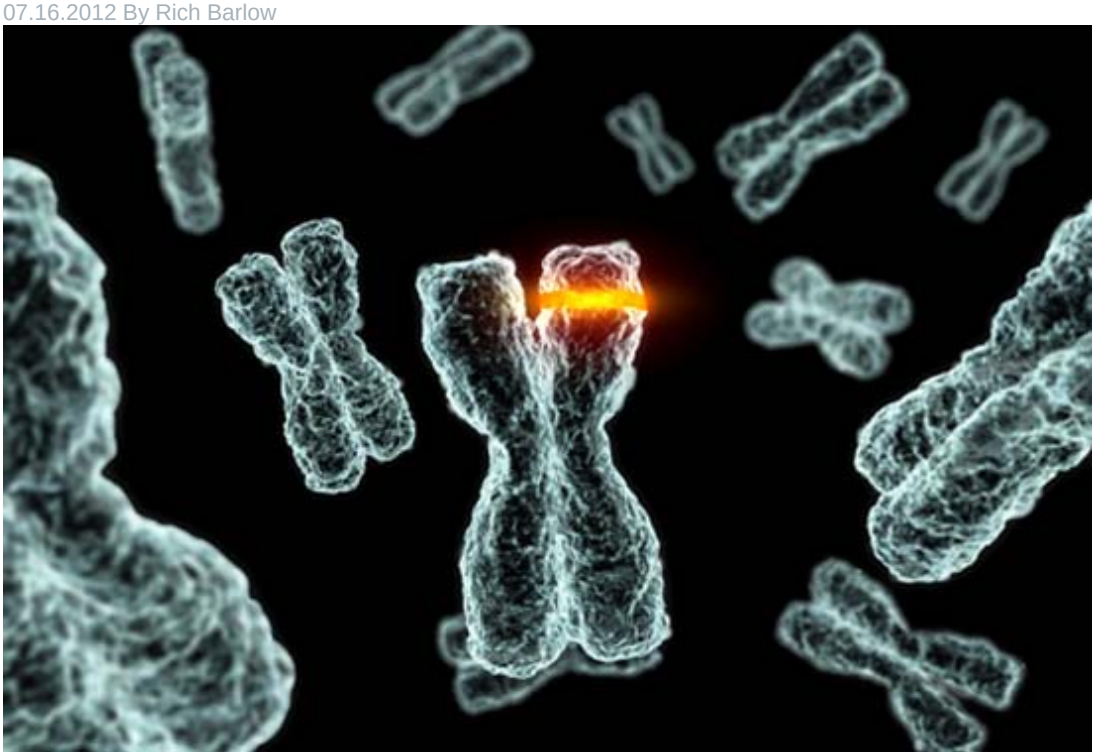
Your Genes or Your Life

Geneticist: what you don't know can kill you

07.16.2012 By Rich Barlow



Genetic mutations, such as the one above, can cause lethal disease.

A Bloomberg News reporter recently wrote about having his whole genome mapped. The tests revealed, much to the writer's distress, that he carried a genetic variant linked to a bone marrow leukemia. The reporter consulted geneticist Aubrey Milunsky for the story. "He turned up a Copenhagen study of 18 people with the same condition—*all dead*," says Milunsky.

Because some genetic illnesses are untreatable and other genetic conditions are little-understood, whole genome sequencing is not advised, says Milunsky, codirector of the Center for Human Genetics. (The fact that the procedure costs ten grand is another disincentive.) But single gene testing for 2,500 diseases is available and covered by insurance (and Medicaid), and it's most definitely advised by Milunsky, for the reason in the subtitle of his recent book: *Your Genes, Your Health: A Critical Family Guide That Could Save Your Life* (Oxford University Press, 2011).

Beware medicine's limits, however. Common killers like type 2 diabetes, Alzheimer's disease, and heart disease are the products of both genetics and lifestyle or environmental factors, Milunsky says, "for which there is no simple, definitive, one-gene test available." And patients' persistence can be crucial, given what he calls "the perilous knowledge of the new genetics by practicing physicians. Physicians who

graduated more than 12 years ago are way behind in the awareness of what's available" for genetic testing. Moreover, patients who don't know their family's health history are at a disadvantage, since causes of death of family members might suggest whether you should get a gene test, according to Milunsky. "It is desperately sad how often families don't know what happened to their close relatives."

Milunsky, whose center receives DNA samples from 44 countries for testing, talked to *BU Today* about the expanding genetic frontier.

BU Today: Which diseases are linked to genes or genetic mutations?

Milunsky: Everything is genetic. The most important single-gene diseases, where there is a defect or mutation in a gene, are determinable by DNA tests, and there are many examples. Common ones include cystic fibrosis, muscular dystrophy, sickle cell disease, Tay-Sachs disease.

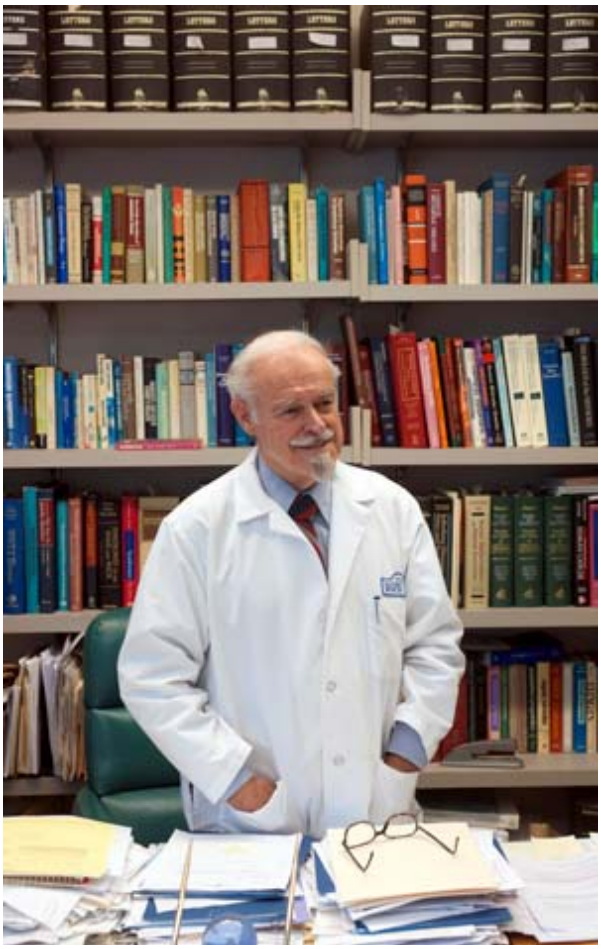
How many of these diseases are treatable?

That is the pressing question. There is a view by many that, 'Look, I've got my genes like bricks in a building, I can't change them, what's the point of testing?' It is true that there are extremely few examples of actionable results that would make, for example, a cure. Treatment, or gene therapy, is making advances, such as in hemophilia, but in a general sense, gene therapy is not at hand for virtually all these diseases.

The majority of diseases to which we all fall victim are the result of a combination of a set of genes and environmental factors. A person may be born with the susceptibility to diabetes, but if they remain thin and well-exercised, their diabetes may never materialize, whereas if they become obese, diabetes type 2 will show up. Common types of heart disease also fit in this category. But on the other hand, very few people realize—including physicians—that about one in 12 people has a rare genetic disorder—there are more than 7,000 rare genetic conditions.

Should we all get genetic testing?

The short answer's no. To begin with, if you mean check out your entire gene set—we call that whole genome sequencing, and it turns out it has received considerable hype—the cost approximates $10,000. It's not advised, for the reason that all of us carry at least 100 different mutations. If you have your whole genome tested, there is an uncomfortable chance you're going to come up with stuff that you didn't want to know and about which you can do nothing.



Aubrey Milunsky says that knowing your family history is key to deciding whether to have genetic testing. Photo by Vernon Doucette

Because we don’t have treatments?

Correct. What’s the point of knowing that you’re carrying something that’s going to cause sorrow? Equally important, it turns up findings that are uninterpretable. We don’t know what the result means. You find an alteration of unknown significance—we don’t know if it’s a mutation.

In that case, what kind of testing makes sense, and for whom?

If the family history is indicative of a condition that is genetic, a person should see a clinical geneticist. The actual name of the game is avoidance and prevention. If because of your family history or ethnicity, you recognize your risks—and all of us have risks on the basis of who we are: white, black, Asian, Armenian, Jewish—a simple DNA test will enable you to determine whether you have a risk of having a child with that disorder.

There are *no* families that don't have to think about genetics. None. The question is whether it's a disorder that tracks through the family—breast cancer, ovarian cancer, colon cancer, melanoma, for example. Very poorly recognized, even by physicians, are disorders—for example, hereditary colon cancer with no polyps in the colon—for which, in those families, there might be other cancers, of the uterus, of the prostate, due to the same gene mutation that caused the colon cancer. Such people would benefit from genetic testing. If somebody is found to have a mutation in one of the colon cancer genes, then surveillance becomes acute. That is absolutely actionable. They can immediately have surgical treatment.

We've known for a long time the mutations in two of the common breast cancer genes that also cause ovarian cancer, so if there's a mutation in a breast cancer gene, people are also concerned about ovarian cancer developing in that same patient or their first-line relatives. That's why women found to have breast cancer before the age of 50 *and* the mutation face the possibility of electing to have both breasts removed *and* their ovaries removed.

The hope is that the patient's physician will recognize the condition as genetic, or if uncertain, will call the geneticist and ask.

So a person reading this should get as much information as they can about their family history and share it with their doctor?

And also recognize their ethnicity is a risk, especially when it comes to having children. There are standards by the American Congress of Obstetricians and Gynecologists, where every person who is black is offered a sickle-cell carrier test, every person who is Jewish gets at least a Tay-Sachs disease carrier test and a Canavan disease test, to determine if the parents are carriers. If not offered and there's a catastrophe—namely, your child is born affected—that is an open-and-shut case of negligence, because there is a published standard.

Rich Barlow

Rich Barlow can be reached at barlowr@bu.edu.