

## Protein associated with breast cancer metastasis

Breast cancer is one of the leading causes of death in women. Although there have been significant advances in diagnosis and treatment, therapy of breast cancer which has spread to other organs remains a significant challenge. It is now a key focus of cancer research to discover the sequence of events which leads to breast cancer spreading

to distant sites. To this end research over the last decade has identified specific proteins, which are essential for the cancer to develop in other organs.

Developing a better understand of these proteins will allow the development of medicines that interfere with the actions of these proteins thereby helping to inhibit processes that drive cancer to an advanced stage.

*How does a cancer cell leave its original site?*

For cancer to spread, it needs to detach from its original site (e.g. breast tissue) and become migratory. This process involves the cancer cell changing its shape and specific proteins such as 'E-cadherin' and 'Twist' have been implicated in facilitating cell mobility. If the normal tissue cells surrounding the cancer cell do not produce E-cadherin, the cancer cell is stimulated to leave that site and enter nearby blood vessels. Twist has also been shown to promote breast cancer cells to migrate away from their site of originaorigin.

*Why does breast cancer spread to specific organs?*

'In-side out' signaling molecules produced by a cell are used under normal conditions to control the function of other cells in the vicinity. In cancer, some of these signaling molecules are highly expressed and this overproduction leads to cancer growth. If a specific signaling molecule called "Transforming Growth Factor Beta (TGF-?)" is overproduced, this leads to a type of breast cancer that grows rapidly. TGF-? can also enable cancer cells to spread more easily. Such cancers are particularly aggressive. The production of specific proteins under the control of TGF-? can lead to the cancers cells migrating to a specific organ. For example, the protein Angiopoietin-like 4 has been shown to encourage breast cancer to spread to the lungs, whilst Parathyroid hormone-related protein encourages breast cancer spread to bone.

*Why do breast cancer cells continue to multiply and spread?*

There are many factors, which cause breast cancer growth and spreading. One of the factors identified is a growth signal called Osteopontin. Overproduction of Osteopontin by cancer cells acts to re-model the tissue surrounding a mass of cancer cells (commonly referred to as a tumor) to make it easier for them to divide and multiply. Osteopontin also has a role in promoting spread of cancer cells to other sites such as bone.

## Summary

Once cancer has spread to another organ in the body, it is usually at an advanced stage where the malignant cells have become resistant to chemotherapy. Because the advanced cancer is likely to have spread to multiple sites, it is difficult to treat effectively. The consequence is poor survival rates for patients with advanced cancer.. There is currently a substantial amount of research being undertaken to fully understand the roles of signaling molecules including the specific proteins mentioned above in cancer development and spread. In the near future many of these research discoveries could be translated into the discovery of molecules designed to interfere with the signaling pathway proteins mentioned above. This could lead to new medicines improving quality of life and perhaps prolonged survival for patients with advanced breast cancer.

## Publication

[Protein deregulation associated with breast cancer metastasis.](#)

Chan KK, Matchett KB, McEnhill PM, El H D, McMullin MF, El-Tanani Y, Patterson L, Faheem A, Rudland PS, McCarron PA, El-Tanani M  
*Cytokine Growth Factor Rev.* 2015 Aug