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# Embryo Biopsy for Stem Cells: *Trading Old Problems for New*

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BY KATHY L. HUDSON

**T**he team of scientists at Advanced Cell Technology led by Robert Lanza has announced that it has developed a method to create stem cells from a single cell extracted from a human embryo without destroying the embryo. Heralded by some as the perfect solution to the political stalemate over funding stem cell re-

search, Lanza's work—at the moment—raises as many questions as it answers.

Currently, scientists harvest stem cells from early-stage embryos, usually excess embryos from IVF that would otherwise be discarded. The embryo is destroyed in the process. Lanza asserts that scientists could remove one cell from an early-stage human embryo to create a new stem cell line, preserving the remaining embryo for transfer to a woman's womb to initiate a pregnancy. A similar technique—under the name preimplantation genetic diagnosis—is used rather routinely in IVF clinics. In PGD, the cell undergoes genetic analysis in order to test embryos for genetic diseases or conditions.

Lanza also suggests—although he did not test the claim experimentally—that a single cell removed from the

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Kathy Hudson, "Embryo Biopsy for Stem Cells: Trading Old Problems for New," *Hastings Center Report* 36, no. 5 (2006): 50-51.

embryo could be used simultaneously for dual purposes: Let it grow and divide overnight, he says, and use the resulting multiple cells both to perform PGD and to grow stem cell lines. If PGD shows the embryo to be unaffected it can be transferred to a woman's womb. Theoretically, he points out, if the stem cell lines develop successfully, the new baby will have his or her very own stem cell line from which matched tissue or other therapies can be grown.

So what's wrong with this picture? First, taking a cell from an embryo brings risk—how much risk is unknown. It's a touchy time for a young embryo—intercellular communication networks are being set up and a host of other critical functions are being initialized. Moreover, removing a single cell from a tiny embryo requires “good hands” on the part of a lab technician—and even with the best of hands, some embryos don't survive. Biopsied embryos survive freezing much less well than intact embryos, and some evidence suggests embryos that survive the biopsy are not as good at implanting in the womb.

It is thus almost certainly a nonstarter to ask couples going through IVF to contribute a cell for stem cell research. The risks of embryo biopsy could reduce the likelihood that IVF would succeed. The prospective parents already have only about a one-in-three chance of having a baby from any given IVF cycle. The odds are reduced if the embryo's viability is impaired, and reduced even more if a biopsied embryo is frozen for later transfer.

These doubts led Lanza and his colleagues to suggest that this approach to stem cell research be used only in the context of PGD. Lanza's logic is that if prospective parents contemplating PGD can still get the benefit of genetic analysis, they would not object if the blastomere removed for genetic analysis also gives rise to stem cells, and especially not if it gives their future offspring the chance to have matched stem cell lines for potential future therapeutic use. Two for the price of one.

The problem is that Lanza and his colleagues only *suggest* this “two-fer”—they have not actually done it. Nor have they analyzed the additional risk it brings to families

seeking PGD. Presumably, under Lanza's scenario, couples contemplating PGD would be told that they can contribute to stem cell research by permitting two changes to the way PGD is typically performed: an overnight delay, and genetic analysis on the cells that have grown overnight rather than on the original cell removed from the embryo. There is no way to know how the additional time and cell division would affect the chance of genetic “glitches” being introduced. PGD accuracy could plummet as a result.

Worse, more than 40 percent of the individual blastomeres failed to divide in culture in Lanza's study, and half of those, or about a third of the starting cells, divided only once. Thus, the families could lose everything: no stem cell line, and inadequate cells for PGD. A member of the ATC ethics advisory committee was widely quoted in news reports saying that cells that have stopped dividing, and are presumably dying, could still be tested for PGD, but this was not demonstrated by the Lanza group. In fact, dying cells can release nucleases that rapidly degrade DNA. Thus, DNA from dying cells is not a good substrate for genetic testing.

It's one thing for families considering PGD to weigh the risks of biopsy against the need to identify genetic problems that may lead to fatal or debilitating illness; this has real benefits for the family and the child. But Lanza's theoretical solution asks these families to take on additional substantial risks, in a technique and procedure already fraught with the possibility of disappointment, only in the service of basic research. In that context, these risks are unacceptable.

There is no question that this new work is intriguing, and if we could establish that it imposed no additional risks on the parents, the embryo, or the child from his proposal, I would applaud it as a breakthrough. Until that is established, we have not solved the ethical problems in embryonic stem cell research. We are tying ourselves in ethical Gordian knots in an effort to address the concerns of some Americans about the intentional destruction of embryos. At best, this new research merely ties the knot in a different way.