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“As to diseases ,make a habit of two things —
to help, or at least *do no harm.*”

— Hippocrates, *The Epidemics* —

**NEW REPORT: EMBRYONIC STEM CELLS
ACCUMULATE RISKY MUTATIONS
BUT PROVIDES NO SUPPORT FOR GOVERNMENT FUNDING OF NEW LINES**

A report released by an international scientific team documents that human embryonic stem cells accumulate genetic mutations as they are cultured in the lab (1). The study compared genetic changes between cells early on in their laboratory growth and those that had been grown for longer periods of time. Like all other cells, human embryonic stem cells accumulated mutations and chromosomal changes, many of which are associated with faster growth and tumor formation.

While some are already “spinning” the facts from the report to call for passage of the Castle/Specter bill and use of federal money to produce new human embryonic stem cell lines, the real lesson is exactly the opposite.

The authors themselves note that their findings do not limit the utility of the cells for basic research or even for possible future applications, but simply draw attention to the need to monitor growing cells closely for genetic changes. The fact is that any cell in prolonged culture will show changes, but good laboratory practice involves freezing cell samples as a hedge against such genetic changes, so that a pool of frozen cells is always available. Using such practices, normal human cells have been used for decades for research as well as vaccine preparation; examples include the WI-38 cell line first isolated in 1961 (2), the MRC-5 line isolated in 1966 (3), and the IMR-90 cell line first grown in 1977 (4), still used today. It is inconceivable that those maintaining cell cultures at NIH would not have followed this practice.

Indeed, the NIH noted in 2004 that they had 3500 frozen samples of the 22 currently growing approved lines ready to ship, and fully half (39) of the original 78 approved lines have yet even to be thawed and grown for research use. These frozen sample have of course not had an opportunity to grow in culture and accumulate genetic mutations. Geron Corp., a leading proponent of embryonic stem cell research, has publicly stated their intention to use the original approved lines for any potential human tests.

The other lesson from this report is a cautionary tale regarding embryonic stem cells in general. This is not the first report to document their tendency for abnormal growth and genetic changes. Previous studies have noted that embryonic stem cells are prone to genetic variability (5) and chromosome changes associated with tumor formation (6), especially when compared to normal adult cells (7). And these changes occur in any embryonic stem cell. For example, the new human embryonic stem cell lines produced by Doug Melton at Harvard showed the same tendency for chromosomal changes (8)

Thus embryonic stem cells pose an unusually high risk for genetic changes and tumor formation, with the risk increasing the longer the cells are grown, thus making their therapeutic use even more speculative and problematic. By contrast, adult and cord blood stem cells are usually not grown for extensive periods, so do not pose this potential of accumulating mutations. Instead, adult stem cells are generally used in patients shortly after they are harvested (or retrieved from frozen storage), and have already benefited thousands worldwide.

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