Progress with Stem Cells: Stuck or Unstuck?

James Thomson's derivation of human embryonic stem (hES) cell lines in November 1998 was a major scientific breakthrough, the full value of which should not be underestimated. Nearly 20 years of work with mouse embryonic stem (mES) cells revealed that those cells can be propagated indefinitely while maintaining the capacity to differentiate into many different cell types. There is little reason to doubt that cultured hES cells also have the potential to form any type of human cell under appropriate conditions. Accordingly, scientists foresee the ability to create new healthy tissue to replace damaged or dead tissue, such as pancreatic islet cells for alleviating type 1 diabetes and neuronal cells for treating Parkinson's disease, Alzheimer's, and various forms of brain and spinal cord disorders.

President Bush's decision to permit the use of federal funds for research on hES cells may have assuaged his political and moral concerns, but the constraints his plan placed on our ability to fully exploit this development may be too costly. Particularly problematic was the president's decision to limit research to what he referred to as "more than 60 genetically diverse stem cell lines" that were derived from excess embryos before 9 August 2001. That statement caught most investigators by surprise, because the scientific literature describes approximately 10 distinct hES cell lines. But the National Institutes of Health (NIH) have indeed identified both U.S. and foreign research centers and commercial companies that have derived as many as 64 hES cell derivations that meet the president's requirements for federally funded research. Recent disclosures, however, indicate that only about 25 of the derivations currently qualify as cell lines. The still-to-be-released NIH registry of eligible cell lines will reveal how and when they were derived, as well as their culture history, growth characteristics, molecular markers, and evidence of pluripotency. Especially relevant is if and when these lines will be available for scientists to assess their quality and utility. For in the end, only independent scientists working with these cells in their own laboratories can validate their usefulness for the important research ahead and determine whether a sufficient number exist. In making his decision, the president may have been unaware of the legal and intellectual property constraints that complicate the availability of the various lines. How these claims will affect the availability and ultimately the use of hES cells and their differentiated products has yet to be negotiated.

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In spite of these uncertainties and impediments, federally funded scientists can now explore the biology and therapeutic utility of hES cells. Admittedly, most biologists prefer that there be no limit to the number of lines eligible for federally funded research, because there is already evidence of considerable variability among the lines, some having more desirable qualities than others. Indeed, many years of experience with different mES cells were needed to learn which ones maintain their pluripotentiality in culture, and we are only just beginning to discover which ones respond best to the cues for directing their specific differentiation. So it is critical to establish as quickly as possible which and how many of the lines sanctioned by the president will serve the scientific requirements. Concerns about whether the existing lines are suitable for therapeutic use are premature, for we are still a long way from exploring their clinical utility. Especially critical is the need for NIH to expedite the process for soliciting and evaluating requests for funding of this research. Delay in implementing the approval and funding process will only blunt what positive effect the president's action has. In the end, strongly grounded basic research, not rhetoric, will be essential to achieve the therapeutic promise of hES cells. Perhaps as important is that if the basic and developmental research that can now be done fulfills the promise we believe will follow, that progress will justify and invigorate renewed efforts to challenge the limitations imposed by the president. Hopefully, when that happens, the Congress will see fit to relax the prohibitions that their and the president's policies have placed on this important line of research.

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