DANNY LEHMAN/CORBIS

Diabetes is a growing problem in southeastern Mexico, where many Maya live.

Maya ancestry may help explain the high risk of diabetes in Mexico

By Emiliano Rodríguez Mega (/author/emiliano-rodr-guez-mega)
5 June 2015 3:45 pm | 11 Comments (/health/2015/06/mayan-ancestry-may-help-explain-high-risk-diabetes-mexico#disqus_thread)

Mexico has one of the highest rates of type 2 diabetes in the world, with 12% of the population suffering from the condition, compared with 9% of people in the United States. The Mexican government is so worried that it recently declared a state of emergency (http://www.jornada.unam.mx/2013/04/10/sociedad/047n2soc) and introduced a tax on soda and junk food (http://www.insp.mx/epppo/blog/2946-imp-refresco.html) . But a new study shows that some Mexicans may be at higher risk for developing diabetes, no matter how healthy their diets are. The reason may be their Maya ancestry, which carries with it genetic variations associated with the disease.

“This is an important finding, because it could provide us clues about how to tackle the disease and plan public health strategies,” especially for Maya-speaking people, says María Guadalupe García, a geneticist at the Autonomous University of Yucatán (UADY) in Mérida, who was not involved in the research.

There may be fewer Maya today than at the culture’s height 3000 years ago, but they never disappeared. Today, Maya-speaking people constitute the second largest indigenous group in Mexico, with 800,000 people living mainly in the Yucatán Peninsula in the country’s southeast. Isolated culturally and geographically from other ethnicities for thousands of years, the Maya gene pool grew smaller and more homogeneous. As tends to happen with any isolated population, genetic variations that are rare in other groups became common among the Maya. Clinical biochemist Marta Menjívar of the National Autonomous University of Mexico (UNAM) in Mexico City wondered whether any of those variations might increase the Maya’s risk for diabetes, a growing problem in southeastern Mexico.

Menjívar’s team surfed through the genomes of 575 Maya individuals looking for 10 genetic variants that had been previously related to diabetes risk. They found that two are unusually common in the Maya (http://www.sciencedirect.com/science/article/pii/S0378111915003716) , the researchers will report in next month’s issue of *Gene* (http://www.sciencedirect.com/science/article/pii/S0378111915003716) .

The Maya’s relatively homogeneous gene pool made these variations easy to spot, explains Julio César Lara Riegos, a geneticist at UADY and the study’s lead author. But they probably aren’t limited to Maya communities. Most Mexicans are mestizos, with mixed European, African, and indigenous ancestry. The average mestizo has about 55% indigenous ancestry, Menjívar says. That makes studying the genetics of specific indigenous groups vital for understanding risk factors that could be present in the broader Mexican population, says Xavier Soberón, head of Mexico’s National Institute of Genomic Medicine (INMEGEN), who was not involved in the research.

It might also lead to personalized treatments for different Mexican ethnic groups and their mestizo relatives, says Ángeles Granados, a biochemist at UNAM and a co-author of the *Gene* paper. She is already studying how the Maya’s unique genetic profile may speed up the work of certain enzymes,

leading to rapid elimination of diabetes medicines from their bodies. “This could explain at least in part why some diabetics are not well medicated,” she says.

Understanding that process could assist doctors in knowing when to reduce or increase their patients’ doses of these drugs. It could also help Granados and other researchers develop medicines that resist breaking down so quickly and, therefore, would be more effective for Maya patients, as well as for anyone else who shares that particular genetic variant.

But other researchers remain skeptical. “We can’t start talking about improved treatments for Maya because diabetes is a very complex disease, involving lots of yet unknown risk factors, says Teresa Tusié Luna, a human geneticist who studies diabetes at the Salvador Zubirán National Institute of Health Sciences and Nutrition in Mexico City. And not all those risk factors are genetic. Mexican genomes could not have changed in just 20 years, yet there are more diabetes cases in the country today than a few decades ago. That means modern lifestyle may have something to do with the increase, but Tusié Luna warns that we are just starting to explore how both genetic and environmental components interact with each other when it comes to diabetes.

Lorena Orozco, another human geneticist at INMEGEN, worries about the methodology used in the study. “It is difficult to associate diabetes risk to Maya because our size samples will always be small, and that’s an intrinsic problem of working with ethnic groups.” Does this mean we should stop studying them? “No,” Orozco says, “we just have to be careful.”

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Science | DOI: 10.1126/science.aac6799

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Kristina Kangas • 14 days ago

I think it's important to note that the diet we observe to be prevalent today in Mexico emerged through colonialism and globalization. A comparable story:

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Robert Drapkin md facp • 15 days ago

Please remember that maise is the dietary staple among the highland and lowland Maya. In the Popol Vuh all mankind is made from maise. Corn is a high glycemic carbohydrate causing rapid elevations of serum insulin. Maturity onset diabetes results from insulin resistance associated with chronic high insulin levels. Maise as your staple is all you need to become diabetic-but maise will get you past childbearing and thus an evolutionary success.

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Maurie Beck • 16 days ago

The question is why hasn't natural selection removed the low fitness genetic variants (alleles) responsible for type 2 diabetes mellitus (DM) from the gene pool in Mayans and other populations with a high incidence of type 2 DM?

Often, genetic polymorphisms (i.e., multiple alleles; e.g., type 2 DM, sickle-cell anemia) are maintained in populations because of fitness trade offs between different alleles in different environments. For example, most people are homozygous (HbA/HbA) for the normal allele (version) of the hemoglobin gene (HbA). There is also a mutated hemoglobin allele (HbS) that cause sickle cell anemia in homozygous recessive individuals HbS/HbS, with two copies of HbS. People with sickle cell anemia have very low fitness. However, people who are heterozygous HbA/HbS (i.e., one copy each of HbA and HbS) are resistant to malaria and have much higher fitness in areas with endemic malaria than homozygous HbA/HbA susceptible individuals. In contrast, HbA/HbA individuals have the highest fitness in areas without malaria.

Although there are many genes involved with glucose metabolism, people with type 2 DM show similar tradeoffs in different food environments, such as our modern diet with a hyper abundance of calories compared to low calorie environments.

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Tanya Loft • 18 days ago

Poppycock. You can link the rising rates of diabetes in Mexicans to diet over everything. Mexico is where the real sugar and glass coca cola is, after all. They love it down there. And also high carb meals as well. You can pretty much learn all about how to be diabetes free from various diabetes treatment programs, I use ones that have already been reviewed at goo.gl/HQ4n22

2 • Reply • Share ›

disqus_q0PYKxihz5 ➔ Tanya Loft • 15 days ago

I have also speculated that "western foods" has not help. The Americas had Squash, chia grains, tomatoes, avocados, cactus, corn, flowers, honey, mushrooms, fish, insects, and cacao. With the introductions of bread, beef, milk, sugar rich and deep fried foods... the diet change has not help to say the least.

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Pesobill • 18 days ago

Are we sure the diabetes is not from the bad diets and coca cola ?
What a crock . The Mexicans eat very poorly and eat way too much sugar/sodium/fat ..DUH .. The numbers are higher than that as well .

1 • Reply • Share ›

disqus_q0PYKxihz5 ➔ Pesobill • 15 days ago

True, my family ate that way when we first arrived here. I got educated and have replaced fatty tamales with fish tamales and many other changes. I don't have enough European blood in me to make my body able to digest lactose.

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Mary Patterson • 18 days ago

Great article. Mayan ancestry seems good for us. We need cutting the risk of diabetes. I was diagnosed with type 2 Diabetes and put on Metformin on June 26th, 2014. I started the ADA diet and followed it 100% for a few weeks and could not get my blood sugar to go below 140. Finally i began to panic and called my doctor, he told me to get used to it. He said I would be on metformin my whole life and eventually insulin. At that point i knew something wasn't right and began to do a lot of research. On April 13th I found this book on http://www.wje592.com/i-am-fin.... I read the book from end to end that night because everything the writer was saying made absolute sense. I started the diet that day and the next morning my blood sugar was down to 100, the next day was in the 90's and now i have a fasting blood sugar between Mid 70's and the 80's. My doctor took me off the metformin after just one week of being on this lifestyle change. I have lost over 30 pounds in a month. I now work out twice a day and still have tons of energy. I have lost 6+ inches around my waist and I am off my high blood pressure medication too. I have about 20 more pounds to go till my body finds its ideal weight. The great news is, this is a lifestyle I can live with, it makes sense and it works. God Bless the writer. I wish the ADA would stop enabling consumers and tell them the truth. You can get off the drugs, you can help yourself, but you have to have a correct lifestyle and diet. No more processed foods.

1 • Reply • Share ›

William B ↗ Mary Patterson • 15 days ago

So what kind of diet is it then? What kind of products are you eating and no longer eating?

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Mary Patterson • 18 days ago

Where is Mayan ancestry?

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Perry Matterson ↗ Mary Patterson • 18 days ago

In your genes

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