Abstractions

FIRST AUTHOR

That there is a link between particular variations in our genetic code and diseases is well established. But because researchers cannot usually identify the parental origin of a sequence variant, until now it was not clear whether or how that origin might affect disease risk. Augustine Kong, a statistical geneticist at deCODE Genetics in Reykjavík, and his colleagues have determined that parental origin can have an important causative role (see page 868). He tells *Nature* more about the discoveries.

How did you determine whether gene variants were of maternal or paternal origin?

Thanks to national censuses and parish records, Iceland has complete genealogical records going back 10 generations for the entire population, which totals just 317,000. That means that in a population-based genetic study such as ours — so far we've analysed almost 40,000 people — how everyone involved is related is already known. So as we gathered genetic data on each individual, we were often able to use data from relatives to infer the genetic make-up of that individual's parents, in cases in which the parents themselves were not available for genotyping. In this way, we were able to distinguish the paternal contribution of gene variants from the maternal one. There is nowhere else in the world where this kind of study could be done on such a large scale.

How does the parental origin of gene variants affect the risk of disease?

It depends on the variant. We analysed two variants already known to be associated with disease — one with breast cancer and one with basal-cell carcinoma. In both cases, we found that if the variants are of paternal origin, they will confer a greater risk for those diseases. If they're inherited from the mother, nothing changes — there's neither more nor less risk. We also examined three variants known to increase the risk of type 2 diabetes. We found that those variants confer risk only when inherited maternally, having no effect when inherited paternally.

What was your most exciting finding?

During the course of the study, we discovered an entirely new susceptibility variant for type 2 diabetes. It is unlike the other variants we studied in that it increases the risk of developing the disease if it is inherited from the father, but decreases risk — that is, it is protective — when inherited from the mother.

Will this parent-of-origin influence apply to many gene variants?

Right now we can't say. We expect to learn much more about this in the next few years. ■

MAKING THE PAPER

Ahmed Zewail

Imaging technique captures movement at atomic scale.

Today's microscopes are incredibly powerful, but run into a wall at the nanoworld. The resolution of optical microscopy has advanced considerably with the advent of the near-field optical microscope, but still can't capture atomic structures. Meanwhile, a standard electron microscope can provide atomic details but only takes static images, and so cannot capture the dynamic behaviours of nanometre-sized molecules and materials.

Ahmed Zewail and his colleagues at the California Institute of Technology in Pasadena have now found a way to introduce near-field imaging to electron microscopy to produce real-time movies of nanometre-sized structures. Their technique, dubbed photon-induced near-field electron microscopy (PINEM), has the potential to change the way scientists see the nanoworld (see page 902).

Zewail had long been trying to add another dimension to the electron microscope's static three-dimensional images. "This has been my dream for many years," he says. "To get the structure and see how it changes over time." His group made a leap towards that dream in 2005, when it published and patented four-dimensional electron microscopy (V. A. Lobastov *et al. Proc. Natl Acad. Sci. USA* **102,** 7069–7073; 2005). This technology allows atoms to be seen in, for example, the graphite of pencil lead (B. Barwick *et al. Science* **322,** 1227–1231; 2008).

But Zewail wanted to see even more detail — such as the movement of electrons within a structure. "The question was, can you exploit the electron energy to image in space and time the electronic distributions that describe nanostructures?" To do so would require the team to image both electrons and photons — which have drastically different energies — at the same time.

The idea of bringing together electrons and photons in this way is akin to that of simultaneously capturing, with one quick click of a camera shutter, a running leopard and a galloping horse coming from two different directions at unspecified times. "Electrons and photons do not interact in free space because of the mismatch of their energies and momenta," says Zewail. Luckily, however, in the nanoworld these rules do not always apply, and the two energies do sometimes interact.

Brett Barwick and David Flannigan, two postdocs in Zewail's lab, illuminated various nanostructures, tubes and wires, then visualized electrons in the light field. "Instead of looking at the image for all electrons, we look at the image only for those electrons that lost or gained energy by interacting with matter or photons, respectively," Zewail says. To their surprise, the approach worked and they were able to visualize fields of electrons in these nanostructures over time. Seeing their shining results of how atoms interact in nanomaterials, "was like looking at a beautiful flower or work of art", Zewail says.

The researchers were particularly surprised by how bright their images were. In cases in which they saw an energy gain, electrons acquired as much as 8 quanta of energy — the researchers had expected only one to two at most, with low probability. "In science, you work so hard and sometimes the ideas or the systems don't cooperate," Zewail says. "But sometimes things cooperate so much, it's beautiful." ■

FROM THE BLOGOSPHERE

How important is it to publicize science's message? Richard Grant explores the topic of public relations (PR) in science on his blog The Scientist on Nature Network (http://go.nature.com/R1f4Ol).

At a gathering of science bloggers in August, another blogger proposed that "science doesn't need PR, it's a waste of time and money", recalls Grant, an information architect at Faculty of 1000 in London. But Grant points to two recent articles that support the opposite view. The first relates the fact that many people in the United States are choosing whether to get the H1N1 vaccination on the basis of emotions. The second incorrectly reports the results of a clinical trial that studied the effects of a daily dose of aspirin in combating a form of degenerative blindness. "In both cases, it's a failure of PR ... It's a matter of getting things right, and getting that information out there, to the public," argues Grant. "PR is necessary. And it's *hard*; perhaps even harder than the science."

The post includes a link to a video of the bloggers' gathering, where you can 'meet' many of your favourite Nature Network web writers. ■

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