

How pomegranate extract alters breast cancer stem cell properties

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Professor Ramune Reliene (right) discusses the powerful benefits of pomegranate with graduate assistant Sameera Nallanthighal. Credit: Paul Miller

A University at Albany research team has found evidence suggesting that the same antioxidant that gives pomegranate fruit their vibrant red color can alter the characteristics of breast cancer stem cells, showing the superfood's potential for aiding in much more than diabetes or heart disease as previously thought.

Pomegranate extract, derived mainly from the skin of the fruit, is known for having high levels of powerful antioxidants called polyphenols. Professor Ramune Reliene, associate professor of Environmental Health

Sciences in the School of Public Health, and graduate assistant Sameera Nallanthighal, both working with UAlbany's Cancer Research Center, wondered if these antioxidants could demonstrate [cancer](#)-fighting effects.

Because not all [cancer cells](#) are the same and tumors are comprised of many cell types, they decided to target the one long thought to be the most dangerous in any given tumor: cancer stem cells.

The Cells

Stem cells are unlike other types of cells in that they have a remarkable ability to self-divide and reproduce themselves, even giving rise to other types of cells. This self-dividing nature alone is not dangerous; in fact, normal tissue stem cells can replace dying cells and even repair damaged tissue.

The danger arises if stem cells become cancer stem cells, because their division and renewing ability carries over to cancer progression by aiding in tumor initiation, growth, and even re-initiating cancerous tumors long after a person has been declared cancer-free. Compounding these issues are the fact that cancer stem cells are thought to be more resistant to therapy than other types of cancer cells.

As such, cancer stem cells have become an important target in cancer therapy and prevention more so than other cancer cells, because of the idea that if the stem cells can be slowed or made "less stem-like," the cancer itself could be slowed too.

The Study

Together with an undergraduate student researcher Kristine Elmaliki,

Reliene and Nallanthighal conducted experiments using cancer cells lines that are the prototypes of breast cancer stem cells. These cells, which display the exact properties of cancer stem cells, were treated with diluted [pomegranate](#) extract and incubated for periods ranging from one to six days.

During this time, the team measured several markers of breast cancer stem cells in both the pomegranate extract treated cells and [untreated cells](#). They then compared the results between the groups and observed significant differences between the [cancer stem cell](#) prototypes that were treated with pomegranate extract.

Additionally, the cells that were treated with pomegranate extract were treated with relatively small amounts – thought to be manageable for a person to consume by simply purchasing the product at a grocery store and incorporating it into their diet.

"One thing we found surprising is that relatively low concentrations of the extract are able to modify the ability of cancer stem cells to reproduce themselves," said Reliene.

The Findings

- Reliene, Nallanthighal and Elmaliki made several notable findings, including:
- Pomegranate extract inhibits [breast cancer cells](#) ability to self-renew
- The inhibitory effect is maintained for several cell generations of newly formed cells (the equivalent to children and grandchildren of pomegranate extract-exposed parent cells) that have never been exposed to pomegranate extract but still have difficulties in self-renewing
- Pomegranate extract converts cancer stem cells to cells that look

like more traditional cancer [cells](#) and which may successfully be eliminated by cancer drugs.

"Our evidence alone does not suggest that pomegranate is the end-all-be-all-cure of breast cancer, but [pomegranate extract](#) shows promising potential for having a positive effect in both the primary cancer prevention and inhibition of the disease progression," said Reliene. "It warrants further investigation of its overall possibilities," she continued.

More information: Sameera Nallanthighal et al. Pomegranate Extract Alters Breast Cancer Stem Cell Properties in Association with Inhibition of Epithelial-to-Mesenchymal Transition, *Nutrition and Cancer* (2017). [DOI: 10.1080/01635581.2017.1359318](https://doi.org/10.1080/01635581.2017.1359318)

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