ASU genetics research sheds light on evolution of the human diet

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Diet - and how it has shaped our genome - occupies much of an evolutionary scientist's time. Anne Stone, associate professor of anthropology in Arizona State University's School of Human Evolution and Social Change, will discuss how diet holds keys to understanding who we are, how we live and form societies, and how we evolved from hunter-gatherers to agriculturists, all the way to modern urban dwellers, at the American Association for the Advancement of Science annual meeting in her seminar - "Genetic Perspectives on the Evolution of Human Diets".

Researchers like Stone look to our closest relatives - the chimpanzee and other primates - for comparisons to humans in order to understand the unique development of the human body and how it is impacted by diseases and the environment.

"One area we look at is starch consumption, something prominent in both agriculturalists and hunter-gatherers," says Stone. A study she and graduate student George "P.J." Perry led on the amalyse gene (AMY1) copy number variation - the gene responsible for starch hydrolysis - produced one of the first examples of positive selection on a copy number variable gene in the human genome. The results show how different levels of AMY1 copy number differentiation is unusual in a population, and that individuals with high starch diets have more copies than those with traditionally low starch diets. Digestion of starches is critically important for energy absorption - especially during episodes of diarrhea. This research gives insight into why certain populations may

weather diarrheal diseases better than others.

"To gain an even better understanding of this process in humans, we analyzed patterns of AMY1 copy number variation in chimpanzees and bonobos. We discovered that the average human has about three times more AMY1 copies than chimpanzees, which eat mostly fruit and far less starch than humans. And bonobos may not have any," says Stone. "This human-specific increase may have occurred with a dietary shift early in hominin evolutionary history. We know that starch-rich root plants were a critical food for early hominins, and may even have facilitated the initial spread of Homo erectus out of Africa."

Other genetic research on copy number variants in humans and primates includes examining the TAS2R gene family, the gene responsible for taste sensitivity to the bitter compound phynylthiocarbamide (PTC). "Sensitivity to bitter taste is an important means for animals to interact with their environment. These variants may be very significant from an evolutionary perspective, and they're important to study and understand," says Perry. "We talk about genetic diseases and cures, but first you have to find out what genetic differences are there so you can study what they're involved with and what they mean from a morphological variation and disease standpoint."

Identifying unusual patterns between species, such as copy number differences between humans and chimpanzees, can lead to identifying those that were involved in producing the evolution of human-specific traits. "This research not only illustrates the importance of studying genetic variation in other primates to understand our own genome better, but also sheds light on the diversity and adaptations of our nearest relatives," adds Stone.

Source: Arizona State University