The Ethical Reasons for Stem Cell Research

HUMAN EMBRYONIC STEM (HES) CELLS ARE unique in their demonstrated potential to differentiate into all cell lineages. Reports by T. Wakayama *et al.* ("Differentiation of embryonic stem cell lines generated from adult somatic cells by nuclear transfer," 27 Apr., p. 740) and N. Lumelsky *et al.* ("Differentiation of embryonic stem cells to insulin-secreting structures similar to pancreatic islets," *Science*Express, 26 Apr., 10.1126) testify to the enormous promise of ES cell research. The editorial "Disappearing stem cells, disappearing science," by Irving L. Weissman and David Baltimore (27 Apr., p. 601) emphasizes the implications of this research for human health. Weissman and Baltimore point out that hES cells are currently the most promising source of cells for tissue regeneration research. They also note that this area has enormous potential for shedding light on some of the greatest mysteries of early human development.

During this same week, the U.S. Department of Health and Human Services suddenly asked the National Institutes of Health (NIH) to cancel a planned first meeting of a committee that was to review applications from scientists seeking federal funds for hES cell research. This announcement heightens concerns that the Bush administration may eventually block implementation of the NIH's guidelines supporting this research. We hope that these fears are groundless and that the Bush administration will use this additional time to move toward support of the guidelines. Whatever the outcome, however, these delays have a real cost in terms of human suffering. According to data from the Centers for Disease Control's National Center for Health Statistics, approximately 3,000 Americans die every day from diseases that in the future may be treatable with ES-derived cells and tissues. We believe that these urgent health needs provide strong moral grounds for pursuing ES cell research.

In addition, at least three ethical considerations recommend federal funding for this research. First, withdrawal of support will slow this research, but not stop it from going forward. Private organizations and overseas researchers will fill the void. In some cases, they will do so without the kinds of comprehensive ethical oversight provided by U.S. human subjects regulations.

Second, prohibiting such funding will not prevent the destruction of embryos. Each year, thousands of spare embryos created in infertility procedures are routinely destroyed at the request of their progenitors. A very small number of these embryos could be used to produce immortal stem cell lines that could be grown and used for research without ever using more embryos. The relevant ethical question is whether these spare embryos will simply be thrown away or used for human benefit.

Third, and finally, we note that the United States is a religiously and ethically pluralistic nation. Many of those who oppose ES cell research base their position on religious views not shared by other citizens. As much as possible, the government should try to avoid taking sides in these debates and confine itself to policies that promote public health and welfare. ES cell research within the framework of the NIH guidelines is such a policy.

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Arsenic Levels Can Be "Standard" or "Safe"

NO DISTINCTION BETWEEN THE DRINKING water standard and the safe level for toxicants such as arsenic is made in the news article "Science only one part of arsenic standards" (News of the Week, Jocelyn Kaiser, 30 Mar., p. 2533). Therefore, readers may get the impression that determination of the safe level is also only partly based on science and thus is not much different from risk assessment.

> **"[D]uring an outbreak of arsenic poisoning from tainted beer, the highest safe level was found to be ~250 ug/l."**

Such an impression would be incorrect. Legitimate policy judgment enters the drinking water standard in the form of a separate "safety margin." The safe level is a purely scientific determination. First determined by the Royal Commission on Arsenic Poisoning 100 years ago during an outbreak of arsenic poisoning from tainted beer, the highest safe level was found to be

Letters to the Editor

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~250 ug/l (*1*). This safe level plus a five-fold safety margin make up the present drinking water standard of 50 ug/l.

Within a factor of 2, the safe level of arsenic remains the same if good and reproducible science of the intervening 100 years is used (*2*). That requires weeding out controversial studies such as the one from northwestern Taiwan (*3*), which is highlighted in the news article.

Results presented in Table 4 of that study show 3, 3, 2, and 7 cases of urinary cancer and 1, 1, 2, and 6 cases of transitional cell carcinoma at arsenic levels below 10, 10 to 50, 50 to 100, and above 100 ug/l, respectively. Numbers of cases at the three levels below 100 ug/l are so small that no positive interpretation of increased cancer risk is possible. The claim that "cancer risk rose with arsenic levels even at these low exposures" is incorrect. There are hundreds of arsenical skin cancers on record and thousands of cases of the typical arsenicism, fully reproduced at levels above 200 ug/l. These cases and the complete absence of arsenical skin disease in the United States should be used to identify the safe level and to set a drinking water standard.

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References and Notes
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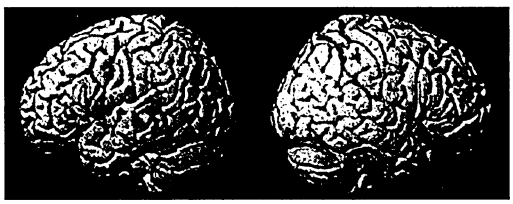
2. G. Stohrer, *Arch. Toxicol.* 65, 525 (1991).
3. H.-Y. Chiou *et al., Am. J. Epidemiol.*, 153, 411 (2001).

Defining Dyslexia

DYSLEXIA IS CALLED "THE LANGUAGE DISORDER that makes reading and writing a struggle" by Laura Helmuth in her News of the Week article "Dyslexia: same brains, different languages," (16 Mar., p. 2064). Although she is in the good company of many cognitive neuroscientists and educational psychologists, her terminology is in error. Evolution prepared us for language, but not for reading or writing. Indeed, Western cultures have demanded that all their normal children acquire script only within about the past 100 years. It is surprising and satisfying that most children do develop a reasonable reading skill—but many children don't. Most of them would never have become diagnosed as "language disordered" in an oral culture; they have speech and language skills that are entirely in the normal range. Calling dyslexics "language disordered" shows a lack of evolutionary and historical awareness and it risks being considered discriminatory.



Green areas of the brain are significantly less active in dyslexics compared to normal individuals when reading simple words.

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The wonderful report by E. Paulesu *et al.* does not make this error ("Dyslexia: cultural diversity and biological unity," p. 2165).

Still, in the Paulesu *et al.* report, developmental dyslexia is called a "disorder of genetic origin," and the authors discuss "brain abnormalities" that are apparently involved. The implicit assumption is that our brains should normally allow for the acquisition of reading. If they don't, then there must be an abnormality. The question is whether this "abnormality" is still within the normal evolutionary range.

In other words, would our ancestors with such brains have become normally speaking and normally functioning hunter-gatherers? If so, it is a misnomer to denote dyslexics as neurologically abnormal. It