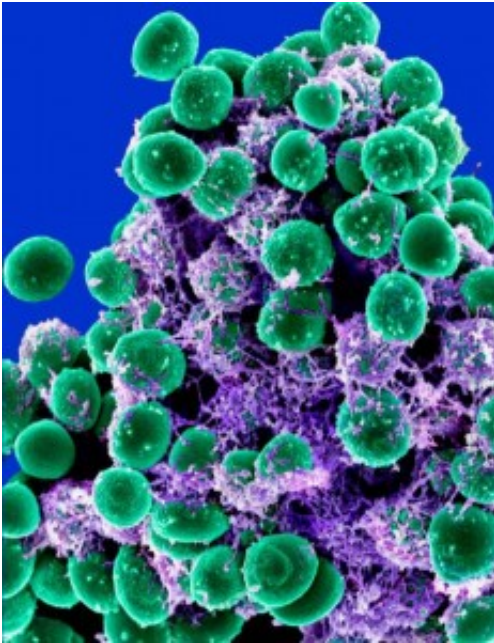


The role of bacterial communication in breast tumor progression

June 10 2015, by Daniella Lowenberg



Staphylococcus epidermidis bacteria. Credit: NIAID

Breast cancer is a threat to men and women worldwide. Like all cancers, the known causes are attributed to genetics and carcinogens, but recently, scientists have begun to recognize the microbiome as another contributing factor. Historically, breast tissue had been thought to be sterile, but it has become increasingly evident that microbes may both move to and reside in the breast tissue and nipple ducts.

Building on the recent discovery of Escherichia and Bacillus [bacteria in](#)

[the breast tissue](#), researchers published a study in *PLOS ONE* illustrating the role bacterial communication may play in breast [tumor](#) progression.

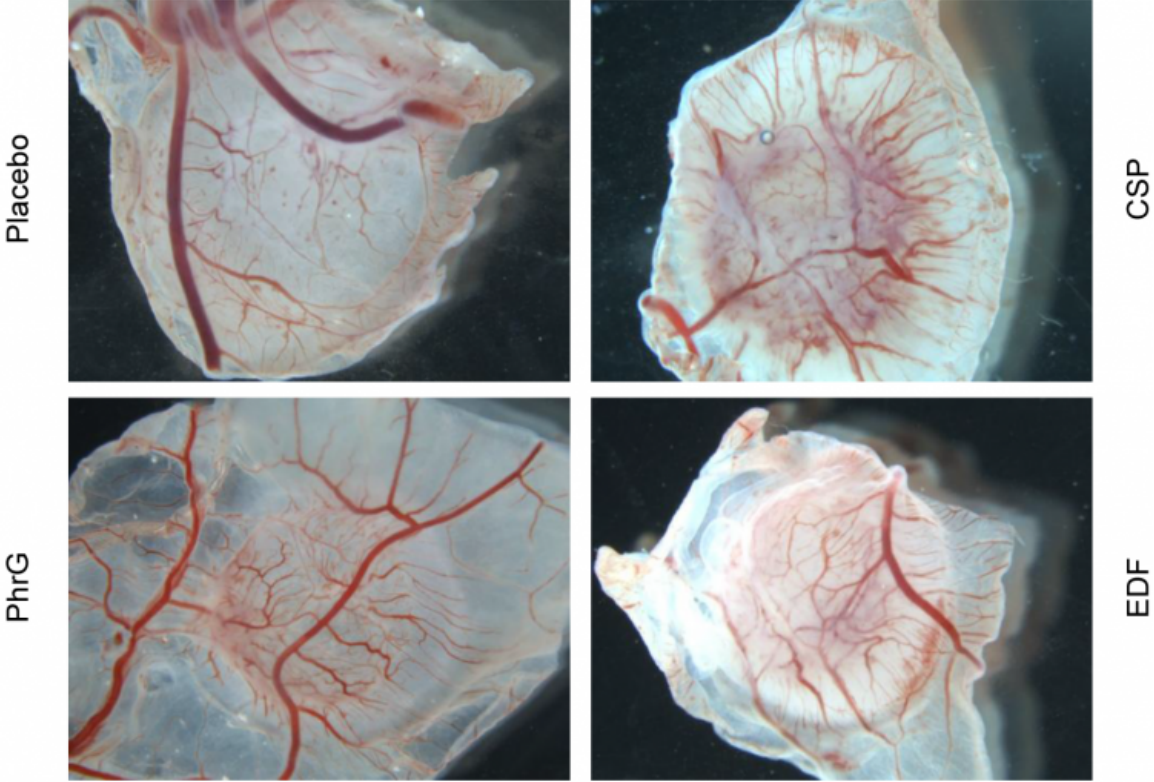
Bacteria have a system of communicating with each other called quorum sensing, where they may release hormones, lactones, or [peptides](#) that act as chemical signals to elicit a specific response in other bacteria.

Quorum sensing peptides and bacteria themselves can travel in the blood stream, and this may allow for both the peptides and bacteria from other areas of the body to invade breast tissue.

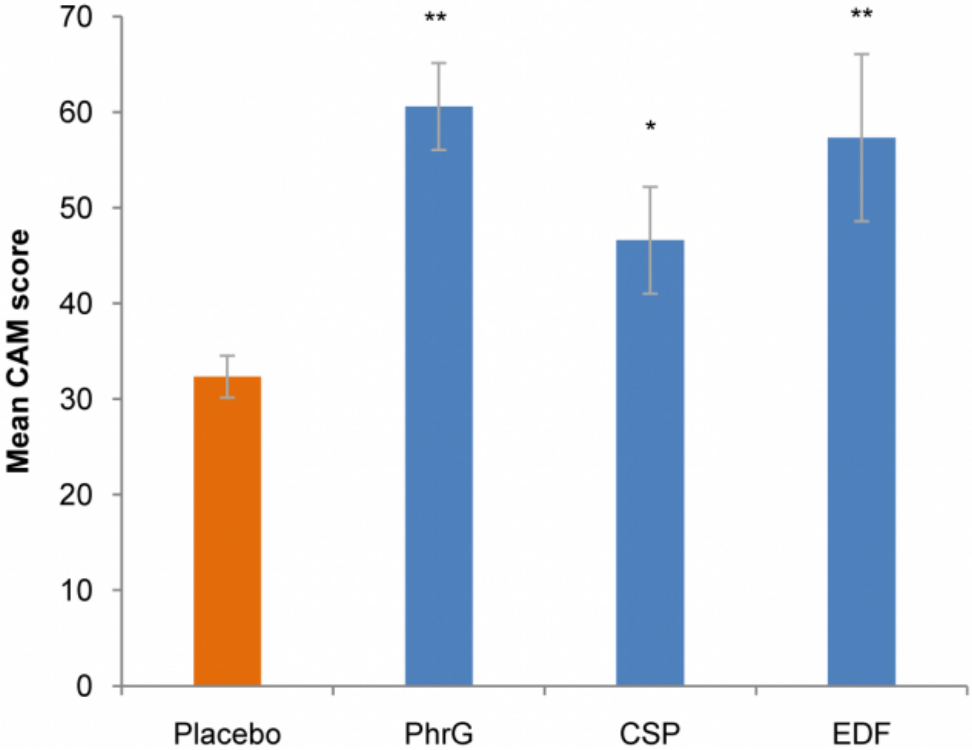
The authors of this study investigated the relationship between blood vessel formation and quorum sensing peptides, and how these entities may promote breast tumor cell invasion in vitro. To assess the effects that the presence of these bacteria and peptides may have on [breast tumor](#) evolution, researchers evaluated signaling peptides released from three different bacterial strains common to the human microbiota: *Bacillus subtilis*, *Streptococcus mitis*, and *Escherichia coli*. Using cancerous cells derived from human tissue, researchers looked at how much protein was produced, what genes were affected, and visual changes in the human tumor cells after cells were exposed to the quorum sensing bacterial peptides.

The researchers found that exposing these cells to quorum sensing peptides caused an increase in the production of specific proteins by the cells related to [oncogenes](#), specific genes associated with cancer spread and growth. One of these oncogenes results in angiogenesis, the process by which new blood vessels are formed so that blood can reach the tumor and deliver nutrients necessary for growth. Additionally, the researchers noted a drop in the expression of an important anti-tumor protein in the human cells, p53, which could result in further tumor growth and progression.

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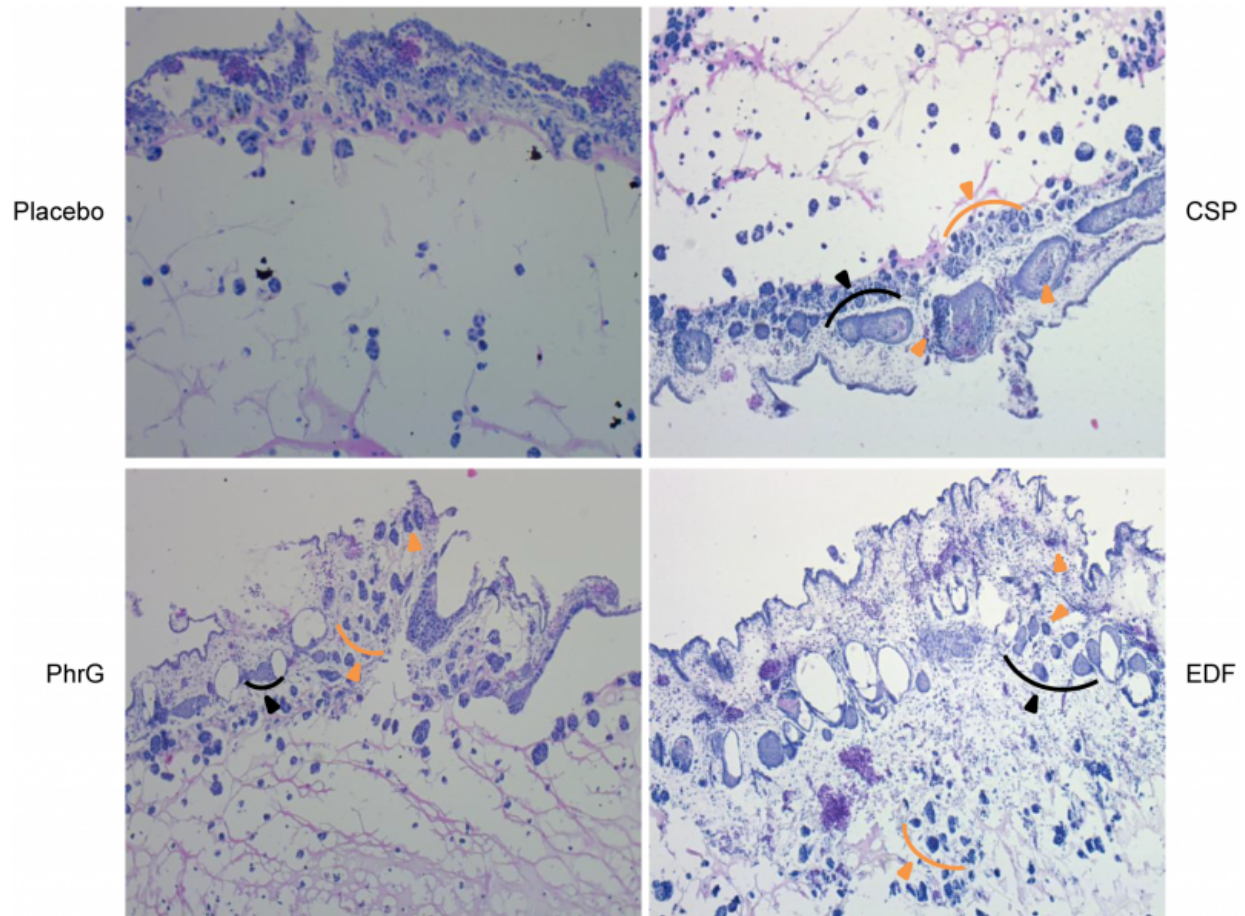


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Next, the researchers used an established assay for tumor invasion, called chick chorioallantoic membrane assay, or CAM, to monitor blood supply, or vascularization, a possible indicator of angiogenesis. As depicted in the image above, after 6 days of exposure to the peptides, the researchers observed neovascularization—the growth and formation of blood vessels—in the embryonic membrane of a chick egg. This increase in vascularization may be a route of transportation for the quorum sensing bacteria and peptides to enter the breast tissue.

The researchers were then able to use microscopy to observe how peptide treatment caused the tumor cells to disrupt the chorionic membrane and spread, the latter through a process called metastasis. They saw that the exposure to [quorum sensing](#) peptides appeared to promote tumor cell invasion through the chorionic layer into the mesoderm. The black arrows in the image below point to the aggressive invasion of the tumor cells through the chorionic tissue layers and disruption of the membrane. Although this experiment was performed on chick chorionic epithelial cells and not human breast tissue cells, the results from this tumor invasion assay may indicate what might happen during [breast tissue](#) invasion.



Microbes are the yin to the human yang, and are vital for survival. It is becoming increasingly evident that microbial diversity within our bodies plays a role in not only our daily lives, but also in the progression and or prevention of disease. Although more work needs to be done to map the mechanisms by which the peptides interact with the [tumor cells](#), the authors of this study have taken strides forward to suggest a link between bacterial communication and the growth and spread of breast tumors. With this information, researchers may look at microbial therapy and alternative preventative measures for a variety of diseases

and cancers.

More information: "The Quorum Sensing Peptides PhrG, CSP and EDF Promote Angiogenesis and Invasion of Breast Cancer Cells In Vitro." *PLoS ONE* 10(3): e0119471. [DOI: 10.1371/journal.pone.0119471](https://doi.org/10.1371/journal.pone.0119471)

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