
A brief overview of the role of CA 15.3 in breast cancer

Peer review status:

No

Corresponding Author:

Dr. Esther Una Cidon,
Doctor Specialist in Medical Oncology, Oncology Department, Royal Bournemouth Hospital, Castle Lane East,
BH7 7DW - United Kingdom

Submitting Author:

Dr. Esther Una Cidon,
Doctor Specialist in Medical Oncology, Oncology Department, Royal Bournemouth Hospital, Castle Lane East,
BH7 7DW - United Kingdom

Article ID: WMC005313

Article Type: Review articles

Submitted on: 23-Jun-2017, 10:55:42 PM GMT **Published on:** 27-Jun-2017, 09:55:29 AM GMT

Article URL: http://www.webmedcentral.com/article_view/5313

Subject Categories: BREAST

Keywords: CA 15.3, MUC1, breast cancer, mucin, cancer antigen, tumour marker

How to cite the article: Una Cidon E. A brief overview of the role of CA 15.3 in breast cancer. WebmedCentral BREAST 2017;8(6):WMC005313

Copyright: This is an open-access article distributed under the terms of the [Creative Commons Attribution License \(CC-BY\)](#), which permits unrestricted use, distribution, and reproduction in any medium, provided the original author and source are credited.

Source(s) of Funding:

N/A

Competing Interests:

None

A brief overview of the role of CA 15.3 in breast cancer

Author(s): Una Cidon E

Review

Cancer antigen 15-3 (CA 15-3) is an epitope of the transmembrane glycoprotein MUC1 (mucin 1 or polymorphic epithelial mucin). Mucins line the surface of epithelial cells in several organs and protect the body from infections as prevent the pathogen from reaching the cell surface. It is overexpressed in several cancers such as breast, colon, ovarian, lung and pancreatic.^[1]

MUC1 is composed of an extracellular, transmembrane and a cytosolic region^[1] and it may participate in cell adhesion. In fact, it has been theorised that it could be involved in cancer invasion and metastasis.^[2]

CA 15-3 antigen is a carbohydrate epitope which represents sequences of mucins often overexpressed in malignant adenocarcinoma cells, such as breast cancer.^[3]

Malignant cells shed this tumour marker into the bloodstream, where this could be detected. Not all breast cancers express this antigen, especially early-stages, but also some advanced tumours.

However, this is not the rule. In fact, advanced breast cancers, especially if high burden disease, usually show not only a high incidence of elevated levels but also higher absolute figures.^[2]

In these productive tumours, the level of CA 15-3 will increase as the tumours progress and will reach its highest in metastatic cases, especially if involving the liver, lung and bones.^[4]

Although data regarding its overall value in breast cancers are conflictive, it seems to be low (CA 15-3 levels may also be high in benign diseases and other malignancies). However, when focused only on advanced cases, its sensitivity and specificity increase significantly.^[4,5]

Some authors have reported sensitivity of 76.1%^[5] and specificity of 41%.^[6] while others have shown much higher figures (Quassam et al reported sensitivity of 93.3% and specificity of 96.6% and others sensitivity of 100%).^[5,7]

These results give CA15-3 a real value in detection of breast cancer recurrence, especially with high burden

of disease.^[6,8]

Moreover, it has been documented an early increase in CA 15.3 levels, preceding 5-9 months the clinical or radiological confirmation, although there are insufficient data as to recommend its use for such purpose.^[4,9-11]

Regarding its prognostic value, several studies have confirmed it in early breast cancer. A study, however, found no significance of the post-operative level in predicting breast cancer recurrence.^[6]

Currently there are not enough data to recommend its use for screening.^[1,4]

CA 15-3 measurement has also been used to monitor response to treatment.^[6,7]

In these cases, it should not be used alone but as an additional parameter. In patients with no measurable disease, an increase in CA 15-3 levels may indicate a failure of treatment, although false elevations may occur in the first 4-6 weeks of therapy.^[4,12,13]

Moreover, high levels of CA15-3 predict poor response to chemotherapy and persistently elevated levels post chemotherapy indicate a reduced disease-free survival in locally advanced breast cancer.^[11]

All these data lead to a controversy surrounding the clinical use of CA15-3. Clearly it proved to be useful as a way to monitor response to breast cancer treatment.^[4]

And regarding the diagnosis of a recurrence, it has been reported that more than 75% of first recurrences (all sites included) associate high levels of CA15-3, especially if involving bone, liver, and lung.^[5]

Unfortunately its role as a diagnostic tool for new tumours in patients without a previous cancer background is not definitive.

Acknowledgement(s)

To all those who have always been there, especially in difficult times.

References

1. Duffy MJ, Shering S, Sherry F, McDermott E, O'Higgins N. CA 15-3: a prognostic marker in

- breast cancer. *Int J Biol Markers*. 2000 Oct-Dec. 15(4):330-3.
2. Swart R. Breast Cancer. Medscape Drugs and Diseases. Available at <http://emedicine.medscape.com/article/1947145-overview>.
 3. Klee GG, Schreiber WE. MUC1 gene-derived glycoprotein assays for monitoring breast cancer (CA 15-3, CA 27.29, BR): are they measuring the same antigen? *Arch Pathol Lab Med*. 2004 Oct. 128(10):1131-5.
 4. Geraghty JG, Coveney EG, Sherry F, O'Higgins NJ, Duffy MJ. CA 15-3 in patients with locoregional and metastatic breast carcinoma. *Cancer* 1992; 70 : 2831-4
 5. Hiba Qassem Ali, Nadham Kadham Mahdi, Mohammad Husein Al-Jowher. The value of CA15-3 in diagnosis, prognosis and treatment response in women with breast cancer *J Pak Med Assoc*. 2013;63(9):1138-1141.
 6. Al-azawi D, Kelly G, Myers E, McDermott EW, Hill AD, Duffy MJ, et al. CA 15-3 is predictive of response and disease recurrence following treatment in locally advanced breast cancer. *BMC Cancer* 2006; 6: 220. doi:10.1186/1471-2407-6-220
 7. Antoine E, Kayitalire L, Spielmann M. CA 15-3 in breast cancer. *Rev Med Interne* 1994; 15: 650-62.
 8. Ebeling FG, Stieber P, Untch M, Nagel D, Konecny GE, Schmitt UM, et al. Serum CEA and CA 15-3 as prognostic factors in primary breast cancer. *Br J Cancer* 2002; 86: 1217-22.
 9. Kokko R, Holli K, Hakama M. Ca 15-3 in the follow-up of localised breast cancer: a prospective study. *Eur J Cancer*. 2002 Jun. 38(9):1189-93.
 10. Cervino AR, Saibene T, Michieletto S, Ghiotto C, Bozza F, Saladini G, et al. Correlation between Cancer Antigen 15.3 Value and Qualitative and Semi-quantitative Parameters of Positron Emission Tomography/Computed Tomography in Breast Cancer patients. *Curr Radiopharm*. 2014 May 15.
 11. Duffy MJ. Serum tumor markers in breast cancer: are they of clinical value? *Clin Chem* 2006; 52: 345-51.
 12. Agyei Frempong MT, Darko E, Addai BW. The use of carbohydrate antigen (CA) 15-3 as a tumor marker in detecting breast cancer. *Pak J Biol Sci* 2008; 11: 1945-8. 16.
 13. Thriveni K, Krishnamoorthy L, Ramaswamy G. Correlation study of Carcino Embryonic Antigen & Cancer Antigen 15.3 in pretreated female breast cancer patients. *Indian J Clin Biochem* 2007; 22: 57-60.