

### **ROW 3: Examples of Evaluating Sources and Evidence**

#### **DIRECT EVALUATION OF SOURCES:**

According to David DeGrazia, **American moral philosopher specializing in bioethics at George Washington University,...**

In the opinion of Michael Boylan, **PhD and Department of Philosophy at Marymount University,...**

David Harmer, J.D. **at J. Reuben Clark Law School and former participant in the U.S. Senate Judiciary Committee,...**

David Hemenway, **PhD, Director of the Inquiry Control Research Center, and Professor of Health Policy at the Harvard School of Public Health,...**

Eric Lander, **an expert in the human genome who even played an important role in the Human Genome Project,...**

The summit was sponsored by the **U.S. National Academy of Sciences, the U.S. National Academy of Medicine, the Royal Society, and the Chinese Academy of Sciences, all authorities on science and medicine.**

#### **PURPOSEFUL USE OF SOURCES:**

The first two, mosaicism and off-target changes, were evident in the three studies that attempted to edit genes in embryos. The first two, done in China in 2015 and 2016, used triprenuclear embryos (which are nonviable), to avoid the ethical debate surrounding the use of viable embryos. Besides being nonviable, triprenuclear embryos are suitable stand-ins for regular embryos. The results were only partially successful. Mosaicism was prevalent and off-target mutations were present (Kang et al., 2016; Liang et al., 2015). These results indicate that while CRISPR-Cas9 is much better than previous technologies, the technology itself and the practices for its use both need to be much improved in order for it to be safe for human germline editing. The latest study, conducted in 2017, had better results because CRISPR-Cas9 was added at the same time as the sperm, instead of after fertilization, resulting in less prevalent mosaicism. In addition, no off-target changes were found (Ma et al., 2017). This shows that the technology and practices are improving and that eventually mosaicism and off-target changes can be brought down to a minimum. These three studies were all published in peer-reviewed academic journals and seemed to follow good experiment procedures. They are all controversial, but this is largely due to the controversy that surrounds human germline editing and research with embryos in general, not the studies in particular.