoring CEA levels every 2-3 months for at least 2 years in Stage II / III Colon cancer.

## **NORMAL RANGE**

<3 ng/mL in Non smokers

<5 ng/mL in Smokers

## **CLINICAL USE**

- Monitoring Colorectal cancer
- Monitoring selected other cancers like Medullary thyroid carcinoma, Carcinoma of Rectum / Lung / Pancreas / Stomach / Ovaries
- Maybe useful in assessing effectiveness of chemotherapy & radiotherapy
- Diagnosis of malignant pleural effusion

<b>PATTERNS OF CEA CHANGE DURING CHEMOTHERAPY</b>
• Uninterrupted increase indicates failure to respond
• Decrease indicates response to therapy
• Surge in CEA for weeks followed by a decrease indicates response
• Sustained decrease followed by an increase indicates lack of response to therapy
• 25-30% change from baseline levels is considered significant

## **INTERPRETATION**

### **Increased Levels**

- 75% carcinoma cases of endodermal origin – Colon / Stomach / Pancreas / Lung
- 50% carcinoma cases of non-entodermal origin – Breast / Head & Neck / Ovary
- 40% patients with non-carcinomatous malignant disease
- 90% patients with metastatic solid tumors specially to liver or lung
- Malignant effusions

- Non – malignant diseases – Ulcerative colitis, Crohn’s disease, Diverticulitis, Peptic ulcer, Chronic pancreatitis
- Liver disease – Cirrhosis, Chronic active hepatitis, Ostructive jaundice, Alcoholic liver disease
- Renal failure
- Fibrocystic disease of breast

**HIGH RISK FACTORS FOR COLORECTAL CANCER**

- Family history of Colorectal cancer in first degree relatives – relative risk 1.75X
- Diet of animal fat
- Hereditary (Autosomal dominant inheritance) syndromes – Polyposis colon & Lynch syndrome
- Inflammatory bowel disease
- Streptococcus bovis bacteremia
- Ureterosigmoidostomy
- Tobacco use

**EARLY DETECTION OF COLORECTAL CANCER**

- Digital Rectal examination – should be part of routine physical examination in all adults > 40 years age
- Fecal occult testing – American cancer society recommends this test every 5 years after 50 years of age for asymptomatic individuals
- Flexible sigmoidoscopy - American cancer society recommends this test every 5 years after 50 years of age for asymptomatic individuals
- Total colon examination (colonoscopy of double contrast barium enema) - American cancer society recommends this test every 10 years after 50 years of age for asymptomatic individuals

**LABORATORY DIAGNOSIS**

- Serum CEA
- Fecal occult blood – colorectal cancers detected in <10% & benign polyps detected in 20-30% of positive cases
- Fecal DNA – analyzed for multiple mutations associated with Colorectal cancer

**PROGNOSIS**

Prognosis is related to serum CEA concentration at the time of diagnosis.

CEA	REMARKS
< 5 ng/mL before therapy	Suggests localized disease and favourable prognosis
>10 ng/mL	Suggests extensive disease and poor prognosis
>20 ng/mL	usually have recurrence within 14 months after surgery

## ***LIMITATIONS***

- Normal serum CEA levels do not rule out primary, metastatic or recurrent cancer because 20% of colon cancers do not express CEA
- Usually CEA levels become normal 6-12 weeks after removal of tumor. Failure to decline to normal levels post-operatively suggest incomplete resection.
- Different assays do not produce equivalent values and should not be used interchangeably.