James C. Peterson

Asilomar II: The Ongoing National Academy of Sciences Report on CRISPR

The possibilities and risks of recombinant DNA triggered the famous Asilomar Conference in 1975. Geneticists agreed there on safeguards for their research with recombinant DNA. A second such formative conference was held in Washington, DC, in December of 2015. This one was triggered by an even more transformative new genetic technology called CRISPR Cas9. Instead of clumsily working proteins, CRISPR Cas9 (and now Cas13) makes possible uniquely specific deletions and additions in RNA. The National Academy of Sciences and the National Academy of Medicine of the USA, the Chinese Academy of Sciences, and the Royal Society of the UK, called together a gathering of the founding scientists with some advisors to work through the best direction for this strikingly efficient, precise, and inexpensive method to edit DNA. At that conference, I saw first hand the challenge of developing ethical consensus. The conversation went from 7:00 each morning to 7:00 in the evening with food brought in for three days. The resulting statement was heralded on all the major television and newspaper networks, but largely missed by the public. It was released at the end of the conference, December 3, 2015, while the news stream was dominated by the San Bernardino massacre.

The agreed communiqué begins: "Scientific advances in molecular biology over the past 50 years have produced remarkable progress in medicine." It continues, "The scientific community has consistently recognized its responsibility." Of course, the subtext here is that we geneticists are doing work that should be supported, and we will regulate ourselves. There is no need for governments to clumsily intervene. Granted research funding is still most welcome and productive. Keep that coming.

The document then advocates four conclusions:

1. *Intensive basic and preclinical research is clearly needed.* We are only beginning to realize the opportunities with CRISPR to extend our understanding.
2. *Clinical applications at this point should be intended to affect only the presenting patient.* Every word in a document such as this, counts. The key word here is "intended." Participants know that treating the presenting patient (somatic) often has implications (germline) for any children that they might have. We have already somatically tested and treated for PKU long enough to see its incidence increase. That is a germline effect, from a standard of care, somatic, effort.
3. *Deliberate germline editing should not be pursued until safety and efficacy issues have been resolved, and there is broad societal consensus that such editing is appropriate.* The key word here is "until." Participants expect that germline editing will eventually be welcome, but realize that it is not yet. That awareness leads then to the fourth conclusion.
4. *There should be ongoing discussion that is inclusive among nations and from a wide range of perspectives* "including biomedical scientists, social scientists, ethicists, health care providers, patients and their families, people with disabilities, policymakers, regulators, research funders, faith leaders, public interest advocates, industry representatives, and members of the general public."

The dialogue has indeed continued globally, and will extend to Golden, Colorado, this July. At the 2016 Annual Meeting of the American Scientific Affiliation, Douglas Lauffenburger of MIT ably began our discussion in a premeeting workshop. At the 2017 Annual Meeting, I will continue that conversation with a plenary on the ongoing proposed guidelines concerning somatic, germline, curative, and enhancement uses in human beings, and will include Christian insights and purpose that might shape our response. I look forward to thoughtful discussion and what we will discern working together.

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