

Nurture over nature

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Score one for the nurture side of the nature vs. nurture debate, as North Carolina State University geneticists have shown that environmental factors such as lifestyle and geography play a large role in whether certain genes are turned on or off.

By studying gene expression of white blood cells in 46 Moroccan Amazighs, or Berbers – including desert nomads, mountain agrarians and coastal urban dwellers – the NC State researchers and collaborators in Morocco and the United States showed that up to one-third of genes are differentially expressed due to where and how the Moroccan Amazighs live.

The research is published in the journal *PLoS Genetics*.

The NC State researchers, Youssef Idaghdour, an NC State graduate student in genetics and a Fulbright scholar, and Dr. Greg Gibson, formerly William Neal Reynolds Professor of Genetics at NC State and currently a faculty member at the University of Queensland in Australia, set out to study the impact of the transition from traditional to urbanized lifestyles on the human immune system. They used the latest tools for characterizing the sequence and expression of all 23,000 human genes to compare the three Moroccan Amazigh groups. These groups were chosen because they have a similar genetic makeup but lead distinct ways of life and occupy different geographic domains. Thus, differences in gene expression profiles between the three groups would likely be due to environmental and not genetic factors.

The team uncovered specific genes and pathways that are affected by lifestyle and geography. For example, they found respiratory genes were upregulated, or turned on, more frequently in the urban population than in the nomadic or agrarian populations.

This makes sense, Idaghdour says, as urban dwellers deal with greater amounts of pollution in the city and encounter more difficulties with diseases like asthma and bronchitis. So it stands to reason that certain respiratory genes in city dwellers go into overdrive while staying quiet in rural and nomadic populations, he adds.

The NC State researchers also examined every gene in each of the three populations and found very few genetic differences, positing that these limited differences were unlikely to explain the large gene expression differences.

Although Idaghdour initially hypothesized that environmental factors would play a role in gene expression, he didn't expect such large differences. About 30 percent of genes were differentially expressed between urban dwellers and mountain agrarians.

"The most important implication of this study is that people with the same genetic makeup can be in different environments and have different expression profiles," Idaghdour says. "The same gene can be expressed in the city but not in a rural place because of the environment. So you must look at the environment when studying associations between genes and disease."

Source: North Carolina State University

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