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LETTERS

Edited by **Jennifer Sills**

A necrogenomic registry's potential

THE REDUCED COST and increased capacity of next-generation sequencing technologies have substantially increased the numbers of DNA variants identified per test. However, many of these variants are of unknown significance or are incidental findings (*1*). The lack of an evidence base hinders the translation of genetic findings into disease prevention and rational treatment choice. Furthermore, many population groups have not been adequately assessed genetically, which means that normal genetic variation within these groups is unknown, especially with respect to disease manifestation and drug metabolism.

We advocate the creation of a nationwide necrogenomic registry, recording the genomic sequences of all Danish citizens and residents at the time of their death. Danish law would allow these data to be linked to the Danish Civil Registration System, which registers medical history as well as socioeconomic information for all citizens and residents (*2*). The clinical and genomic data of 50,000 Danes (*3*) could be linked each year. With the combined data records, researchers could assess the phenotype/genotype association for many diseases that commonly affect the Danish population, enabling large genetic epidemiological studies.

Studies based on the necrogenomics database could provide strong evidence of genetic association, identify potential drug targets, and inform treatment modalities. The database would also provide the evidence necessary to adequately evaluate the clinical risk associated with incidental findings. Furthermore, a family physician, with the consent of the treated or advised patient, could request genetic findings found in deceased family members. This information could enable the patient to choose early and preventative treatment, thus avoiding premature death, serious disability, or adverse drug reactions. The release of such findings should follow the recommendations of the American College of Medical Genetics to ensure that the information provided is actionable (*4*).

There would be many ethical challenges. To address consent, an "opt-out" possibility similar to organ donation procedures in Denmark might allow individuals with reservations to exclude themselves from sampling upon their death. Anonymization, access, protection of minors and others who cannot decide for themselves would also be crucial. Defining the cultural, legal, and ethical framework of the necrogenomics registry will require public debate and detailed discussions in ethics committees and the political arena. Only once strict legal and ethical standards are in place can the advantages of necrogenomics be fully realized. In Denmark, a necrogenomics registry can be handled within the framework of our laws on biobanking, but laws in other countries may differ. If properly administered, necrogenomics will provide the predictive power necessary to offset the current lack of evidence that plagues genetic testing for many disorders.

Paula L. Hedley[1]* and Michael Christiansen[1,2]

[1]Department for Congenital Disorders, Statens Serum Institut, 2300, Copenhagen, Denmark. [2]Department of Biomedical Sciences, University of Copenhagen, 1165, Copenhagen, Denmark.

*Corresponding author. E-mail: phy@ssi.dk

REFERENCES

1. R. D. Aatre, S. M. Day, *Circ. Cardiovasc. Genet.* **4**, 81 (2011).
2. C. B. Pedersen, H. Gotzsche, J. O. Moller, P. B. Mortensen, *Dan. Med. Bull.* **53**, 441 (2006).
3. Statistics Denmark, *Deaths and Life Expectancy* (Statistics Denmark, 2015), vol. 2015.
4. R. C. Green *et al.*, *Genet. Med.* **15**, 565 (2013).

Construction on the Belo Monte dam in Brazil.

PHOTO: © PHIL CLARKE HILL/IN PICTURES/CORBIS

Tropical dams: To build or not to build?

IN THEIR POLICY Forum "Balancing hydropower and biodiversity in the Amazon, Congo, and Mekong" (8 January, p. 128), K. O. Winemiller and colleagues present a much-needed window on biodiversity impacts of tropical dams. They conclude that "without more careful planning," impacts will include species extinctions and losses of fisheries and ecosystem services. It needs to be made clear that the most important change required is a fundamental reform of how decisions are made on whether or not to build dams, not the planning of how dams are designed, sited, or managed.

"[V]alidation of technologies intended to mitigate environmental impacts" or improved "design parameters" from better environmental impact assessments (EIAs) pale in comparison with the initial decision: to build or not to build a dam. No amount of adjustment would prevent enormous impacts from a dam like Belo Monte in Brazil—impacts that far exceed what was considered in the EIA, let alone what was considered when the decision to build the dam was made long before the EIA existed (*1*).

Winemiller *et al.* state that the dam projects they discuss "address important energy needs" and that their suggestions for better dam planning would "ensure that societal objectives for energy production are met." The assumption that these dams are needed is questionable from the standpoint of societies in the three cases presented: the Congo, Mekong, and Amazon basins. The Democratic Republic of Congo's Grand Inga Dam is primarily to export electricity to South Africa (*2*, *3*); mainstream Mekong dams will destroy livelihoods in Laos and Cambodia to export electricity to Thailand and Vietnam (*4*); and Amazon dams will feed Brazil's "National Interconnected System," which has many lower-impact options for providing the benefits of electric power. Brazilian society's interests are poorly served by exporting electricity in the form of aluminum, because smelting consumes vast amounts of energy while creating little employment: The environmental and social impacts of the dams that power the smelters stay in Brazil, whereas the benefits are exported (*5*). Brazil has massive potential to reduce inefficiencies in electricity transmission, distribution, and use and to tap wind and solar sources (*6*).

Weinmiller *et al.* state that "at least 334 new Amazon dams have been proposed."

One cannot simply treat this as inevitable and limit suggestions to a better choice of sites to locate these dams and to improving their design and management. It is essential to face the issue of whether such a massive dam-building plan should exist in the first place.

Philip M. Fearnside

National Institute for Research in Amazonia (INPA), Manaus, Amazonas, 69067-375, Brazil.
E-mail: pmfearn@inpa.gov.br

REFERENCES

1. P. M. Fearnside, *GWF Discussion Paper 1210*, Global Water Forum, Canberra, Australia (2012); www.globalwaterforum.org/wp-content/uploads/2012/04/Belo-Monte-Dam-A-spearhead-for-Brazils-dam-building-attack-on-Amazonia_-GWF-1210.pdf.
2. F. Misser, *La Saga d'Inga: L'Histoire des Barrages du Fleuve Congo* (Éditions L'Harmattan, Paris, 2013).
3. R. Sanyanga, "Will Congo's poor benefit from world's largest dam project?" International Rivers (2013); www.internationalrivers.org/blogs/266/will-congo%E2%80%99s-poor-benefit-from-world%E2%80%99s-largest-dam-project.
4. G. Ziv, E. Baran, S. Nam, I. Rodríguez-Iturbe, S. A. Levin, *Proc. Natl. Acad. Sci. U.S.A.* **109**, 5609 (2012).
5. P. M. Fearnside, *World Dev.* **77**, 48 (2016).
6. P. F. Moreira, Ed., *O Setor Elétrico Brasileiro e a Sustentabilidade no Século 21: Oportunidade e Desafios* (Rios Internacionais, Brasília, ed. 2, 2012); www.internationalrivers.org/node/7525.

TECHNICAL COMMENT ABSTRACTS

Comment on "Worldwide evidence of a unimodal relationship between productivity and plant species richness"

Andrew T. Tredennick, Peter B. Adler, James B. Grace, W. Stanley Harpole, Elizabeth T. Borer, Eric W. Seabloom, T. Michael Anderson, Jonathan D. Bakker, Lori A. Biederman, Cynthia S. Brown, Yvonne M. Buckley, Chengjin Chu, Scott L. Collins, Michael J. Crawley, Philip A. Fay, Jennifer Firn, Daniel S. Gruner, Nicole Hagenah, Yann Hautier, Andy Hector, Helmut Hillebrand, Kevin Kirkman, Johannes M. H. Knops, Ramesh Laungani, Eric M. Lind, Andrew S. MacDougall, Rebecca L. McCulley, Charles E. Mitchell, Joslin L Moore, John W. Morgan, John L. Orrock, Pablo L. Peri, Suzanne M. Prober, Anita C. Risch, Martin Schütz, Karina L. Speziale, Rachel J. Standish, Lauren L. Sullivan, Glenda M. Wardle, Ryan J. Williams, Louie H. Yang

Fraser *et al.* (Reports, 17 July 2015, p. 302) report a unimodal relationship between productivity and species richness at regional and global scales, which they contrast with the results of Adler *et al.* (Reports, 23 September 2011, p. 1750). However, both data sets, when analyzed correctly, show clearly and consistently that productivity is a poor predictor of local species richness.

Full text at http://dx.doi.org/10.1126/science.aad6236

Response to Comment on "Worldwide evidence of a unimodal relationship between productivity and plant species richness"

Jason Pither, Lauchlan H. Fraser, Anke Jentsch, Marcelo Sternberg, Martin Zobel, James Cahill, Carl Beierkuhnlein, Sándor Bartha, Jonathan A. Bennett, Bazartseren Boldgiv, Leslie R. Brown, Marcelo Cabido, Giandiego Campetella, Cameron N. Carlyle, Stefano Chelli, Anna Mária Csergő, Sandra Diaz, Lucas Enrico, David Ensing, Alessandra Fidelis, Heath W. Garris, Hugh A. L. Henry, Maria Höhn, John Klironomos, Kadri Koorem, Rachael Lawrence-Lodge, Peter Manning, Randall J. Mitchell, Mari Moora, Valério D. Pillar, Gisela C. Stotz, Shu-ichi Sugiyama, Szilárd Szentes, Radnaakhand Tungalag, Sainbileg Undrakhbold, Camilla Wellstein, Talita Zupo

Tredennick *et al.* criticize one of our statistical analyses and emphasize the low explanatory power of models relating productivity to diversity. These criticisms do not detract from our key findings, including evidence consistent with the unimodal constraint relationship predicted by the humped-back model and evidence of scale sensitivities in the form and strength of the relationship.

Full text at http://dx.doi.org/10.1126/science.aad8019

ONLINE BUZZ

Tenure's tenure

In her 11 December 2015 Editorial, "Whither (wither?) tenure?" (p. 1295), Editor-in-Chief Marcia McNutt questions whether tenure is still relevant and proposes replacing it with a 10-year rolling contract system, which she suggests would benefit women and discourage unproductive faculty. Excerpts of your comments are below. Read the full comments at http://comments.sciencemag.org/content/10.1126/science.aad9966.

A selection of your thoughts:

...[A]djunct teaching faculty are most widely used at cash-strapped public universities and colleges.... Eliminating tenure will have little impact on the financial constraints faced by universities....

Roger Albin

Tenure is very important in my field.... Academic freedom that only tenure can provide is critical for the protection of scientists....

George Leikauf

...Without tenure, professors would be under enormous pressure to make pedagogical and assessment/grading decisions that "keep the students happy." This would...erode the quality of our educational systems....

Loren Byrne

...Ten-year contracts do not increase family security or promote women employment.... The true problem is the large number of newly minted Ph.D.s....

John Smith

...Tenure can become a burden to [large research] universities...required to support faculty who have no real purpose if they don't have grant funding. That is not the case for...nonscience disciplines....

David Martin

...Wouldn't it be better to argue that we need to consider how tenure is awarded so all can profit from the freedom it brings...?

Toby Walsh

I'm partial to the idea of a "rolling" contract that is renewed every year for some span of time (say 10 years) unless the institution decides not to renew. ...That way tenure does not turn into employment for life doing anything an individual desires, but the individual's predilections are not at the mercy of the short-term whims of administrators....

Warren Gallin