Editors and embryos

To the editor — A recent editorial has stressed how the debate over the disposal of frozen human embryos did not take into consideration the potential benefits derived from the use of human fertilized cells for research (*Nature Medicine* 2, 947; 1996). The authors imply that the "humanness" of a four-cell embryo is untenable, but unfortunately they fail to tell us which event after the fusion of the pro-nuclei signals, in their opinion, the beginning of a human life, and the scientific evidence to support it.

It is clear that any debate about the generation, storage and disposal of human embryos should be preceded by an in-depth and serene discussion on the status of such embryos. Those who deny the spiritual dimension of human life will have to explain at which point of development can an organism be recognized unequivocally as belonging to the *Homo sapiens* species. Those who believe that there is more to human life than biology will first have to address the issue of defining a human person in philosophical terms; this

should be followed by the discussion of when during human development can that concept be applied. In this process it will be very helpful to use correct terminology (terms like "four-cell zygotes" are certainly misleading), but it is even more important that our line of argumentation is not influenced by our ideological preconceptions. In this regard, most readers of the editorial mentioned above will probably find the expression "hard-line reductionists" a bit over the top.

Editors of top scientific journals have the responsibility of ensuring that such debate is carried out in a balanced way, respecting the various philosophical and religious sensitivities and fostering the unbiased search for truth, the ultimate goal of any scientific endeavor.

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Measuring gene-transfer efficiency

To the editor — In the October issue of *Nature Medicine*, Phillips *et al.*¹ reviewed current approaches to measuring gene transfer efficiency in hematopoietic cells. In particular, the article highlights the potential advantages of using retroviral constructs encoding cell-surface antigens, such as the low-affinity nerve growth factor receptor

(NGFR) or murine CD24, to measure the proportion of transduced cells and to facilitate the selection or the tracking of the desired marked cell population. In their closing remarks, the authors highlight the need for stable gene expression over long culture periods. We have data that question the reliability of analyzing cell-surface marker expression by flow cytometry as a means for assessing gene transfer into human hematopoietic cells.

We have recently transferred a retroviral vector encoding a truncated low-affinity NGFR gene² by means of flow-through filter transduction³ into an EBV-transformed lymphoblastoid cell line (EBV-LCL) to determine the efficiency of this approach in human B cells. Gene transfer was assessed 24 hours after transduction by analyzing NGFR cell surface expression by flow cytometry. Although initially the majority of LCL cells were found to express high levels of NGFR (80% positive cells), when the cells were placed in culture, NGFR levels on transduced LCL rapidly declined so that by one week after transduction only 5% were positive for NGFR. As this decline may have represented a negative selection pressure of the transgene and consequent outgrowth of untransduced cells, we selected NGFR-transduced LCL on a fluorescence-activated cell sorter (FACS). FACS analysis performed on positive sorted cells one week after the sorting procedure failed to show evidence of expression of the transferred gene. Furthermore, the transgene was not detected by Southern analysis in unsorted cells from which DNA was extracted at a time when NGFR surface expression was >50% as assessed by flow cytometry.

Retroviral particles are formed by budding from the packaging cell line, and part

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