

Changing Your Lifestyle Can Change Your Genes

New research shows that improved diet, meditation and other non-medical interventions can actually "turn off" the disease-promoting process in men with prostate cancer.

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Here's some very good news: your genes are not your destiny. Earlier this week, my colleagues and I published the first study showing that improved nutrition, stress management techniques, walking, and psychosocial support actually changed the expression of over 500 genes in men with early-stage prostate cancer. This study was conducted at the non-profit Preventive Medicine Research Institute and the University of California, San Francisco in collaboration with Dr. Peter Carroll, Dr. Mark Magbanua, Dr. Chris Haqq, and others.

In this [study](#), published in the Proceedings of the National Academy of Sciences, we studied gene expression in biopsies from 30 men who were diagnosed with low-risk prostate cancer. These men had decided not to undergo conventional treatments such as surgery, radiation, or chemotherapy for reasons unrelated to the study. They had early, small-volume prostate cancer with stable prostate specific antigen (PSA) levels and Gleason scores of six or less, meaning that their tumors were not aggressive.

We biopsied their prostates at the beginning of the study and again three months later, after making comprehensive lifestyle changes. Since these patients did not have conventional treatments during this time, it enabled us to assess the effects of the lifestyle changes on gene expression without confounding interventions such as surgery, radiation, or chemotherapy.

The changes included a plant-based diet (predominant fruits, vegetables, legumes, soy products, and whole grains low in refined carbohydrates), moderate exercise (walking 30 minutes per day), stress management techniques (yoga-based stretching, breathing techniques, meditation, and guided imagery for one hour per day), and participating in a weekly one-hour support group. The diet was supplemented with soy, fish oil (three grams/day), vitamin E (100 units/day), selenium (200 mg/day), and vitamin C (2 grams/day). These lifestyle changes are described more fully in my book, [The Spectrum](#).

After three months, we repeated the biopsy and looked at changes in normal tissue within the prostate. We found that many disease-promoting genes (including those associated with cancer, heart disease, and inflammation) were down-regulated or "turned off," whereas protective, disease-preventing genes were up-regulated or "turned on." For example, a set of cancer-promoting oncogenes called RAS was down-regulated in these men. The Selectin E gene (which promotes inflammation and is elevated in breast cancer) was down-regulated. Another gene that suppresses tumor formation called SFRP was up-regulated, thereby reducing the risk of cancer. These genes are the target of many new drugs that are being developed. Clearly, changing lifestyle is less expensive, and the only side-effects are good ones. Dr. Craig Venter's pioneering research is showing that one way to change your genes is to synthesize new ones. Another may be to change your lifestyle.

The figure [here](#) provides a graphic representation of some of these changes in gene expression. Each line represents one of 31 genes that regulate "intracellular protein traffic" which affects how cells communicate with each other. The green color represents genes that are downregulated ("turned off") and the red color represents genes that are upregulated ("turned on"). As you can see, there are a lot more green (turned off) genes on the right side of the figure than on the left side.

For the past 31 years, I have directed a series of research studies showing that changes in lifestyle can make a powerful difference in our health and well-being, and how quickly these changes may occur. We showed that comprehensive lifestyle changes may stop or reverse the progression of coronary heart disease, diabetes, hypertension, obesity, hypercholesterolemia, and other chronic conditions.

Two years ago, along with Dr. Carroll (Chair of Urology, UCSF) and others who also collaborated on the new gene expression study, we published the [first randomized controlled trial](#) showing that these lifestyle changes may slow, stop, or even reverse the progression of prostate cancer, which may affect breast cancer as well. When we published our earlier studies, we didn't understand many of the mechanisms by which these changes may have occurred. Now, our new study is beginning to provide some insight into what some of these genetic mechanisms may be.

Because we looked at normal tissue within the prostate (rather than the prostate tumor cells), it is likely that our findings may be generalized beyond men with prostate cancer. Also, people who are otherwise healthy may not need to make such intensive changes and have a spectrum of choices. We are still trying to understand the full significance of these findings--we've raised more questions than we've answered, and we need larger, longer-term studies--but it's already clear that you may be able to alter, at least to some degree, how your genes are expressed simply by changing your diet and lifestyle.

I find this to be a profoundly hopeful message. Often, I hear people say, "Oh, I've got bad genes, there's nothing I can do about it"--displaying what I call genetic nihilism. Our findings (the first to show the effect of lifestyle changes on any kind of cancer genes) can be an antidote to genetic nihilism and, I hope, motivate people to begin making their own changes. In most cases, our genes are only a predisposition; they are not written in stone. And if we have a strong family history for diseases such as prostate cancer, breast cancer, or heart disease-- "bad genes"-- then we may need to make bigger changes in lifestyle in order to help prevent or even reverse chronic diseases. In the centuries-old debate about nature vs. nurture, we are learning that nurture affects nature as much as nature affects nurture. It's not all in our genes.

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We found that changing lifestyle actually changes gene expression. In only three months, we found that over 500 genes were either up-regulated or down-regulated—in simple terms, turning on genes that prevent many chronic diseases, and turning off genes that cause coronary heart disease, oncogenes that are linked to breast and prostate cancer, genes that promote inflammation and oxidative stress and so on. Part of the value of doing science is to redefine what is possible for people, not only in terms of unclogging arteries and making your genes healthier but also in deeper ways. Again, why bother with all that stuff? We are all going to die anyway.